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Oppression or Emancipation?

How development aid projects impact Small-Scale Gold Miners in Uganda and Colombia.

A Techno-Anthropological Action Research

Master´s Thesis in Techno-Anthropology - Aalborg University CPH - 2019

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AALBORG UNIVERSITY
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Master´s Thesis in Techno-Anthropology by
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This work is my first contribution to the brave Small-Scale Gold Miners from Uganda and Colombia and for the future of my two Sons, Jose and Cristoffer in a world without mercury.

ACKNOWLEDGEMENTS

When you cross the border over your 40s, nearly the second part of one ´s life, it is time to think in inflexions and turning points. My decision to come to Denmark was motivated mainly by two reasons: Three years back on time my family life needed a second significant challenge to grow, be together, start from zero, be stronger and also required new lessons of resilience. We changed comfort, acknowledge, family, friends and a significant professional network, for new knowledge, unique culture, youth energy injection, and lessons of humility and about the essential for humanity. I want to thank my mother Gabriela, my mother in law Mabel and my wife Sofi for your invaluable love, understanding and support, thanks my siblings especially to Johanna; you were my conscience and my backbone in Colombia.

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The decision was appropriated and also allowed me to meet beautiful and inspirational people. I want to mention my colleagues from Barcelona: Jordi Colobrans, Arthur Serra and Richard Fabra, they have a living example of Techno-Anthropology making changes with technology for citizens, with their democratical and inspirational projects in the i2Cat lab. Maximino Matus, who with discipline and commitment, produces and shares Techno-anthropological knowledge from Latin-America to the world; and the professor Arturo Escobar who is a new lighthouse for my thoughts. I also want to thank Dialogos Team; you will always be in my heart for all the good time spend together specially to Peter Appel, Sofie Pedersen, Rasmus Køster-Rasmussen, Leoncio Na Oi and Rudy Onos, and in Uganda Africa to the NAPE team in particular to Bety Obbo and Geoffrey Kamesse.

After two years here, now I know why God guided me to take this path. This country is a perfect example of what good things are possible to develop for citizens, customers and the environment. In Denmark, I reconnected my spirituality, my family, my brain and my desire for a better world. If Denmark is not close to perfection, no one country will be ever. Thank you, Denmark, for your hospitality thank you for your people, and thank you for your education that is the only thing that makes us free.

ABSTRACT

This master´s thesis explores from a Techno-Anthropological perspective a particular situation presented by a Danish NGO which promotes around the world the implementation of Mercury Free Method for Small-Scale Gold Miners: Few months after the application of the technique; miners go back to use mercury without any "logical and reasonable" explanation.

Aiming to identify the reasons and the barriers for the transference of technology in marginalised and oppressed groups as the Artisanal Small-Scale Gold miners from Uganda; I found an excellent opportunity to link this exercise with my home country Colombia. Small-Scale Gold miners from my country are also dealing with formalisation issues and the harmful use of mercury in their activities.

The main research question formulated was: How can an NGO develop a sustainable model for engaging and empowering small-scale gold miners´ communities in the adoption of a Mercury-Free Method?

The three fieldwork, one in Colombia, and two in Uganda revealed an issue that grounded my expectations: unintentionally, developing aid projects instead of facilitates and "help" the communities, generate more oppression to them. The idea to intervene in Colombia drove me to think in which sustainable way should be conducted the intervention this time.

One of the central conclusions of this research is that it is necessary to rethink and demystify the paternalistic stance of aid projects in developing countries. Projects need to change from a FOR vocation to a WITH perspective. In other words, the idea is not to work for the oppressed, but to work with them. They are the only ones who locally must find the conditions for their liberation. Creating technological solutions through collective and democratic dialogue and facilitated by NGOs.

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RESUMEN

Esta tesis de maestría explora desde una perspectiva tecno-antropológica, una situación particular presentada por una ONG danesa que promueve en todo el mundo la implementación del Método Libre de Mercurio para los mineros de Oro artesanales y de pequeña escala: Pocos meses después de la implementación de la metodología, los mineros regresan al método con mercurio sin ninguna explicación "lógica ni razonable".

Con el objetivo de identificar las razones y las barreras para la transferencia de tecnología en grupos marginados y oprimidos como es el caso de los mineros de oro artesanales y de pequeña escala de Uganda; encontré una excelente oportunidad para vincular este ejercicio con mi país natal, Colombia. Los mineros de oro en pequeña escala de mi país también están enfrentándose a un complejo proceso de formalización y están lidiando con el flagelo de la ilegalidad derivada del nocivo uso del mercurio en sus actividades extractivas.

La principal pregunta de investigación formulada fue: ¿Cómo puede una ONG desarrollar un modelo sostenible para involucrar y empoderar a las comunidades de mineros de oro de pequeña escala en la adopción de un método libre de mercurio?

Los tres trabajos de campo, uno en Colombia y dos en Uganda, revelaron un problema que fundamento mis expectativas: Involuntariamente, proyectos de ayuda en lugar de facilitar y "ayudar" a las comunidades, les genera aun más opresión. La posible idea de hacer un projecto similar en Colombia me llevó a pensar de qué manera sostenible debería llevarse a cabo esta vez.

Una de las conclusiones centrales de esta investigación es que es necesario repensar y desmitificar la postura paternalista de los proyectos de ayuda en países en desarrollo. Los proyectos necesitan cambiar de una vocación de PARA a una perspectiva de CON. En otras palabras, la idea no es trabajar para los oprimidos, sino trabajar con ellos. Ellos son los únicos que localmente deben encontrar las condiciones para su liberación. Creando soluciones tecnológicas a través del dialogo colectivo y democrático y facilitado por las ONG.

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1 MOTIVATION

My approach to this thesis originates from three sources. 1) My prior experiences as an electronic engineer in Colombia working for more than 18 years; 2) my family´s closeness relation with small-scale gold mining in a turbulent region of Colombia, Segovia; and 3) experiences and learning from the 3 previous semesters in the master´s program in Techno-Anthropology (T-A)[1]. Especially during the T-A 9 which included fieldwork that brought me to Colombia and Uganda. In my approach, I intend to connect T-A 9 experiences, my interest and intentions to the learning objectives for the T-A 10.

My past professional history was full of good stories, significant challenges and sometimes, dangerous risks. Many beautiful people and great masters filled my days with lots of positive and inspirational moments. Huge responsibilities were also present, stressing situations and sometimes sad episodes hardened my heart and taught me to manage those tough situations. Nevertheless, as destiny games, I was over and over evidencing everywhere, significant gaps between the primary intention, the real situation and the solution implemented. It always sounded like a communication problem, but I often doubted at such that simple explanation, I knew there was something else, but nobody was able to explain it to me at that time. Those explanations were not closing the gaps and thus not contributing to stable and socially responsible development, and this triggers me. Techno-Anthropology (T-A) allowed me to understand better this kind of socio-technical configurations that need an explanation from a new perspective.

As an engineer, I have understood technology as a mediator to solving problems within the physical world for humans. Therefore, when designing technological solutions, the process usually follows complex iterative but linear systems. There is a problem that needs to be managed; in the end, one can say if the "thing" worked or not, middle options are unthinkable. A traditional interpretation of technology suggests that it reaches its last form in a laboratory after

1 Techno-Anthropology is a professional program in the Aalborg University, organized in ten semesters. The first six semesters are part of a bachelor program. Consequently, from the seventh semester to the tenth semester it correspond to a master´s program, in which people from different backgrounds both from the technical or the social sciences are welcome to contribute in the discussions and in new interdisciplinary knowledge production. From here T-A 9 must be understood as the 9th semester of Techno-Anthropology in other words, the 3rd semester of the master´s program.

the research, and thus the development process is done. Developers can determine and predict the effects that technology will have on society. However, that "thing" was only conceived and operated from the technical perspective, form the physical world, for instance, when you ask an aeronautical engineer: does the plane flies? He must answer yes or no; there should not be other options.

Nevertheless, from a T-A perspective of Technology, the artefact is not necessary a "solution" for the problem, it is only a partial approach. It can be only one link that belongs to a long chain. As a techno-anthropologist, you understand that the developing process of technology is not linear when pretend to solve things for people; technology solutions are "endlessly developed" when it aims to reach the people (AAU, 2019b). Moreover, technology is necessary entangled to society, and the effects of the ensembles between technology and communities depend on where they are situated.

A Techno-Anthropologist learn how to formulate, design and justify a project that can address not only scientific and technical knowledge about the material world and technological artefact but also the social, cultural, organisational, institutional and ethical assumptions and implications of that knowledge (Børsen & Botin, 2013, p. 43). That is what we call a socio-technical configuration. During the first three semesters, I came to realise that those gaps previously identified belong to different worlds and cannot quickly vanish but must be bridged. The T-A bridging process permits scholars to have bidirectional interpretation about the contextualised and situated relations between humans and technology. The possible bridging facilitation is what precisely inspired me in this Master´s program.

I chose some examples to explain what gaps mean to me and how those gaps were shaping the way I was creating a link among all of them. It took many years for me to understand what Steve Jobs stated in his speech during the commencement at Stanford University in 2005, One *"[···] cannot connect the dots looking forward, you can only connect them looking backwards."* (Jobs, 2005). This Master´s thesis is the connection of some dots from my previous experiences, even the ones I had during this Master´s program. I will go behind pure communication plays and – based on wide-ranging academic and professional practice find valid explanations and contributions to sustainable development.

The following gaps´ examples are accurate representations of socio-technical configurations of technology (Asaro, 2000; Feenberg, 2002; Geels, 2002; Giuliano, 2013), and in

this regard, it could have been better understood using this perspective, but I did not have that competence before.

For instance, in my career as an electronic engineer, I headed a marketing team for telecommunication products. The focus of our department was on designing products and developing sales strategies. The technical department was in charge of production and implementation, and the other side brought those into the market (sales). Surprisingly after the whole development process and the launch of the product, somehow something went wrong, and the customers misunderstood and rejected the service designed. How could that be possible? How could we identify where the problem was? The company had to start over again with the implications that it entails (money, effort and more time to the market). When you are the "leader", your people are in the boundary of the problem; this is usually considered as a management problem, where communications, control and specific procedures play a central role in the subsequent steps. Sometimes you succeed, but in a very competitive arena such as telecommunications, all the efforts are never enough. Your competitors are doing their best to get your market part, and those "mistakes" are being paid with losing customers. Solutions with technology not always fulfilled the customer's desires; there were shortcuts in communication with developers but also in the exploration and understanding process about customers real needs. In my thesis, I will demonstrate how application of interactive, interventional, experimental, analytical or ethnographic methods can prevent such mistakes, by merely understanding human-technology relations better and include this, not only in sales but also the design and products production.

Another example of a "gap" happened when I was leading the telecommunications team for the national elections in Colombia 2010. I had to explain to the media a technical inconvenient that was affecting the electoral process for the Congress and the Colombian Senate. Servers, computers and high complex technological configurations supported by hundreds of engineers were committed to the transparency and efficiency of the results. Suddenly, the unexpected happened! In the tense and heated atmosphere of the political parties, there was a technical contingency, and despite the integrity of the data never was in risk or altered authorities and media demanded an explanation.

The media misinterpreted our explanation, and this episode was the perfect alibi to focus the public attention in the wrong spot, while the corruption was having a feast. That was the longest night of my life; it lasted after three stressed and inquisitive months facing

all kind of assessments and inquiries by authorities and experts. I am now much aware that central technical or scientific processes, e.g. key processes of scientific and technological development must be transparent to users and other stakeholders from the outset, not least when we are dealing with politically sensitive matters.

In the end, experts and the authorities clarified everything, thus them relieved us from all responsibility because the electoral information never was at risk and the expert witnesses confirmed later that our platforms never failed. The year 2010 had the fastest and most effective results in the history of elections in Colombia. We succeeded, but we paid a significant organisational and personal cost that could have been avoided if we had understood the problem better, the risks, the power relations implied, and if we had designed and implemented appropriate due care for it. For instance, having known that knowledge is a crucial element for empowerment, from a strategic point of view, we could have considered informing influencers like the press more on the technical issues. In my thesis technology for small- scale gold mining is in play, but I believe that the same principle problems with transparency, political matters and empowerment are most important.

Critical questions for the thesis could be: Is it possible to change the way we configure a technological solution to humans? Alternatively, in the other way around, is it possible to change the way we formulate human and responsible solutions with the technology? I firmly believe that both forms are possible. However, by considering my personal and professional experience, the impact can be more significant if it is conducted through interactional, interventional and participatory projects based on action research. Projects supported by the ethnographic work, and with fundamental in research strategies that allow one to configure strong argumentative reasons and ways to promote a change, as Kurt Lewin states: *"If you want truly to understand something, try to change it."* (Zuiderent-Jerak, 2015)

My objective then is to be able to initiate and lead interdisciplinary collaboration in technological change and be able to evaluate and account for the multidisciplinary aspects assuming professional responsibility for solutions that were proposed towards all stakeholders.

As I widely exposed in the T-A9 project report (Contreras, 2018), the training process to implement the Mercury-free method among Small-Scale gold miners might need some inputs from a Techno-Anthropological perspective. Few months after the implementation of the technique, miners went back to use mercury without any reasonable explanation. When things

like this happen in other scenarios, NGOs, with all the budget of the project almost executed, usually decide to close the interventions, writes their reports and leave the site with a strange feeling of defeat. The community intervened often is neglected again with the same or even more significant problems than before.

However, for Dialogos, the Danish NGO I collaborated with for T-A 9 and this Master´s thesis, this is not a possible option. Dialogos has a strong commitment both with his donors and with the vulnerable communities from countries such as Mozambique, Bolivia and Uganda where closeness and bond relationships are always in play. One of his institutional values is that they never abandoned the field unless they achieve all the objectives of the projects, no matter if it sometimes implies over costs in time and effort. Dialogos has more than forty years of experience implementing projects aiming to prevent the use of pesticides and in the eradication of mercury that affect people´s health globally. Furthermore, and due to our frequent interaction in the last months, and the explorative work I have been doing with the local miners' associations and mining authorities, the interest is positively growing to formulate and implement a project, funded by the civil society of Denmark (CISU). The project aims to promote the Mercury-Free Method among Small-Scale gold miners in Segovia-Colombia. We hope the project would include most of the recommendations provided by this Master´s thesis.

Coming to Denmark to study T-A was the most conscient and consistent decision that I ever made. My main intention to come here was not to find a job after graduating. My commitment, as a professional and as a global citizen, is with finding paths to the solution to those gaps identified.

My intention with the Master´s thesis is hence, as stated in the description of the T-A10, to conduct a project that contributes to the development of robust and socially responsible solutions to societal challenges (AAU, 2019a) by facilitating interdisciplinary collaboration, and by generating new knowledge about this complex societal and ethical implications of technologies. Therefore, with my Master´s thesis in cooperation with Dialogos, we want to identify what are the factors that can prevent the acceptance, engagement, implementation and stabilisation of the Mercury Free Method. Moreover, subsequently, promoting a change in the way the training is being conducted to induce miners´ participation with the method in a more lasting manner.

Promoting a transformation, or a change entails many considerations in which one need to be aware. For instance, what are the motivational reasons for the change? Whom are the people being affected by the change? What are the values and the rationalities that will be impacted in the transition process? In an organisational (NGO) structure and also in the communities, what are the power relationships that we need to consider as central for the implementation and the sustainability of the change? All these questions and elements of analysis are very well explained and might be well covered when you think Action Research, as the primary methodology to explore options for a change in a participatory way. As mentioned by Hilary Bradbury and Peter Reason in the Sage Handbook of Action research,

> *"Action research is a participatory process concerned with developing practical knowing in the pursuit of worthwhile human purposes. It seeks to bring together action and reflection, theory and practice, in participation with others, in the pursuit of practical solutions to issues of pressing concern to people, and more generally the flourishing of individual persons and their communities"*(Bilfeldt, Andersen, Søgaard-Jørgensen, & Perry, 2018).

This explanation, as much other papers and literature provided by my supervisors and lecturers, inspired me for the T-A9 project and also gave me the motivation to keep finding my path in this structure of work for T-A10 and hopefully for my future as Techno-Anthropologist.

Consequently, Action Research will also be the fundamental framework for this Master´s thesis, not only because of the change identified as required for the success of the Mercury Free Method in the future, but also because it is essential for me to promote research balanced, between theory and reflection and action as a must.

The case of the miners is only an example; I am going to go more in-depth later on it in the next chapters. But, even during previous semesters projects I have identified the same mechanisms in quite other areas: The Sundhends platform in Denmark, was implemented in the autumn 2016 and according to (Abbout, Contreras, Kristiansen, Lopes, & Youssef, 2018) there was a shallow acceptance by doctors and other healthcare with the platform. Moreover, finally, considering that models and public policies are also technology, (Romain & Contreras, 2017) call the attention that the model for the social appropriation of scientific knowledge is recurrent failing in countries as Colombia, due to the lack of institutional support. But the main visible reason is that there is not a local development of technology, neither a public understanding of the situation, thus, giving rise to the fatal implications for a country on development.

In real life, as well as through semester T-A7; T-A8; and T-A9; I have identified numerous problems related to T-A perspectives and explanations. In this Master´s thesis, I will try to find a more cohesive clarification in the complex picture already painted. I will strive to reach general conclusions in the subject matter based on the work produced and in response to the thematic and theoretical literature. The outcomes would become the first step to pave the road for understanding better sustainable, effective, and durable alternatives to engage users or citizens to extraneous technologies. So, the analysis solutions and conclusion proposed in this document aim to clarify and indicate possible approaches to understand and to manage better situations like the ones described above, ethically and responsibly, using, sharing or designing technology.

The next chapters you are going to have a general overview of the situation the NGO deals with the miners´ communities and how is structured the current model for the interventions. Afterwards, I will be focusing my attention on one problem formulation and some research questions which will help me to guide and clarify the purpose of my research. In the next chapters, I will describe the methodology used to approach the project, what were my decisions made, what happened in the fieldwork and how it was possible for me to develop arrangements to obtain my empirical data.

In the subsequent chapters, I want to help the readers to navigate into the world of some theories concepts and methodologies that I consider fit the most for the interpretation and the assimilation of the data collected; the data is the combination of participant observations executed during three fieldwork journeys in Colombia and Uganda Africa.

Critical theory of technology (CTT) will support my arguments with the miners´ redefinition of their understanding of the current method, and how they need to develop the emancipatory decision to adopt the new approach. In combination, I will also draw in the concept of "Technological Transition" (TT) (Geels, 2002) very well-articulated to CTT that would give me a proper justification for the process miners could achieve institutionalisation of the method after the interventions have finished after the three years project.

Post-development theory contributes to this thesis in the reflective point of view of the communities that claim for another way to front facing foreign interventions; this theory is an answer for those that are seeking for "help" in a more sustainable, conscious and responsible manner (Escobar, 2007, 2016; Matthews, 2007).

Pedagogy of the oppressed as a revolutionary theory posses more substantial requisites all educators, trainers of facilitators should consider in educational and training settings involving people in any level of marginalisation by society (Álvarez G., 2018; Freire, 2000; Ocampo L., 2008).

In the analysis, I want to explain the model that I developed as my commitment to the production of new knowledge building on top of other scholars ´ models. It is a humble version of my interpretation of the situation evidenced not only in the past two semesters but in the compilation of my last ten years in my career.

In the end, I want to conclude in a block of several recommendations for three different audiences, for the NGO, the action researchers and for the next generations of techno-anthropologist.

2 PROBLEM ANALYSIS

2.1 Coming from T-A 9

During the 9th semester, as stated in (Contreras, 2018), I found a profitable opportunity to initiate and conduct a collaborative project with the NGO Dialogos. Within this project, it was possible to develop and strengthen my skill as a professional and individually as a techno-anthropologist because I was immersed in activities focus in the transformative process of technologies for small scale miners being part as a facilitator for an interdisciplinary team. I contributed with my analysis into a discussion about societal an ethical implications of the Mercury-Free-Method, as a technology, for the communities of miners from Uganda and Colombia.

In the conclusions from the T-A9 project, I wrote: "This project was aiming to contribute with the production of knowledge from a T-A perspective in the enterprise to transfer the Mercury-Free-Method to ASSGM. However, the real purpose was more oriented to identify what is needed to assure the engagement and final adoption among those miners ´ communities. The project was divided into two semesters. The first is focused on the AR with the communities of miners from Colombia and their motivation to migrate for a clean extractive method. The second that will be related with my second and third fieldwork in Uganda, I will be focused in the adaptations (translations) the Mercury-Free Method needs while travelling from country to country." (Contreras, 2018, p. 50). Despite some circumstantial variations, the planned trips for the second and the third fieldwork in Uganda were executed as planned. After the exploratory trip in September 2018, I participated in early January 2019 in a training intervention for 25 small scale gold miners in the village of Tiira-Uganda. Moreover, I was in constant interaction with the miners ´ associations and other regional and national authorities from Colombia since the first trip to Colombia, aiming to configure a possible intervention for the introduction of the Mercury-Free Method there.

A reflection as an Action Researcher that comes to my mind here is that the interaction with the action groups should not be occasional, one cannot stop down what is happening out

there while doing other activities. The situations in the communities when you are doing Action Research are like the water of a river, and when you go back to visit it, the water will never be the same than before. The critical thing is always kept contact and does not expect people are going to call you, the push is on you.

2.2 Linking this Thesis and T-A basics

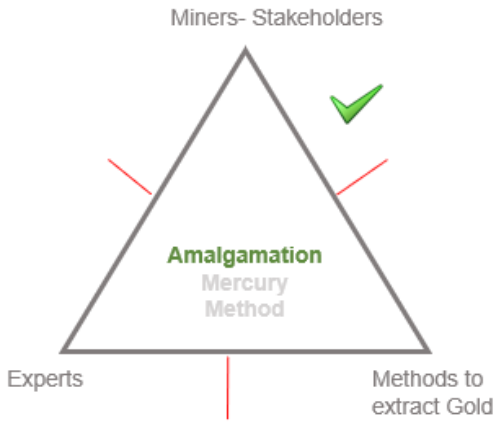
In the figure below, I want to explain how to correlate basics in T-A with the miner's case from T-A9.

The basics of T-A arrangement is suggested by Tom Børsen and Lars Botin in the book, "What is Techno-Anthropology" (2013). Because this is the compass that helps the T-A researcher when she is trying to identify the problem that is needed to be addressed, I will suggest another approach to this figure incorporating more elements of the findings from this project in the discussion chapter.

In the centre of the triangle, the authors of the method suggest situating the Technology that should be under T-A observation. In the corners are situated the facets from where that technology is going to be addressed: Users / stakeholders; experts / scientists / engineers; and artefacts/ procedures / scientific texts. Moreover, the interdisciplinary T-A competences are those interactions between all the vertexes. Interactional expertise: user-expert relation; social responsibility: Expert-Artefact interface; user-driven design: User-Artefact (Børsen & Botin, 2013, p. 50).

For the T-A9 I decided that Amalgamation was the technology under evaluation, "*I will be focused on the current method they are using to extract gold as the technology that needs to be changed*" (Contreras, 2018, p. 24) see figure 1 below.

Figure 1. T-A9 analysis approach focused on the mercury method.

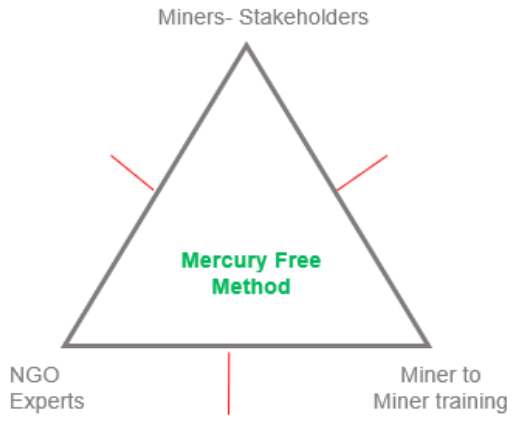


Source. Developed by the author.

In the last semester, I focused my attention on describing the miners, who were the experts both, the Danish NGO and Colombian authorities, and I explore the common methods to extract gold even those mercury-free as well. This perspective helped me to understand and identify some elements to engage miners in the Mercury-Free Method and to open a possibility for a new intervention.

In the Master´s thesis, and as part of my reflection about what could be the next steps and the elements that we need to consider in future interventions, I decided that this time, the technology under study will be the Mercury Free Method promoted by the NGO.

Figure 2. T-A approach of the current situation under analysis.



Source. Developed by the author.

In the vertex "users of the technology" are the miners. NGO´s team will cover the expert's role. And the procedure is the transference of knowledge, in other words, the miner

to miner training . The mercury-free method in the centre direct focus on how this technology is handled by the experts, and how it may affect users (miners) with the configuration given by procedure miner to miner training.

Is the artefact imposing the technology on the users (miners) by the experts? Alternatively, could miners use it for broader purposes? This *problematic* is central to my thesis. I found suitable expression in this context from Andrew Feenberg in his definition of the potential of technology; he says that technology can be "the basis of vocational self-development" (Feenberg, 2002, p. 188). I consider that a new configuration of the training, having absorbed the technology, could help miners to develop new approaches of it and achieve bigger purposes within the community.

Another approach could be interesting if we were going to assess different methods to extract gold apart from the Mercury Free Method; and if we are considering, as a statement, that there was no doubt about the success of the miner to miner training. Scientific studies have probed with technical and empirical evidence that the mercury-free method is effective. (Appel & Na-Oy, 2012; Køster-Rasmussen et al., 2016). The miner to miner training is the one that needs more attention and should be improved by understanding the interaction with users and experts.

In this Thesis, I expect to identify which these interactions succeeded or not, especially when miners are in play. I will document the factual interactions, and as part of the recommendations, I will suggest how other relations should have been done better. The aim is a technology change.

2.3 Action research perspective

Kurt Lewin and Paulo Freire can be defined as foundational fathers of Action Research. Despite they represent two different approaches, Pragmatic Action Research and Transformative Action Research respectively ((Børsen & Thorsen, 2019) They have in common that both sought to promote democratic values and resolve social conflict through cooperation among researchers and communities.

In special Freire focused his efforts in the raise awareness about self-conscience of the oppressed, aiming to accept and identify the sources of their oppression and their condition and limitations to design their concept of freedom. In this regards, the fundaments for my thesis follow the next statements "The stakeholders are moved from passive to active voice" (Greenwood & Levin, 2018, p. 19). "Action Research separates researchers and their research "object" and give the social actors a role as subjects in the research process" (Andersen, Bilfeldt, & Søgaard-Jørgensen, 2014, p. 100).

This situation very affected me because it is natural to mention in everyday life conversations that you want to help others. People used to say, "very good that you are helping those people". However, now my reflection after this theoretical exploration, is that sometimes those people (miners) do not need your help, they do not see any value in the money, in the new technology that you promote with the project. Some of those people do not like to hear from you what they need to do, to gain more efficiency in their activities. Perhaps the only thing they need is facilitation and a mediation accompaniment between their interpretation of their world, the technology and their people. But this need requires to be defined with the action group.

The methodology that guides the whole conceptualisation for this project will be Action Research. By doing action research, the empirical data collected and the connection with the action group, help the researcher to understand and connect the links of the practical knowledge that interaction and the dialogue brought, aiming mainly to incite a concerted transformation or a change (Brydon-Miller & Ortiz-Aragon, 2018). But for the reasons I will highlight below, I want to quote again on Greenwood and Levin. When they write that " Action Research, centres on doing "with" rather than doing "for" stakeholders and credits local stakeholders with the richness of experience and reflective possibilities that long experience living in complex situations bring with it."(2018) For me, this is the turning point that defines the scope of my project.

My intention is not to make values judgment about NGO's actions or performance; neither doubt about the mercury-free method, and much less about people. My big concern is about What should have an intervention to fulfil at least the minimal requirements in impact and sustainable outcomes expected?

Although with my proposal I do not pretend either, that all the actors in an NGO should know how to do this kind of interventions properly, I think it is a process that needs to be developed and fostered in association with the academia. Moreover, what I believe, is that the role of a Techno-Anthropologist as a mediator between interdisciplinary actors is central here and need to be acknowledged and proposed to be an active part in this kind of situations.

As an example of our role as mediator in many circumstances, I was aware of something that could be useful for the process of training and could become an instrument to conduct my participant observation helping the primary data obtention. During the last stage of the MFM, the process of smelting the gold is essential, because it determines the quality and the quantity of the outcome of the process. In the process, it is necessary to use a blower to help to raise the temperature for the clay bowl in which is located gold concentrate already mixed with borax. In the Philippines, miners commonly use an electric blower [F], but in Uganda, access to electricity and the cost for an electric blower seems to be an issue [A]. We noticed in the first trip to Uganda that some communities had rudimentary technological solutions to it (Picture 1). As part of my interest, I assumed the responsibility to research about effective, cheap and homemade solutions to address this issue for the intervention in January 2019. I will show it later in the Analysis chapter, it raised awareness of the importance of the smelting step and was a good opportunity to discover more relevant information to open a dialogue.

Furthermore, as a personal commitment and having observed the challenge that of implementing a training process for miners` communities, I also decided to explore learning processes, pedagogical models and critics about educational interventions in developing countries to have a starting point in my participation in the third stage of the interventions for the Mercury Free Method led by Dialogos.

Picture 1: Artisanal arrangement for a manual blower, built with scrap metal elements, a wheel from a bike and a rope.

Source. Taked by the author.

2.3.1 The Mercury-Free Method (MFM) - The technology

As it was mentioned before, the vertex that needs to be explored in dept is the Miner to Miner Training, but I consider that I need to explain first what are the basics of the Mercury-Free Method, if you want to know more about it you may refer to T-A9 project (Contreras, 2018), or to other authors who research about mercury-free methods as well, they are: (Appel & Na-Oy, 2012; Hinton, Veiga, & Veiga, 2003; Teschner, Smith, Borrillo-Hutter, John, & Wong, 2017; Veiga, 1997).

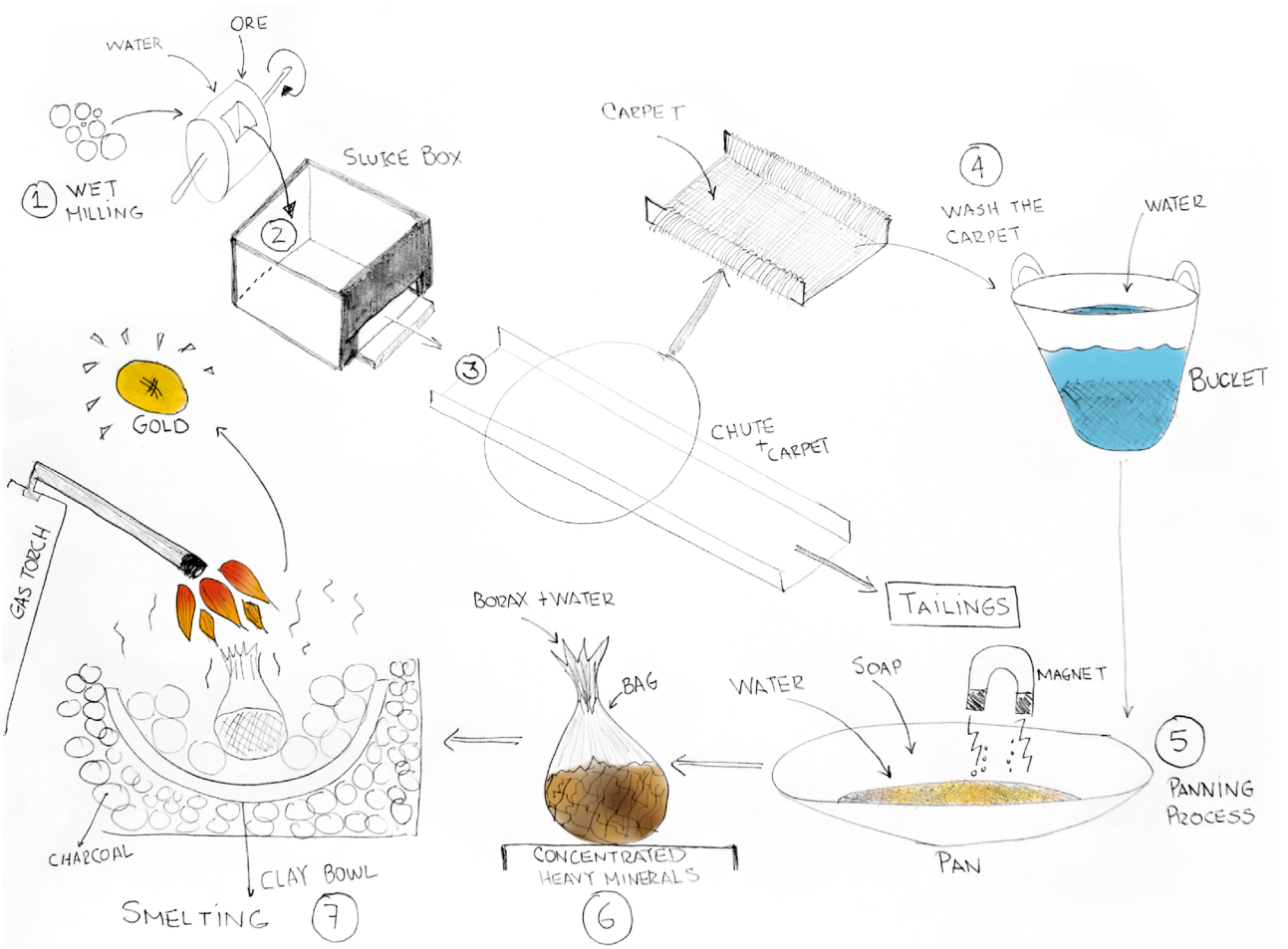
The MFM that the NGO Dialogos promotes is a procedure that can be described in basic steps as follow (Appel & Na-Oy, 2012; Køster-Rasmussen et al., 2016); it has many similarities with the whole ore amalgamation process with the main difference that here mercury is not used.

1. The first step after crushing[1] the ore is doing wet milling in metallic drums with iron balls in it.
2. When the ore is grounded, it is flushed into a sluice.
3. Then the material runs down in a chute that has a carpet previously installed.
4. Once the carpet is loaded with heavy minerals, it is washed in a plastic pail (bucket)

1 In Africa artisanal and small-scale gold miners crush the ore manually using hammers; in Colombia they usually use crusher machines from the milling stations.

5. The next step is concentrating the minerals collected using a pan[2]; expert miners add little soap to help reduce surface tension and gold flakes sink to the bottom; they also use a magnet to take out iron from the concentrate.
6. All the mineral concentrate is saved in a bag[3] and is combined with drops of water and borax. The method promotes the use of borax to reduce the melting point of the minerals in the concentrate.
7. The last part of the process is the smelting[4] the concentrate.
8. The next figure illustrates the process.

Figure 3. A general overview of t he MFM



Source. Developed by the author.

In the next parts, I am going to discuss information related with each vertex of the T-A triangle: (NGO as experts; Miners as users and Miner to miner method as the procedure / artefact). The main idea is to guide the readers in the point of view that I want to give to the case. After each vertex description, I will formulate some complementary questions

2 The "Ninja Pan" from the Philippines is metallic, in Colombia miners have wooden made pans and in Africa they have plastic pans.

3 It cloud be a plastic bag, a piece of fabric or made of plantain leaves as in Africa.

4 Depending of the level of sophistication, some milling stations have furnaces, other uses gas torches and other just use charcoal and clay bowls.

(highlighted in italic) that would help me to drive the case to the problem formulation chapter, and afterwards to the analysis.

2.3.2 NGO's roles as experts

The NGO´s role, as an expert, is getting more relevance when going from T-A9 project to the Master´s thesis, not least because it expands the complexity of the field. The expertise of the NGO relies on the knowledge they have about the MFM, the knowledge they have in the risks working with mercury, it supposed that are also experts in project management, and mainly because was the NGO who designed the miner to miner training.

However, the role of NGOs in the last years has gained more attention because they are getting more political power, thus more critical postures on their performance, approaches and corporative independence (Jamison, 1998). Some scholars, for instance, critic the inferior results in NGOs and Nonprofit Organizations around the world, not least development NGO's working to "help" people to catch up indicators established by the concept of "development", which was created many years ago after the second world war. The question is whether this concept of development can sustain, given the fact that context has changed a lot, and contemporary issues are not the same (Esteva & Escobar, 2017). I want to build on Gustavo Esteva and Arturo Escobar concern, because I have been reflecting during this semester about reasons, motivation or incentives what gives international NGOs the legitimacy and power to intervene and modify things in others´ life. However, in the other side of the coin, I was curious on how bottom-up social movements and civil society organisations, find in international NGOs the elements that can sponsor and complement their political aspirations for solving their community problems — elements such as scientific knowledge, institutional support and for sure access to funding.

2.3.2.1 Experience with NGOs in history

Through history, NGOs have been performed a unique role in society, primarily trying to facilitate and mediate in processes, transitions and situations that can affect people, and then promoting change and empowerment. Commonly they have been mediating between different parties, some of the governments with citizens or between governments (Charnovitz, 1997). For instance, in the 18th century, they played an essential role in the abolition of slavery in the 19th century, they were involved in movements to protect nature. The 20th century they faced a significant turning point due to the acceptance and the power they started to have among governments and social movements as the Labor organisations, women movements and child

labour concerns. During periods of war, there were not that many possibilities to be active, but by the last decade of the 20th century, NGO´s were central in the development of UN strategies and programs implementation. (Charnovitz, 1997; Sriramesh & Vercic, 2003)

NGO participation during the last two decades has risen in the international arena to new heights. "NGOs seem poised to strengthen their influence in the foreseeable future" (Charnovitz, 1997, p. 268).

As well as the NGOs, and more specifically in the 60´s decade, many other activists and social movements focused on the environment and their concern for the environmental future of the earth joined or copied the model of the anti-war social movements. Some of these movements acquired visibility, legitimacy among citizens and even political power in their communities (Jamison, 1998, 2001). Professionalisation and formalisation are part of their challenge and those which succeed, join or form larger institutions with more coverage and with access to more financing and another kind of collaboration models. Many other, keep their modest level and face difficulties to survive.

I refer to them because the transformational processes of many societies, specifically in developing countries, were promoted by social movements and grassroots civil society organisations; with agendas focused on improving their well-being, for example; working conditions, land ownership, security, public policies among others. These movements play a significant role in society, because they are a clear example of the implementation of democratic values and because they propose a change from their specific situation and not from global demand. These are also called "bottom-up approach" NGOs (Sriramesh & Vercic, 2003, p. 160).

NGOs and social movements support the materialisation of citizens democratic rights, the right to organise themselves. In this regard, the NGO concept is defined as "⋯ groups of individuals organised for the myriad of reasons that engage human imagination and aspiration. They can be set up to advocate a particular cause, such as human rights, or to carry out programs on the ground, such as disaster relief. They can have memberships ranging from local to global." (Sriramesh & Vercic, 2003, p. 491). Although the definition involves a clear description of the NGO scope, not any definition includes the responsibility and risks NGOs carried in their shoulders.

2.3.2.2 Good intentions of NGOs

NGOs face many managerial issues such as obtaining funds to operate, and the risk connected with lack of accountability of their voluntary's members. Being conscient that the list of problems and criticism can be ceaseless, I want to highlight some that I consider are central for my analysis in this project took from (Sriramesh & Vercic, 2003)

1. At some stage of their [NGO´s| life cycle, some international NGOs become unproductive and bureaucratic
2. The effects of NGOs' work could be counterproductive (or perceived as such)
3. The need for building coalitions in communities and empowering the people that are being helped requires different skills than those taught in traditional public relations curricula
4. Large international NGOs from developed countries sometimes develop standards based on "western" traditions and expect these standards to be universally applicable.

All these four issues were evident in my latest year's experiences working with this kind of organisations. One of those problems (the third) was addressed in the T-A9 project, I believe for instance, that the role of a techno-anthropologist in the exploratory stage for the possible intervention in Colombia with the MFM contributed positively, because it was possible to detect no only power relations, but tension that would put in risk the implementation. Moreover, it was remarkable the importance to promote the collaborative work among the local organisations and including the defence of democratic values as part of the goals for the project.

One can sum up that NGO´s projects have good intentions, but harmful effects and neither its reduced impact have not been explored yet profoundly. For instance, it is essential to asses if the communities in play are prepared to face the changes derived from the interventions, and moreover, if they can carry on activities by themselves when projects funds are finished.

In Colombia, we had the experience with "territorios digitales" (digital territories). Thousands of million Colombian pesos were invested in the first decade of the Millennium, buying and installing in computers for education. The project implied sending personal and hardware to the most remote rural areas from Colombia. It sounded very promising, exciting and understandable in Canada, where a local government created the initiative, is clear that the intention was good. Our reality was very disappointing. The substantial logistical and organisational effort, after days of journeys through the mountains of the country, riding

horses with the equipment, supplies and computers; paradoxically was not repaid. What the installers team found, was unacceptable but was real: schools without roofs, without water, without electricity to connect the computers and moreover, teachers without any digital competence. The intention was good, but the results are far from what was planned by sponsors.

Here, another unintentional gap shows up, the one created by organisations that pretend to "help". Aiming to generate wellness (well-being, welfare) and contribute to a positive change, but instead creates discomfort, conflict and consequently unsustainable results and minimal impact, thus creating more ways of oppression and hence wasting the valuable donors' money. This worry is also included in my thesis. It was expressed to me in T-A9 project, that "He (Fernando Gomez, Secretary of mines Segovia) confirmed that in several occasions many other companies, universities and "traders" with ideas and products from all around the world were offering new techniques and mercury-free methods with very disappointing results." (Contreras, 2018) [B]. He was very welcoming but also direct and honest about his sceptical position.

Another controversy about NGO's is their economy. Most of them are financed by governments, companies and other powerful actors. This creates a dilemma regarding the agenda. The official agenda will usually be social good for vulnerable or needy people and communities. However, is the funding solely philanthropy or is there a payback perspective, whereas the latter often appears as "the hidden agenda"(Millar, Choi, & Chen, 2004, p. 9). There are several examples where NGOs with a hidden agenda, promote commercial or political interests. Their focus on helping people is shadowed by the visibility of a brand or a party. The first, trying to gain "top of mind" relied on a false generosity that Social Responsibility actions promote. Moreaover, politicians hunting more votes for their next campaign. To mention some examples; I draw into the censured case of manipulation of scientific results and with the media that in 1995 Greenpeace led in the case of Brent Spar oil storage facility, and the questioned "partnership" between Chiquita and the Rainforest Alliance that created a fuzzy zone between collaboration and business, that criticizes the independence and authenticity of the NGO. (Millar et al., 2004). Once more, the discussion will be in another arena, as it was established in the famous Hobbesian expression Cui Bono; instead, I would prefer to use the Leigh Star version of Cui Bono; she recommends asking preferably: " "For whom?" but also "who cares?" "what for?" "why do ´ we ´ care?" Moreover, mostly "how to care" (Puig de la Bellacasa, 2017). My intention with this thesis is

not to go again in the discussion what comes first the egg or the chicken? My point of view claim here, which could be the best way to make interventions to promotes the use of new technologies in communities with people in any degree of marginalisation or oppression? So, the effort should be in one link of the chain, not in its material, colour, size neither on its weight.

My reflection is that every single interaction between a Mzungu[5] or a Gringo[6] within a community has an effect or a consequence in that community. Sometimes it is very positive, and sometimes it is not, the point is *how to make an objective assessment when you are not thinking in that way, and your interest is not in communion with the locals?*

This thesis takes the perspective of poor people, miners and their families and communities and how action research perspectives and methodology can create self-conscience and empowerment. It is a crucial question to me, whether the current concept for development aid and the NGO's role as experts comply with my perspective or with its challenges.

2.3.3 Who are the users / stakeholders?

The users of the MFM are the miners selected to be part of the training miner to the miner. However, all the miners from the region of Busia in Uganda are candidates to use the method as well. That is a side effect desirable by the project; Dialogos and the donor (civil society of Denmark-CISU) hope the method spread up not only in the region but in the whole country.

In the fieldwork, I evidenced several categories of people that are involved with the technology and also with the artefact.

The first group of people are the Miners from TIIRA; they are women and men that usually "live by the seasons"[7]. Some miners are full time in the mining activities although it is well known that in some months the workload is very low. They do not have a minimum monthly wage; they get paid daily based on are activities done in coordination with other members of the community. Many others cooperate in the mining activities, carrying, crushing the ore, making the washing process, or logistical activities as cooking or many other tasks. The payment they receive is with the ore itself, to which later they will have to apply the procedure to obtain gold,

5 Expression for "white" "foreigner" in east Africa- Uganda.

6 Common expression in Colombian jargon for a foreigner with white skin, blond hair, colored eyes or english speaker.

7 This expression means that people base their activities according to the dry season or the rain season. Is common to see people combining mining and agriculture due to these activities belong commonly to different seasons.

sell it and have their money. This modality of payment is always an uncertain bet, because sometimes after executing the process, the result is insignificant and does not compensate for the effort or even cover the costs. Women from Tiira are gaining a more prominent place in the mining activities, and they need to combine and harmonise their household activities with mining duties. It is common to see some female miners taking care of their children in that hectic and risky environment, but it is the only option they have to assure food in their table. [A][C][E]

The second group are people from a certain level of power. During my observation, my interpretation was that power is given by their economic, religious, social, political, organizational or academical position. For instance, there are hierarchies that in general miners or citizens usually respect. The "pastor" of the church; a landlord, the chief of the police station, an engineer, a medical doctor, a trader with money, or the president of one local association. And if you have the combination of some of these, your power gets higher. Moreover, if you are white and have any combination with the previous mentioned, you are in a prominent advantage.[A][D][E]

The next group are the associations. In the region and specifically in mining, there are a numerous group of associations. Some of them belong to another gremial, regional or national association. Uganda is a very collective society, and they like to organise and formalise their people in grassroots organisations. It is common to see that most of them share the same purpose, but the strategy is to have small groups of people organised and guided by social leaders elected democratically. According to some people I had interaction with, their success is linked with the ability to attract regional, national or international funding.[D][E]

The last group are all the providers and traders that develop a direct and indirect market for the mining activities. This group is very interested in the process because if the mining business succeeds the money is going to flow to them. In this group are the providers of machinery, supplies for the mines, milling stations, gold buyers, workshops, minimarkets, grocery stores, gas station, transportation services, and all the services providers attracted by the gold as alcohol, drugs dealers and prostitutes. [A][C][E]

During the whole fieldwork, I was aware of the people involved in the process, their relationship with the new method, their concerns and limitations. Surprisingly the perception they have from it is quite contrasting in comparison with our perception of the technology, and I will try to explain it later in the analysis. [A]

A complementary question that will help us to understand how the users and the technology have relations and its implications would be: *How is the socio-technical configuration for the situation of the Artisanal Small-Scale Gold Miners from Uganda and Colombia that need to be addressed from a T-A perspective?*

Another question connected with the user's perspective is: *What are the factors that can prevent the acceptance, engagement, implementation and stabilisation of the MFM as a new technology for extracting gold in small scale gold miners from Uganda?*

2.3.4 The training Miner to Miner as the artefact

Before explaining how the training is being taught, one of the most critical features of the training is who is in charge of lead the transference of knowledge. For more than ten years working in collaboration with Dialogos, Leoncio O ´ Nay, a master small -scale gold miner, president of one of the most important miner's association from the Philippines and the owner of a big milling station in his region, is the trainer leader of the mission. Usually, he travels with other colleagues from his country, and those belonging to his able school of miners.[F]

He has experimented with the MFM for many years, and he has mastered its implementation for different varieties of minerals. Observing their attitude to the work, the energy that they apply to the activities and his positive thinking, even in the most unpleasant situations, makes a total difference, and it is a very gratifying experience.[A]

a. The miner to miner training, get its name due to the trainers are also highly skilled miners and the purpose is the trainees are going to learn in deep the method, to become later trainers for other miners.
b. Before the training, the setting is revised, and the training facility must have all the materials, elements, tools and supplies, including the water supply ready.
c. The first step is the selection of the trainees in the community of miners
d. Usually, the second step is a comparison, where the local miners compete in similar conditions against the Philippines miners betting who gets more gold.
e. The next day, the trainees are divided into three groups; each group is going to learn by doing.
f. The group A is going to learn how to do the wet milling

g. The group B will be introduced in the process of sluice and washing

h. And the group C is going to be focused on the panning process to get the ore concentrate.

i. The next days all the miners have to rotate into the 3 groups until they have the confidence to do it alone with no supervision.

j. At the end of every workday, all the trainees participate in the smelting process, the first days just observing, and progressively they start assuming responsibilities in the process. In the end, all the trainees must know how to perform the smelting process.

k. The miner to miner training may vary according to the community´s context. It depends on the time availability, the skills off the miners, the quality of the ore and many other logistic issues.

l. After each session, there is a follow-up meeting where the miners ask questions to the trainers to clarify concepts and revise the whole process.

m. The training is a very exhaustive process that is designed to take around two weeks for approximately 25 to 30 miners trained.

n. The last day, there is a graduation ceremony, where certificates are handed in by the local or regional authorities, by representatives of NGOs, and by the trainers. [A][F][I]

My personal reflection in this facet of the technology, is that the training process is very vulnerable because it depends on the competences, confidence and skills of the trainers, there are not backups or alternative elements to support the training and it makes the exercise a very physically demanding process both for the trainees as for the trainers. Furthermore, the high dependence of the ore availability can deviate the attention of the training in logistic issues. A complementary question here could be: *What elements should be considered to be changed to guarantee and optimise the process of training the MFM?*

2.4 Reflection on users´ cultural values

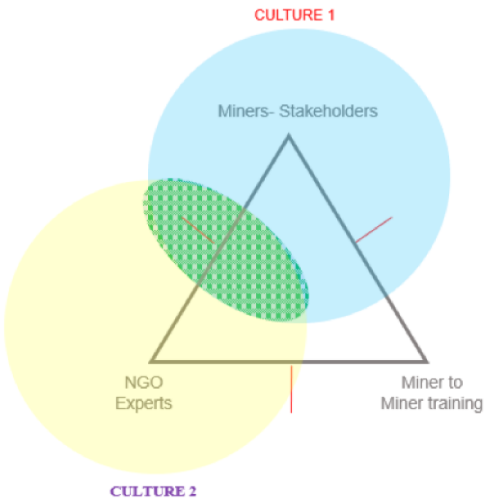
My concern is how a contribution from an outsider can generate a minimal impact on the locals 'cultural values? How is it possible to get the best possible effects in their interpretation of progress or development? I believe that working with communities might represent to acknowledge the rights they have on deciding what the elements that contribute to their Self-Development are. This concept of self-development / "autonomy" (Escobar, 2016) is the main point that I want to highlight in my thesis and hope to indicate it accurately with the methodology I want to propose in here.

Interventions can be executed in very different ways, maybe as diverse as the number of cultures on the planet. Since an intervention implies contact, changes, observations, activities, interactions, translations, problems, misunderstandings, even discussions, and sometimes conflicts; my interpretation in this sense is that every simple contact between two cultures always generates new things, and possibly the production of new cultural values (Snow, 2013; Ziai, 2007). In 2018 in the framework of the first encounter for techno-anthropologists from different countries in Barcelona, I presented a comparison between Colombian and Ugandan cultural values in gold mining. There, I highlighted the difference in the common conception for the work in Uganda, while in Colombia due to the high competence and the rush to get more gold, incentives a more individual work. As a lesson learned, the training method needs to be adapted to each scenario; otherwise, the acceptance in Colombia would be lower if the sessions promote collaboration during the training of the MFM.

2.4.1 Is the time gold?

Another value is the management of the time. In Uganda, time is not an issue; there is not reasoned to be in a hurry. In Colombia time is gold but to be punctual becomes an issue; the intention to be on time is inversely proportional to the relevance (subjective assessed) of the activity the person is doing just before the new appointment. For Europeans, sometimes this is frustrating and occasionally generates cultural clashes and conflict. Figure 4 illustrates that interventions might have cultural coincidences or face intricate cultural differences between the experts and the users. A response driven by the cultural differences clashes has a doubtful success. On the other hand, finding mutual cultural understanding could be an open window to see together more favourable results.

Figure 4. Experts and users might belong to different cultures.



Source. Developed by the author.

2.4.2 Interference

Intervention depends on how participants in a project are interpreted. In some cases, researchers assume the role of subject and decide unilaterally that the others are objects of their research. But, in projects that intended to promotes democracy, empowerment and change the researcher needs to "give the social actors a role as ´subjects´ in the research process" (Andersen et al., 2014, p. 100) thus enriching the process of collective production of knowledge. The subject is who is doing the action. My proposal here is to name or to label this kind of interventions as "Interference"; that in Spanish means "the alteration or disturbance of the natural development of one thing through the interposition of another that may end up being an obstacle" (Oxford living Dictionaries, 2019 (translation by the author)) . In other words, an intervention becomes an "interference" when you as a participant or researcher are not contributing to the collective production of knowledge and instead, are imposing your ideas and methods and thus adding barriers to the process of transformation the community you are working with need.

The risk is devastator when NGOs waving flags of democracy and freedom, accepting or even following corrupt practices in countries where they operate and interfering without any control, unfold exactly is the opposite, tyranny, slavery and more oppression. Those interferences, the communities often became objects of some NGO´s who travel and invest time and money to impose, sometimes involuntarily, their western habits, their subjective interpretation of progress and development, their concept of poverty an even their idea of happiness (Escobar, 2016; Esteva & Escobar, 2017; Latapí Agudelo, Jóhannsdóttir, & Davídsdóttir, 2019). People that, maybe with the best intentions, generate unfortunate not return mistakes. Interferences that releases involuntary cultural changes, developing distrust, reticence and sometimes xenophobia and stigmatisation of foreigners.

2.4.3 White is money

I experienced such a similar situation on my last trip to Africa, where I spend more time with the community of miners from TIIRA-Uganda. When children from the village noticed that you were around, automatically they assume that "white people" can give them money, food, clothes, candies and toys and then approach you begging for something. When did I ask why I should give them my money? I was expecting an answer like "because we do not have any money and my family is starving". But the real answer was, "because you are white and white is money" (9 years old boy from Tiira-Uganda)[E]. I want to clarify that this kid was having lunch when I asked him about this. White persons are stereotypes associated with the monetization of the aid. And in the mindset of children and many people of these villages, they feel that they

have the right, and I have an obligation to give them something. It was alarming and shocking for me because if you do not provide something, they find the option to take it from you in another way [A][C][E]. For instance, the price for a ride in motorcycle from town to the village usually costs 2.000 Ugandan shillings, but for me, it was 10.000. I got a proper balance of the situation after the fourth day doing the same route twice or sometimes more time every day. Prices for food, water, in the hotel everywhere was the same.

This story illuminates the complex challenges when taking account of local culture – which is my perspective. First, the local interpretation of "white people" create an expectation that he/she will not be working **with** them building sustainable development. Neither do they expect that he/she will be working **for** them apart from giving charity? Maybe some real experiences with developing aid created this interpretation. Second, such interpretation creates a stretch for developing empowerment; the locals remain to stay with the hat in their hand and wait for dollars to drop own. As a set-out to combat this challenge, I will catch up with information from T-A9 project. "The president of the association [from Colombia] also explained to me that our presence there would be understood by their people like a little light at the end of the tunnel. Although it lays a big load (responsibility) on us, it also gave us good ideas on how the best way was to explore and find solutions to their situation" (Contreras, 2018)[B]

2.4.4 Critical criteria

A second example is when governments from developing countries copy, without any critical criteria, programs, norms and technological models advised by international NGOs, covered in the legitimacy of previous "successful" experiences in other countries. The sad part of the story is that at the end that advice become public policies. When governments create public policies without responsible research about the context and the implications for the citizens, impacts in the economy and other variables such as literacy of the people and existing infrastructure, the medicine (solution) becomes more harmful than the disease, (the problem that governments are trying to address). One can say from the T-A9 project this problem was also in risk of appearing when transferring the Mercury Free Method from the Philippines, to Uganda and then to Colombia without any critical exploration of the convenience and the proper methodology to do the implementation. The contacts with the authorities in Uganda and Colombia facilitated the work with the NGO because they were aware of the real intentions we had, and we tried to harmonise their current strategies with the scope of our project.

A complementary question in regards to this topic, could be: *Why interventions in Uganda or Colombia need to be changed from a "for" perspective to a "with" approach?*

2.4.5 My position as a researcher

My intention is to explore T-A theories and methodology as well as practical experiences primarily from T-A9 project to unlock this gordic knot. An essential resource in this respect may be my personal identity. My legitimacy in the T-A9 project supported by my decision to serve, help and facilitate the process with my knowledge and positive attitude to the process was very well accepted by the community. There I was not only a practitioner coming from Denmark, with a new method for clean gold mining, travelling with a Danish expert, I was also a "Cardeño" (my mother ´ s family surname) (Ibid.)

This raises yet another issue. I need to be aware of potential bias as personally related. This will be stated as explicit and transparent in the thesis. It relates to the issue of balancing proximity and professional distance and the risk as a researcher to "going native". It may have an upside for engagement and insight that I have a stake in the matter. But relevant facts supporting or questioning my objective must be equally highlighted and included in conclusions. I intend to employ the concept of critical subjectivity (Heron & Reason, 1997, p. 282) and as part of my proposal the concept of Critical Proximity (Birkbak, Petersen, & Elgaard Jensen, 2015) to keep a decent balance.

My experience with the miner's project triggered new elements in my motivation and next steps with T-A. For example: *how NGOs need to reconfigure the management and the planning of their projects? How NGOs and other interventional based organisations, need to change the way they promote configured and implement new technologies in remote communities? How can we understand the role, T-A action researcher? is the MFM as a technology able to create empowerment? Or is empowerment who can facilitate the MFM adoption [appropriation, technology transfer]?* I hope we can go further with these questions and find through T-A some interdisciplinary on healthy alternatives to solve some of them.

PROBLEM FORMULATION

A general problem with development and consultant projects is that their approach lack understanding of issues with the technological transition from an anthropological and cultural angle. The donor wants solutions, do not pay for the delivery of new matters. It is a "system error" since many projects fail to implement solutions. For instance, one of the strategical objectives the Danish civil society on development (CISU) has, is to obtain "meaningful results of development cooperation" (CISU, 2018). The "system" for CISU is the organizational configuration they have, to support, contribute, assess, and have "meaningful" results with the holistic purpose of "secure people's rights, promote global justice and sustainability, and combat the causes of poverty" (ibid.), But, when they do not succeed, the system is failing somehow. That is what I call a "system error".

The project of Dialogos is a good representation of a project connected with the change of technology. I attended the three first of four stages that Dialogos´ interventions accustom to commit in different countries. The exploratory phase that seeks for identifying prospects communities interested, the second stage, where it is defined the sites for building the training infrastructure. Moreover the third stage for the miner to miner training in situ. That experience gives me a full understanding panorama of the situation, from the miners' perspective and subsequently, from the NGO point of view.

The idea to intervene in Colombia drives me to think in which sustainable way should be conducted the intervention this time. This raises the first question that would lead my analysis:

3.1 What elements should be considered to be changed to guarantee and optimise the process of training the MFM in Colombia?

Another question that comes to my mind is what makes Colombia different in comparison to Uganda? Considering the complexity of the situation in Colombia, is it possible to think that if the procedure works there, it will work everywhere?

During my participation, I identified many variables, elements and issues that are in play. Picking some skills and competencies from my professional experience, I decided to organise those elements and topics into three categories and one transversal category, to make more accessible the approach for the analysis. Some of them were present all the time as the engagement and the involvement; other issues appear just linked to the training instance; other recurrent elements become the talk of the town and my main concern, because of its relations with the sustainability of the MFM in the region; and the last one, I know it should not be matter to this thesis, but I want to declare it because of its relevance in all future interventions.

3.2 Categories of analysis

1. Engagement and involvement
2. The training process (transference of technology)
3. Institutionalisation, stabilisation, replicability and autonomy.

And the transversal suggested category is:

- Techno-Anthropologist Project management and facilitation, The W model approach.

With the primary purpose to find a better understanding of the elements announced above, I formulated some preliminary research questions as a consequence of the topics highlighted in problem analysis. And consequently, I want to state the main research question to guide my hypothesis towards the new T-A knowledge contribution with my Master ´s thesis.

3.3 Complementary research questions:

- How is the socio-technical configuration for the situation of the Artisanal Small-Scale Gold Miners from Uganda and Colombia that need to be addressed from a T-A perspective?
- What are the factors that can prevent the acceptance, engagement, implementation and stabilisation of the MFM as a new technology for extracting gold in small scale gold miners from Uganda?
- What elements should be considered to be changed to guarantee and optimise the process of training the MFM?
- Why interventions in Uganda or Colombia need to be changed from a "for" perspective to a "with" approach?
- How to make an objective assessment when you are not thinking in that way, and your interest is not in communion with the miner's ones?
- Is the MFM as a technology able to create empowerment? Or is empowerment who can facilitate the MFM adoption [appropriation, technology transfer]?
- How action research perspectives and methodology can create self-conscience and empowerment among the miners?

3.4 Research Question:

Thinking in my contribution to pave the road for future research related to this topic, I want to formulate the next research question:

> How can an NGO develop a sustainable model for engaging and empowering small-scale gold miners´ communities in the adoption of a Mercury-Free Method?

4 METHODOLOGY

The purpose of this section is to explain the methodological framework in which I decided to approach the context of the miners from Uganda and Colombia. Here I will illustrate how the methodology contribute to entering my research questions, what kind of data I intended to collect, and what type of intervention and activities I promoted once being in the field. I will also highlight some theoretical elements that will support the arguments to answer such complementary research questions, looking for a clear path to discuss, analyse and propose demonstrative conclusions to answer the research question formulated.

4.1 Action Research

As it was mentioned in the Problem Analysis, Action Research (AR) is a very flexible suit of methodologies that can be used in combination with many other theories and methods. Empowerment is central here, and the main idea in AR projects is to discover and decide together with the action group what is needed to be changed (Bilfeldt, Andersen, Søgaard-Jørgensen, & Perry, 2018; Dick & Greenwood, 2015; Greenwood & Levin, 2018; Stephen Kemmis, 2008). Democracy and inclusive values define the style and the manner to build collective solutions (Børsen & Thorsen, 2019). It is well known that many authors, and from many years ago have been discussing the relevance, pitfalls and the future of AR for working in participatory exercises with transformative oriented communities. However, as mentioned by David Coghlan in (Coghlan, 2015), AR is also acknowledged to be useful in organisational development involving customers in the transformation of products and services. The argument for doing so is simple and well explained in two statements:

> "*involving the clients or learners in their own learning, not only produces better learning but more valid data about how the system really works. The other is that one only understands a system when one tries to change it, as changing human systems often involves variables which cannot be controlled by traditional research methods.*" (Coghlan, 2015, p. 524)

Both for organisational development and projects with communities, AR requires a careful and balanced combination between reflection and action, between research and collective knowledge production. (Andersen, Bilfeldt, & Søgaard-Jørgensen, 2014)

In my explorative encounter with the miners, I have chosen to emphasise "dialogue" (Jacobs, 2010) over interviews. Interviews will lead miner's attention into the discursive language; this means that the miner may feel he is being questioned, evaluated or judged. Specifically, for miners in their culture, this is an awkward situation. It is the interviewer that sets the agenda and things the miner may find more relevant tend to be left behind. To avoid this, I use dialogue instead. In such a conversation, the informants (miners) will not necessarily notice that they are subject to questioning. Promoting a dialogue will allow locals to be more open, and they would feel the freedom to reflect without any predisposition. Through dialogue starts an interplay of the power between the informant and the researcher in an equal and more natural sense. And as was mentioned by (Jacobs, 2010, p. 382), the dialogue is a "breeding ground for professional development, because it creates a space for reflections on one´s theories in use as well as for co-learning."

To promote different spaces for dialogue, I used other methods as participatory observation, workshops and meetings and the design of a boundary object.

4.2 Participant Observation

Being myself a "researcher" with experience in gold mining, I considered using participatory observation to get my data once in fieldwork, and in general in all my interactions with the actors both from Africa and Colombia (miners) and from Denmark (NGO).

I still consider myself on doing participant observation, because it gave me new perspectives that I was not aware of before, that is the challenging part of the project, and it is everything about being a professional leaving his comfort zone. James Spradley gives the next consideration:

> "*If you select an unfamiliar social situation, you can build on this common experience. Because you feel like a stranger because you don't know the tacit rules for behaviour, you will fall naturally into the role of participant observer.*" (Spradley, 2016)

It would explain that I did not fall naturally in the role, but it made the experience more stimulating.

It allowed me identifying more elements, to be reflective and critical about the situations that I would locate in the field. “Participant observation requires the ethnographer to increase his or her awareness, to raise the level of attention, to tune in things usually tuned out”(Spradley, 2016).

In the workshop that I designed, I intended to detect the disposition of the miners against new ways of doing things, and what would be the key elements to remember the steps of which a process consists.

The meetings and the casual conversations were part of my intention to develop rapport, trust, legitimacy and make them feel comfortable to talk with me.

5 FIELDWORK

In this part, I will present an overview of the representative actions and activities that happened before, during and after the fieldwork conducted in Uganda in January 2019.

A more detailed version of the fieldwork will be in Appendix 1

5.1 Before fieldwork

5.1.1 Foreshadowing and pre-fieldwork research and preparation

Two main issues need to be addressed in the intervention:

1. The challenge the blower for the smelting step would represent, in case of the lack of energy in a miner ´s village. (the process is explained later)
2. The Learning process of the miners.

So beforehand, I decided to use these issues to make an arrangement that would allow me to collect my data in the field, facilitating the opening of the participants into a dialogue, inducing conversations about their experiences adopting new technologies, promoting change, learning new concepts for producing new knowledge.

5.1.2 Introduction to processes and technology

My first observations in Uganda helped me to adapt and develop a pedagogical material that I interpreted as an adaptation of the concept of the "gift" proffered by Marcel Mauss which aimed to give "things" to natives and to expect from them a reciprocity attitude with another "thing" or any other kind of compensation (Mauss, Douglas, & Halls, 2002).

I use the "gift" with two primary purposes: to help them to remember the steps of the method, and to create an emotional link with the new approach too.

I was also curious about what level of reciprocity would them develop with me and in which ways.

In the next figure, you can see the arrangement of the cards in the keys chain, and in Appendix 1.1, you can see in detail how looks like the cards.

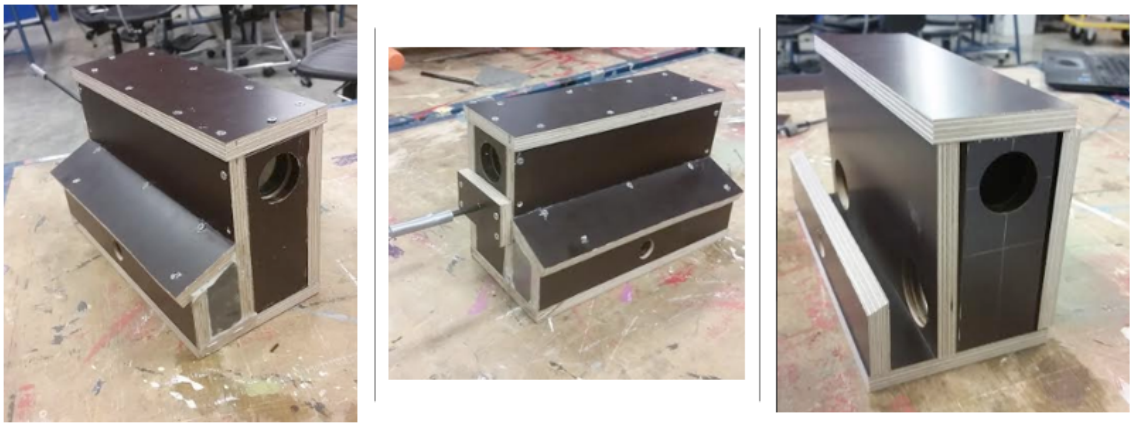
Figure 5. Example of the arrangement keychain-cards, used to discuss the steps of the mercury-free method.

Source. Developed by the author.

5.1.3 On-site testing

In preparation of the field, I researched homemade blowers. I found the Fuigo (Japanese blower) as one of the most efficient ways to blow air to help raise the temperature. I built a prototype myself at Aalborg University ´s V-Lab, aiming to have the experience and prepare the needed materials for conducting a workshop to exchange ideas with the miners about the issue of the blower.

Figure 6. The prototype of a Japanese blower "Fuigo" as a mechanism to be used in the workshop with the miners.



Source. Developed by the author.

5.1.4 Observations methodology

I assumed different roles during the whole intervention, but, my central and undercover role was always as a participant observer. I always performed transparently but never explicit this role to avoid affecting the naturality of my interactions with all the stakeholders, which who I had fascinating conversations as part of the dialogue model that guided my research. With the purpose to observe what was interpreted by miners, I planned to let them present their understanding with drawings and graphs. Since language will be a problem, I felt sure that I could extract more information from the miners than by communication in words.

5.2 During the Fieldwork

A full description of all the activities is in Appendix 1.2 and Appendix 1.3

5.2.1 Miner to Miner Training

The miners were organised in two groups because in Tiira we had only two trainers from the Philippines. The process was divided into two steps; the first group was practising the milling, the sluicing and washing (see figure 7), and the second group was practising the panning process and obtaining the ore concentrate that is smelted in the last step (see also in figure 8). All participants have time to practice and master all the activities. For instance, on the second day, the teams switch their roles, and the first team learn how to pan, and the second group how to sluice. At the end of the training, all the trainees must be able to perform the whole procedure, and some of them are also capable of explaining other people and becoming trainers too [A][G][I].

Figure 7. First-group ´s activities: Milling the ore, sluicing down the ore and washing carpets.

Source. Developed by the author.

Figure 8. Second-group ´s activities: Panning and collecting the minerals concentrate.

Source. Developed by the author.

Figure 9. The smelting process where all the groups are present

Source. Developed by the author.

5.3 After the visit to Uganda

Keep contact and relationships with miners

Formulate a possible intervention project in Colombia

Design a multilevel miners network (please seemore detailed in the appendix 1)

5.3.1 Reflections from the fieldwork

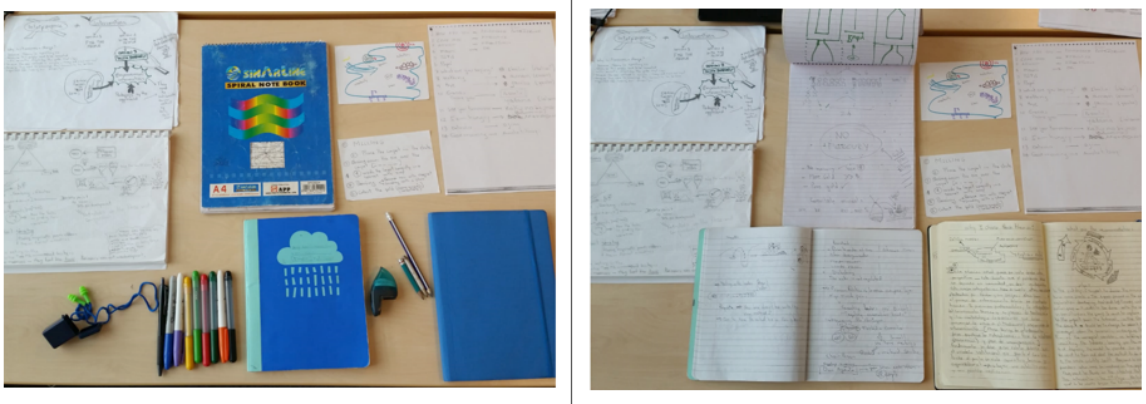
Doing action research fieldwork is a profoundly moving experience, also a big responsibility and has its risks as well. Is moving because one can see life from another perspective, it is difficult to accept how your cultural values are being observed, criticised or compared all the time. Your emotions and sensibility are in a rush in every single interaction, your nature, your convictions and your moral or religious values have a big internal discussion in quiet or lonely moments. My responsibility was enormous, I was there in the name of an international NGO from a foreign country, representing a prestigious university and also representing the culture of a Latin-American country and the ethics of my profession. Every decision, every word, my movements, my attitude and my respect for their culture contributed to the imaginary the locals are going to form about us. I took this so severe. However, this responsibility overwhelmed me, and I want to confess every day I ended utterly exhausted both physically and emotionally.

6 EMPIRICAL DATA COLLECTION AND DISPOSITION

All my empirical data is represented by a) all the interactions I had with the actors of the project such as NGO ´s Team; Miner Experts from the Philippines; Miners from Uganda and Colombia; authorities and so on. Those interactions were mainly through conversations in private or public settings, also in participatory exercises, collective reflections and casual meetings. In general, all the spaces created to promote an open, transparent and democratic dialogue; b) all the drawings, figures, presentations and representations that I developed during the interactions that I referred to in the previous literal; and also c) all the additional elements that I developed to support the interaction with miners and the NGO after the intervention, and all the document; presentations; interaction by email and by whatsaap that I still have with many actors.

I used different elements to register those interactions during the observations. Notebooks for register reflections, and relevant quotations after meetings; spiral notebooks and memo pads for making explanatory drawings with and to the people; a digital memo application in my phone; I took several photos and videos that allowed me to register key elements for further analysis; moreover, I used whatsApp application to promotes more interaction with some miners and local leaders even after the intervention. In the next figure, there is a group of those elements used.

Figure 10. Relation of some elements used and examples of how I register my empirical data.



Source. Photo taken by the author [I]

I will refer to this empirical data during the analysis part using a letter in brackets [“ ”]. Each letter refers to the next categories in which I classified all the information and interaction:

[A] Observations on site

[B] Dialogue with miners in Colombia

Some of this conversations were recorded with the consent of the miners, but mainly most of the encounters happened in informal settings in which I had the opportunity to gather with some miners while working or in the street or their houses.

[C] Dialogue with miners in Uganda

The dialogue was in different places. Some of them were in the reflection part after each training, other was during the training, during the workshop to develop the blower, and many others in more focused meetings that I could arrange with some of them.

Figure 11. Examples of conversations with miners. Pictures taken by other team members form Dialogos.

Source. Developed by the author

[D] Dialogue with miners´ leaders in Tiira-Uganda

I invited three leaders from the community to have an open conversation about the concept of change and the legitimacy of the projects in the region.

[E] Dialogue with other stakeholders from Tiira-Uganda

Every opportunity I had in the village: while having lunch; fixing tools in a local workshop, in a supermarket, in a hardware shop; in the primary school; even buying water or going back to the hotel, I turned it into a session to explore more about cultural issues and perceptions of the locals about the project.

[F] Dialogue with experts (NGO+Philippines Miners)

The opportunity to have multiple conversations with the Philippine miners enriched my knowledge with the Technic and also about their culture, their position towards the training, the method and the interventions. I want to highlight here too the inspiring conversations with Peter Appel, the Danish Geologist who is for me Quixote of the Mercury Free Method; he is mainly in charge of the international engagement of the method; the feasibility before the interventions, and to assuring rigour of the plan once in the field.

[G] Working activities with miners

These practical activities refer to the events in which I participated with miners both from the Philippines and from Uganda looking for prepare and get ready the training facility and the activities that we committed during the miner to miner training.

[H] Modelling based on dialogue with experts / miners

This modelling is the outcome of some conversations both with miners and experts that allow me to have a physical interpretation of their thoughts about any issue. Alternatively even designs or drawings that contributed to developing my analysis and proposals for future situations.

[I] Photo or video recording

[J] Phone conversation- WhatsApp interaction

[K] Email interaction

This interaction refers mainly with the NGO, or with authorities from Colombia

Finally, and as part of future work and to have a common place to have discussions and share more information about the project, I created a blog that you can access by scanning the next code:

THEORIES

The reflection that led me to decide to use the critical theory of technology, post-development, and the pedagogy of the oppressed, was that these three theories have much in common principally in their congruent stance regarding emancipatory and change processes. But besides, the three are perfectly adaptable with Action Research as a methodological basis for this project, which can be made more dynamic through participatory work with communities in processes not only of empowerment but also of change and transfer of knowledge. The hypothesis raised in the problem formulation must be seen from another perspective; for example, what would it imply for the whole project to carry out a collective construction of the process of entering the Mercury-Free Method (MFM)? In this new possible interpretation, the elements of which I will refer in this chapter must be considered.

With these theories, I want to carry out an analysis that allows me to organise the situation of the training process of the miners in a more sustainable way for the NGO and the communities. The proposal that I will develop more broadly in the analysis chapter seeks to divide the transfer process into four parts.

The first part, the discovery, implantation of the research group and preliminary work in the community. For this, I want to explore it from the perspective of Post-Development. The second premise is the technical knowledge, its translation and communicational process (language) and the methodology of teaching for training. To approach this topics I will take elements from Freire ´ s pedagogy of the oppressed, and other aspects of Post-Development and the critical theory; The third stage is the institutionalization and replication of the method [from the normative, technical and organizational point of view, and there, the critical theory would help me with a more exceptional contribution. Finally, there is a proposal of a new model of approach as a complement to interventions in general, which from the perspective of the critical theory of technology could be interpreted as re-contextualization to ensure the community and NGO emancipation from the technology under evaluation.

7.1 Critical Theory of Technology (CTT)

7.1.1 First consideration

I choose this theoretical framework because a change is needed in the way miners are adopting the new mercury-free method. Here there are many norms associated with the technical procedures and in the measurements of efficiency. Moreover, CTT has many resources to use and facilitate not only the understanding of the controversy, but to promotes an alternative solution on behalf of the participants, miners, the NGO, the environment. I do not want to critic the MFM; I need to understand instead, from the technical and social bounds what kind of approach of the training for using MFM would help our miners to have emancipation, from the oppression of the mercury and the NGO.

7.1.2What is the history behind CTT?

The basics of CTT belong to classical philosophy of technology where its maximum exponents were Herbert Marcuse, Theodor Adorno and Max Horkheimer authors that belong to the denominated Frankfurt School. They produced a very abstract critic of technology whose based their argument on that we were immersed in a technocratic society, in which the technical rationality is what dominates their culture. This statement was evolving into almost an allergically position towards technology by some scholars such as Habermas and his colleagues. Maybe, they have forgotten the main thing that the Frankfurt Scholars were concern about, "..the actual technology that we employ is adapted to technocratic control of the underlying population." (Feenberg, 2017b). However, to satisfy us today in the massive flood of technical problems we are facing, the critical theory had to redefine and propose a new approach going back the main preoccupation from the CTT founders' fathers. The renewal scope aims to analyse the political implications when addressing controversies in society due to those technologies. Such controversies are much essential to understand problems related to the transition to mercury-free SCGM, as stated in the problem analysis.

Those controversies arise because of the movements for and against the positions of dominant groups over marginalised or oppressed groups and vice-versa.

Critical theory is a useful framework to understand the tensions and movements in a socio-technical configuration and creates a path to promotes emancipation.

7.1.3 Socio-Technical Configuration and Domination

A socio-technical configuration is an arrangement conform by the relations and networks between the technical but also social elements a technology needs, to be applicable in practice (Geels, 2002). As Frank Geels states, a technology function "*is fulfilled, because a heterogeneous set of elements is linked together.*" (2002). In the social one can consider elements such as regulations and policies, cultural and symbolic meaning, users' practices, final disposal considerations. From the technical perspective, one usually can describe the infrastructure and the features of the technology and also how the whole socio-technical configuration impacts them.

In the relations, tensions and movements between actors with the technology, some of them become a vulnerable group or feel some degree of oppression or marginalisation due to practices influenced by another dominant group. The theory aims to develop a transformed socio-technical configuration through a process of dialogue that allows those in a less favourable position to get access to the more inclusive conversation; thus, moving the oppression away (Feenberg, 2017a).

7,1,4 Central concepts

The critical theory involves and evolves central concepts from the first and second generation of scholars of the Frankfurt school, and Actor-Network Theory. Those concepts articulated facilitates the analysis of the socio-technical configuration, the identification of the relevant factors (as the actors and its networks) for a change and the path for a possible emancipation process.

To understand the first two elements, I want to draw in an early discussion of CTT scholars about modernity. They argued that modernity promotes a constant search for the best and most efficient way to reach an objective: to control nature. This intentional reasoning is named *Instrumental Rationality* (Feenberg, 2002). Subsequently, attention was focused on a critique of Capitalism. Marcuse claims that capitalism forced the creation of a rational culture that prioritises the technical interpretation of reality, displacing any other type of relationship or analysis of it. This technical interpretation of reality gives to raise the concept of *Technological Rationality*, that along with the excuse of seeking efficiency in all the interactions of human´s life, results in new rationality that justifies the need to impose, even sometimes with disastrous results, changes in the society interpreted and encouraged by technology (Feenberg, 2017a). The use of mercury for gold mining is the closest example of a global disaster associated with a naïve initiative of efficiency coming from the Spanish colonial time. (Espina Montero, 2001)

We need to be aware that efficiency is a norm; it is contextualised socially. As it was exemplified by Feenberg in a conference in the Maastricht University in 2016 (Feenberg, 2016), "we want the internet to be efficient, yes but efficient for what we want a use it for, not efficient for what it was designed originally for. The internet was designed for getting remote access to others ´ computers information, but what we want to use for ordering a pizza from our phone, or in more a sophisticated way, to interact with the government as a citizen (e-government).

The instrumental and technical rationality supposes that humans, intending to find such efficiency, seek to control nature or the technology thus, monitoring and also dominating society. This is the derivation to nature devastation or human marginalization.

Having understood the above, the main idea using the critical theory approach is to identify and understand the socio-technical configuration that is generating domination or oppression on a certain group. Depending on ways of using and its context, technology can have positive or negatives effects. CTT is a theoretical framework that can deal and suggest the harmonisation of those two points of view; **harmonisation give the impression of consensus, and often time it will show controversies**. For Feenberg, technology is composed of two aspects. One aspect, which he calls "*primary instrumentalization*", explains the constitution of objects and technical subjects, and another aspect, the "*secondary instrumentalization*", that explains the incorporation of objects and subjects constituted in real technical networks. (Giuliano, 2013)[1]. Feenberg exposes that technology needs to be studied under two layers; the first one is the technology ´s original functional relation with reality, and the second its design and implementation process (2005b). One has to be aware that those layers may include objectives and subjective interpretations.

Therefore, the first layer requires to *de-contextualise* the technology, extracting it from its original context, focusing on reducing it in its useful features. The second level implies a new design or the integration of the technology with other mechanisms or systems and with other social considerations as ethical or esthetical principles. In practice, it is very complex to make a clear separation between the layers, because they influence and condition each other. (Feenberg, 2005b (author translation)). **With SSGM in mind, I wonder how the two layers apply to mercury-free technology. Should it be de-contextualised from the Philippines? Use and application in Uganda and Colombia require integration with other mechanisms or a different justification? I mean what needs to be adapted, and what is not necessary?**

1 Translation by the author

When one needs to prioritise or qualify which solution to a technical problem is more convenient or feasible than other,s efficiency is not enough. It is possible to have feasible solutions with the same level of efficiency, and then how it could be possible to decide? A social approach linked to that solutions would make it more convenient. This approach follows particular interests that facilitate the decision. The harmornisation between the social needs and the technical needs was denoted by Feenberg as *Technical Code*; "the realization of an interest or ideology in a technically coherent solution to a problem."(Feenberg, 2005a)

The application of the theory in a socio-technical configurations implies identifying a technical code. Afterwards you need de-contextualise it in its two parts, the technical and the social elements, developing what was called by Bruno Latour the "technogram" and the "sociogram" respectively. (Feenberg, 2002)

As it was mentioned before, the objective of the theory is to find ways for emancipation. In this regard, it is necessary to *re-contextualise* the socio-technical configuration defining *alternative rationality*. Exercises based on dialogue or in democratic interventions would allow participants to develop *democratic rationality*. Then, and due to it is possible to achieve successful multiples solutions, the main idea always is to find a balance between the technical rationality and the alternative rationality (based on democracy). At this stage, a new socio-technical configuration is established. **In the analysis, I will get back to technical vs alternative rationality in order to support my empirical evidence for problems appearing when a new solution for mercury-free SSGM is presented as technical rationality for gold miners**.

7.2 POST-Development

7.2.1 Second consideration

As an intellectual from the "third world" who is studying in a Western country, I must be aware of my responsibility to write for two audiences. The first would be the audience of my country, for which I must contribute from the social and political point of view and seek to open a possible debate in simultaneous with the academy. And the other audience, inescapably, the Western one, with which I try to pace and continue to develop reflection skills to constantly make new interpretations of reality; supported in the academic rigour. Something that I must not forget is that although I have the conviction to create and propose new theoretical approaches

supported by Techno-Anthropology, I must always have an objective look at what might be convenient for Latin America. This is why I consider relevant the use of Post-development theory from the more conciliatory view of this school of thought; that is, the one proposed by Arturo Escobar, who promotes reconciliation and the assembly of both traditional and modern positions that are present in the two hemispheres, north-south, or as you wish to call developed or developing countries.

7.2.2 Context of the theory

The theory of Post-Development was born in the 80 ´ s decade as a critic of development. The main argument for the scholars, mainly coming from the southern hemisphere, was that after more than forty disappointing years, development had shown failures enough as a historical experiment and they see no sense on improving it. On the contrary, they argue that there is no other alternative than dismisses it without any consideration. Concrete examples of the development flaws were compilated in the "Dictionary of development" in which seventeen authors contributed to demystifies the promises not achieved by development and because it "had not led to a process of catching up for most of the 'developing world' but to a widening gap between rich and poor countries, and finally that 'development' was a 'misconceived enterprise' in that it implicitly aimed at eliminating cultural diversity through the universalizing of Western institutions." (Escobar, 2007; Esteva & Escobar, 2017; Parajuli, 1992; Ziai, 2007, 2017)

Arturo Escobar as one of the most representative scholars of the Post-Development exposes that development is an attempt to normalise and universalise the world, assuming the convenience to follow the economic and social structures practised by the western countries under the label of progress and modernity. However, in that normalisation process, the well-accepted Knowledge is only the one produced by experts trained in a western way; and the "others" Knowledge, the traditional or ancestral from farmers and poor, was considered as inappropriate and commonly as a barrier to modernity. (Quijano, 2000)

New forms of power and control, more imperceptible and refined began to be implemented, hidden in the humanitarian vocation and the promising expectation of the new proposal derived from Development. Because of this, the poor, as never before seen, lost the ability to face their reality and take charge of their own lives; becoming, in this way, the main objective of increasingly sophisticated strategies and programs to which it was impossible not to accept.

"To sum up, I propose to speak of development as a historically singular experience, as the creation of a domain of thought and action, analyzing the characteristics and interrelations of the three axes that define it: the forms of knowledge that refer to it, through which it comes into existence and is elaborated into objects, concepts and theories; the system of power that regulates its practice and the forms of subjectivity fostered by this discourse, through which people come to recognize themselves as "developed" or "underdeveloped". The set of forms found along these axes constitutes development as a discursive formation, giving rise to an efficient apparatus that systematically relates the forms of knowledge with the techniques of power."((Escobar, 2007, p. 30) _Translation by the author)

Escobar defines Post-development as the opposition to the conceptual poverty created by development; in which the economics and technoscience are seen not as the choices to embark into a new irresponsible adventure to development, but for the creation to new ways to be free. (Escobar, 2007)

The representatives of this current state that they are "interested not in development alternatives but in alternatives to [the] development" (Ziai, 2007, p. 4), that is, "the rejection of the entire paradigm". Despite significant differences, the members of this group share certain concerns and interests: interest in local culture and knowledge; a critical look at established scientific discourses; and the defence and promotion of local and pluralist grassroots movements (Escobar, 1995, p. 215).

Post Development has in its entourage thinkers with slightly more radical positions, in which they do not acknowledge as positive the achievements and emancipatory elements that development has. Arturo Escobar, on the contrary, proposes a path that seeks to build a friendly bridge that mediates between the two positions (radicals against development and those who see in it positive emancipatory effects). His experience as a professional and academic in North American universities has legitimised him as such and his proposal transcends even in the world of design. His proposal is for transforming the design as a feasible and necessary way to bring peoples in a transition towards the concept of autonomy, that has been promoted by Post Development (Escobar, 2016).

For this thesis, I found three essential elements that Post-Development theory discuss widely: building discourses, hybridisation of culture and autonomy. The combination of these and my

interpretation from this perspective would allow me to explain some phenomena that I evidenced in the field; and other considerations that I will conclude in the analysis, such as the necessity the miners from Tiira have to make a training facility replicable with their local materials.

7.2.3 Changes in the discourses

The Post-Development framework proposes that discourse is a practice, not only verbal, with conditions, norms and transformations inherited from and for history (Escobar, 2007, p. 362). When it becomes necessary to promote changes in the discourses in an intervened community, this necessarily implies incorporating the common practice of local actors and modifying the structures of what is conceived locally as a truth (ibid). For example, the discourse of development should adapt and move a bit away from the sciences of development, make a critique of the models established in the West and give room to other models of knowledge, learning and different types of experiences. The best example of the differences between western and local discourses is the child labor. For the western perspective, it should not be allowed any child labour. However, for the inhabitants of the small mining village of Namaingo, on the shore of Lake Victoria, that concept of children's work does not exist. The children do not have a local school and the only thing that can keep them busy and away from the mine is fetching water from the lake. For the community that is the dual function of carrying water, having children occupied and meeting the water needs in mining activities and for use in their homes.

Transformations of this type require adapting not only language and ideas but also the formation of cores in whose periphery new forms of power and knowledge can converge and thus find space to discover original cultural productions (Escobar, 1995)

Assuring the establishment of transformed discourses implies to affect and convey political and economic matters. It is needed to develop a new communitarian structure that supports the change as a local and legitime institution.

7.2.4 Hybridisation of culture

Escobar justifies this element explaining that in Latin-America is a continent where "tradition has not gone, and modernity has not yet arrived completely"(2007). Thus, Post-Development reflex in the position that communities should not be struggling with processes aiming to generate modernity replacing the traditional. Instead, Post-development scholars promote the creation of ´ hybrid modernity`, "which is characterised by iterative attempts at renewal by

multiple actors depicting the cultural heterogeneity of each sector and each country involved." (Escobar, 2007, p. 366 (translation made by the author))

Hybridisation is not the exhaustion of the imaginary, cosmology and mythical cultural traditions, on the contrary, hybridisation calls for a cultural composition between cultures but with the freedom to alter, adapt and assimilate new elements without running the risk of imitating or copying; without any critical sense of what is need to be done.

Linked to this assumption, post-development suggest that interventions should be focused on engaging within current popular initiatives instead of proposing new initiatives or different approaches. Accompanying the local dynamics trigger new possibilities to achieve in common new challenges. (Matthews, 2007)

7.2.5 Autonomy

Escobar, in his book Autonomy and Design exposes that the concept of Autonomy makes an analogical or metaphorical comparison with the concept of biological autonomy. "Living beings are autonomous entities since they are autopoietic, that is, self-produced; they generate themselves through the recursive interaction between their components. Autopoietic systems are totalities that relate to their environment through a structural coupling." (2016 (translation made by the author)). The autopoietic systems have an essential characteristic which is they are open to the environment but operatively closed. Transferring this into the social and communitarian work, it means that it is possible to have interactivity only when parties are in the initial stage of involvement, interaction and exploring, but later, they are confined executing what was decided, and they are reticent to open the discussion again. This is the main fundament of their autonomy. Finally, and aiming to guarantee the project or initiative get its own life, or keep running long lasting, it is desirable to promote the creation of Network Structures because "they allow for greater cooperation and mutual support between different organisations and movements without endangering heterogeneity. Another advantage attributed to network structures is that they are said to function in a more decentralised and less hierarchical way." (Matthews, 2007, p. 138) The national miners association is one initiative that aims for structure a well-coordinated group of small local associations of miners; they promote democracy, responsible mining and proper mining practices among miners.

7.3 Pedagogy of the Oppressed

7.3.1 Third Consideration:

Being studying miners´ communities in Uganda and Colombia, being oppressed by local and national governments, corporate businesses and gangs etcetera. I see Freire's philosophy of transformation not as a single path, but as a very inspiring and challenging one. Having been an oppressed also by many circumstances in my past linked to the world of mining, I realised that thanks to lines of thoughts such as those that Freire proposes are not necessarily utopian. Only when one deeply understands the reasons for our oppression, when you make conscious decisions to transform your environment with the right people and when you find a path in education and collective consciousness; that is where the real struggle for your liberation begins. This liberation is provided by the capacity you develop to produce knowledge in the language that fulfils characteristics of context, intention, simplicity and forcefulness. That is what T-A is offering me now, a new language that will allow me to elaborate a new discourse for an audience that needs to work together for a new revolution for the liberation of humans with technology.

As a native coming from Colombia turning into an academic in the western world, I should try to bridge over some fundamental differences in language and intentions that for sure has a significant impact in the NGO´s interventions. In Freire´s approach to dialogue, I find the most revealing tool to take care of in future interventions. Dialogue needs to flow like a calm river both on the surface and in the innermost. Otherwise, there would not be room for developing the shared consciousness that unfolds the possibility of collective knowledge production.

7.3.2 Context of the theory

Paulo Freire wrote the pedagogy of the oppressed in 1970, and it was the result of a personal commitment for the future of Latin-American thinking. He was inspired by the difficult situation he experienced during his childhood, by the acts of abuse and domination suffered by Brazil during the military dictatorship of 1964, and by his critical stance on the educational model inherited from many years ago, of which he declared himself as a victim from it (Ocampo L., 2008).

His proposal was focused on the concept of Education as a practice for freedom. The Freire method was locally used in Brazil, as an educational model to massively eliminate in a short time, illiteracy in Latin America. Afterwards, it was adopted not only by other Latin American countries but by UNESCO as a model applicable to the whole world.

Freire, in his model, raises the recovery of consciousness so that "people" can humanise and transform their reality as an act of love. The critical point to Freire is that in the verbalisation process, each gives words to their problems from the objective-subjective duality that naturally we all humans have (Álvarez G., 2018).

In the first book published in 1970 and in his later work Freire make a clear distinction in how should be approach the analysis of the concept of oppression: "through a convergent theoretical framework where the object of oppression is cut across by such factors as race, class, gender, culture, language and ethnicity." (Álvarez G., 2018; Freire, 2000, p. 15)

Freire defines the oppressed as objects devoid of purpose; they have no control over their being by the domination to which they are proscribed. The oppressed is a non-being, does not exist, can live or die; it is merely nothing (Álvarez G., 2018). The most explicit act of domination is when the dialogue is repressed. Consequently, it drives to the reification of the people. In other words, when you lose the possibility to dialogue, it does not make sense for you to trust anymore or to believe in anything, you are hopeless you become in nothing or a simple "thing".

The main idea in the praxis of the theory is not focusing the attention in the oppressors. Neither in their actions, but in the reasons of oppression that the oppressed make conscious. "if the goal of the oppressed is to become fully human, they will not achieve their goal by merely reversing the terms of the contradiction, by simply changing poles." (Freire, 2000, p. 56), thus, liberation makes sense when the oppressed do not ideally feel the necessity to oppress those who used to crush them but as restorers of humanity for both.

The central elements the theory develop to promote empowerment and liberation are Denouncement; Domination and Ideology; Education as an instrument for liberation; Dialogue; Community, consciousnesses and praxis; and, Liberation.

However, for this thesis, I want to focus my attention only on the central element; such is Dialogue. It does not mean the other features are not essential neither relevant for my analysis, but I needed to narrow my approach and Dialogue is the most manifest contribution Theory of the Oppressed gives to this thesis.

7.3.3 Dialogue

The dialogue is based on the interaction through the word. The constitutive elements of this are reflection and action, and any disturbance of any of these two generates an imbalance that can affect the concept of dialogue. It is verbalism when reflection lacks action, and it is activism when acting without any critical thinking. And according to Freire's theory, the meaning of the dialogue through the word is to build their truth to transform the world. I would personally say that this transformation, in general, would be to promoting and establishing any change (Freire, 2000).

The author explains that dialogue only can be fruitful when its participants are conscious of five stances, such as Love, humility, faith in people, hope and critical thinking. The first three produce the atmosphere for mutual trust and to foster a partnership to overcome situations together. Hope promotes the constant search of humans to get completion, and critical thinking that helps people to continues transforming their reality through the curiosity and the question understood and the best way to start the communicational process (Freire, 2000, pp. 91–92).

Dialogue plays an essential role in the process of demystifying the visions of the dominants. Dialogue allows us to share ideas and enables for socializing and establishing the collective understanding of the world, that is to say of how they perceive their reality (Álvarez G., 2018; Freire, 2000; Ocampo L., 2008).

Finally, the next chart shows the matrix with the four antagonist social actions in Dialogue: the Antidialogical and Dialogical characteristics. The firsts characteristics produce oppression and the second ´s liberation. The idea is to be aware of them once being in the field in a learning process.

Chart 1.

ANTIDIALOGICAL		DIALOGICAL
Conquest	→	Cooperation
Divide and rule	→	Unity for liberation
Manipulation	→	Organization
Cultural invasion	→	Cultural synthesis

Source. Developed by the author

7.4 Application of theory in the analysis:

I need to admit as a very personal reflection, that having read this theory, I was curious about how it would be possible to interpret and use it from a Techno-Anthropological point of view. Reading the controversies that arose in Latin-America due to many misinterpretations of the theory, that impacted our history in unimaginable ways, gave me an idea on how it could fit in my project. The challenge was to rescue from the theory its most valuable contribution to the understanding what the concept of liberation entails for the miner ´s training in the mercury-free method? I found the answer to this question in the approach that action research combined with Techno-Anthropology discusses. In this regard, I consider the pedagogy of the oppressed as the armed limb of action research for promoting, in our case, empowerment and the emancipatory path from the oppression that the technology represents for the miners and the experts. Empowerment understood from T-A as the legitimacy "users" need to gain in the interplay with the experts during the negotiation in a participatory exercise. It can be legitimacy throughout the knowledge transference, the common production of knowledge and the consolidation of the miners ´ discourse (Børsen & Botin, 2013, p. 326).

8 ANALYSIS

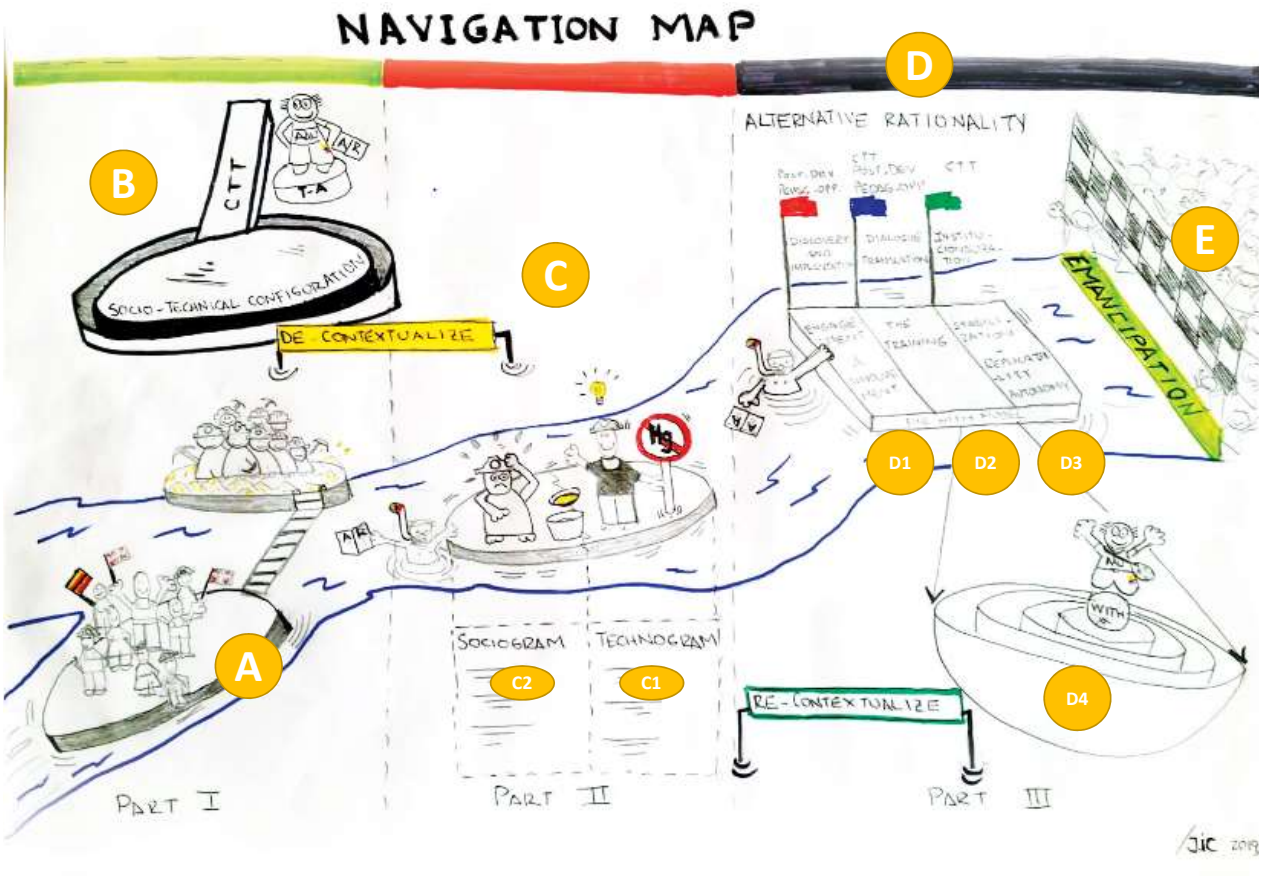
Trying to make it easy for the readers to follow a coherent line through this chapter, I made the next figure that shows a navigation map.

The figure is divided into three parts, In part I, there is a river that represents the episode in which a group of people (A) from different countries in a partnership with a local NGO from Uganda are waving flags showing a good alternative for extracting gold without using mercury. They are inviting a group of small scale gold miners to join them through the river in a balsa prepared for them. The (B) shows a big magnifier labelled as CTT (the Critical Theory of Technology) and myself as the researcher who wants to understand the socio-technical configuration of the miners, and holding a methodological book to conduct the project with the initials AR on it, those stands for Action Research.

Part II has the second element that the theory recommends to analyse, the de-contextualization (C) that has two features (C1) the primary instrumentalisation and the (C2) that is the second instrumentalisation, in the balsa, a trainer is giving arguments to a miner who is a little confused and overwhelmed. In this situation, I am diving into the river following very close the interaction and participating in the movement of the balsa.

The third part has a more sophisticated balsa. (D) Means that the new balsa is the alternative rationality divided into three segments labelled with three flags: Red (D1)-Blue (D2)-Green (D3), each section compiles the researcher, miners and other team members reflections in the fieldwork. The three parts are time-related; it means those are recommendations for before, during and after the training. (D4) it is a model that I designed using elements from T-A and my experience. (D4) is also a transversal element to the three segments of time; it means that should be implemented from the very beginning until the miners arrive at (E) where the emancipation should happen, and hopefully, the miners decide to use the new method and avoid the use of mercury forever.

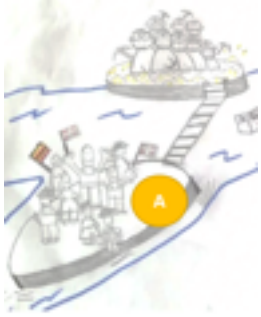
Figure 12. Navigation map for the analysis.



Source. Developed by the author.

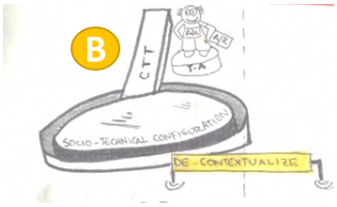
8.1 Part I.

8.1.1 Setting – different cultures – different contexts initiate project (A)



This part involves that exploration stages that the NGO usually do in prospects countries for interventions. Those preliminary steps also include the selection of a local partner who will be in charge of the implementation, the logistics in the site and the activities agreed in the contract with the donor. In this project, the Local Partner is The National Association of Professional Environmentalists (NAPE).

8.1.2 Socio-Technical Configuration (B).



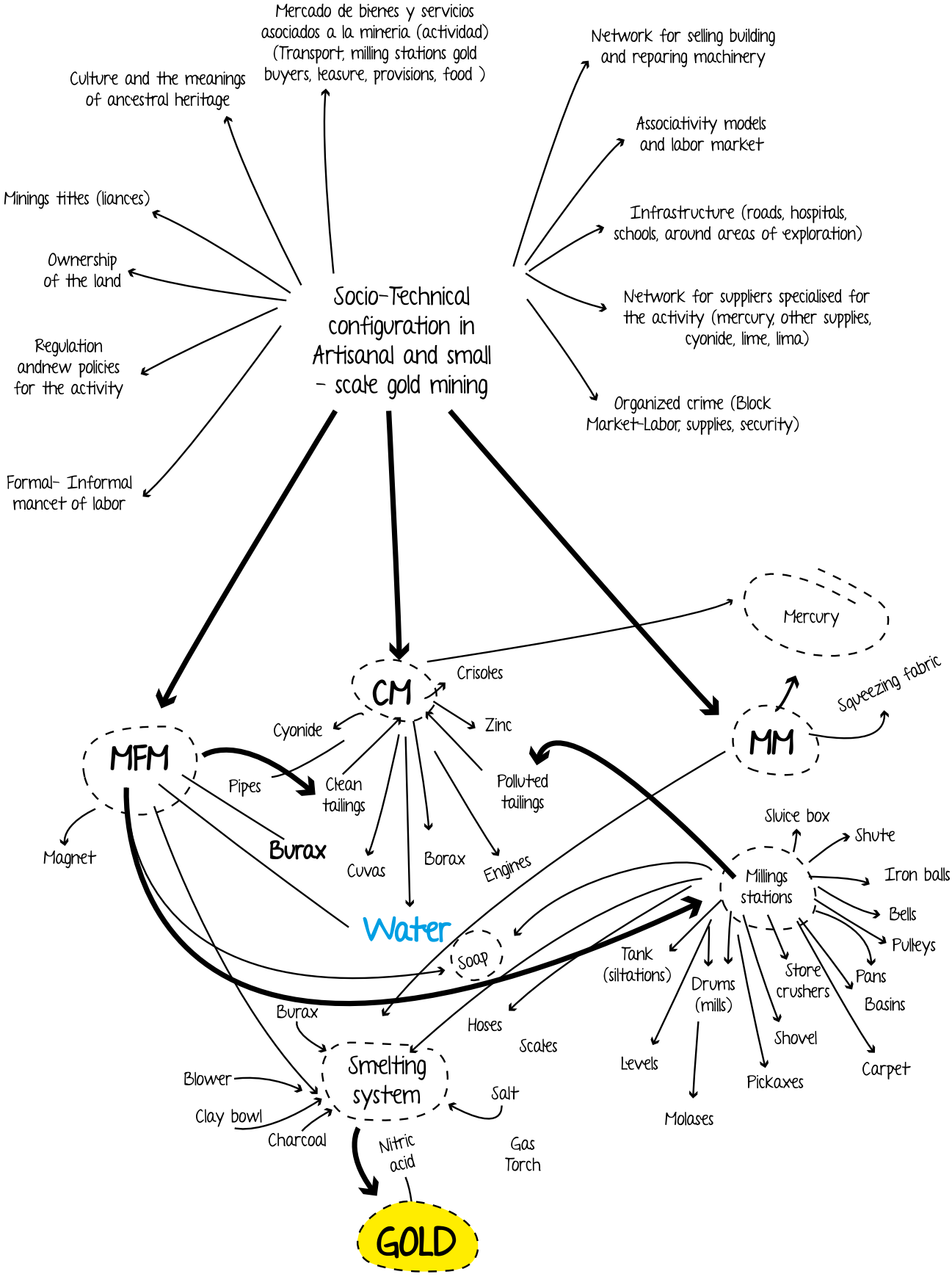
One of the relevant activities a researcher elaborates to understand the criticity of the problem that needs to be addressed, is to explore, discover, and develop a detailed description of the socio-technical configuration of the situation. This exercise contributes to answering one of the first complementary research questions. **How is the socio-technical configuration for the situation of the ASSGM that need to be addressed from a T-A perspective?**

The gold mining process can be mapped as a socio-technical configuration in which mercury is not the only technology involved. However, as stated in the problem analysis, this is the technology we would be interested in changing, and this is the primary motivator for promoting interventions to implement the MFM.

The change is necessary for a rational and normative conception related to the negative impact of mercury; which affect the environment and consequently puts at risk the health of humans. (convenio de Minamata, 2013)

The next figure exposes Artisanal and Small-Scale Gold Mining as a Socio-technical configuration. I developed it in collaborations with miners from Uganda and using

Figure 13. Map of the Artisanal Small Scale Gold Minining as a Socio-Technical configuration [H]



Source. figure developed by the authorin ciollaboration with the miners in Uganda.

information from T-A9 [A][B][H][1]. In the map, it is possible to evidence the entangled relationship between the people involved, and the technologies, including the one that will be under T-A observation. In the apendix 2 is there a more detailed context description of the situation both in Colombia and Uganda.

The socio-technical configuration shows how all the elements have close connections to each other. It means that a significant change in one aspect generates an impact on the different aspects linked with it. Moreover, this is the big challenge a new technology such as the MFM, has to deal with when it wants to be introduced into a new culture as the Ugandan or Colombians one.

"*Radically new technologies have a hard time to break through, because regulations, infrastructure, user practices, maintenance networks are aligned to the existing technology.*" (Geels, 2002)

The quotes above, argument that many heterogeneous elements are affiliated to technology and those elements are easily identifiable in the following examples.

The technologies exposed in the figure; the Amalgamation process; the Cyanide Process and the Mercury-Free process are three alternative methods to extract gold. Following the networks that show up in between these technologies, it is possible to see the relevance that some elements have — for instance, the milling stations, water, mercury, and the smelting procedure.

I want to call attention to those elements because all of them are substantial in the analysis. They are in the middle of the discussions because they represent a significant impact on the changes that promote the MFM for extracting gold. These elements are linked with many social configurations such as the regulation, the power of the milling station owners, the environmental assessments, and the formation and information of the miners.

8.1.2.1 Importance of use of water

For instance, Lake Victoria supplies the water requirements in Uganda; they have much water! however, there is not enough infrastructure of aqueducts that supply the liquid everywhere. In most villages, it is common to see community mechanical human actioned pumps to draw water; rows of people with plastic buckets must wait for the chance to fill them and meet basic

1 Letters into brackets [ ] should refer the reader to the list of empirical evidence collected during the research. The list is in the empirical data chapter and in the references.

needs at home [A]. Tiira has a water supply from another city but not from its district, thus prices to get the service are unaffordable for most people, less for the milling stations owners. That is why they use motor pumps to drive the water from flooded gold pits and use it for the process. However, they need to pay for operators, maintenance, fuel, buy hoses and many other supplies for the motor pumps functioning [A][D][E].

As a reflection point here: a central element to assess is **water**. From a practical point of view, water should not be a problem in a country with one of the most significant sources of water in the African continent; this is an evidential and technical fact. The social and practical reality is different because the water is not necessarily accessible in the place. It implies many other elements interlinked as well as the fact that there are also environmental implications. It is not well seen that an NGO from Denmark and an African environmentalist NGO together in a collaborative project were not preventing the water waste or the irresponsible use of it, this an ethical and responsible value that need to be in play all the time.

Like this evidence, there are many other that explains how the social elements have several implications in the technical configurations.

8.1.2..2 The old technology oppresses miners

The **mercury**, as a critical element, is used in the current "technology" to produce the minerals amalgam. It has many connections between the people and also with the machinery employed in the process. There is a supply chain for mercury that even implies smugglers from Kenya and other countries. The gold buyers buy and sell mercury in direct contact with the miners. The tailings from the process with mercury go to another method that uses cyanide to recover all kind of minerals; thus it is possible to recover mercury and then return it into the local market again. And in the other hand, according to the experts from the MFM [F], all tools, basins and machinery that have had contact to mercury are contaminated and need to be replaced if they want to assure, health and funtional outcomes with the new procedure, with the economic implications that this entails [E][F].

The oppression of the miners, as a matter of fact, is not only because they are not adopting the new method or because the training is not understandable for them. The sense of oppression as a personal interpretation is that the old technology of the amalgam oppresses them, and the bad news is they are not necessarily aware of it. And following Freire's words, they need to find the reasons why they are being oppressed:

> "*Hence, the need to overcome the reason for the oppression implies the critical recognition of the reason that creates it, aiming to achieve, through a transforming action that affects their reality, the establishment of a different situation, which makes possible the search for the being better.*"(Freire, 2005, p. 45)2

8.1.2.3 SSMG forms a social institution

The socio-technical configuration involves many actors that are attached to mercury not only technically but also as a social institution. I found clear evidence that the "buyers"[3] have special recognition in the village and play an essential role in the community because usually, they buy gold (they dynamises the village economy with money) and also provides the mercury. In Tiira ,for instance, the "buyers" attend any call in a few minutes by bike. When any of them arrive at the milling station, he carries his equipment in a small fabric bag. Inside the bag, there is a spoon; a gas torch; a scale and a bottle with mercury and sometimes water for cooling after having burned the gold(see picture 3 below). The first step is to negotiate the price, then he burns the amalgam and finally pays in cash to the miner.[A][C][E]

Picture 2. A "burner guy" (Buyer) from buhweju Uganda, igniting a small amalgam with gold.

Source. Photo wastaken by the author in October 2018 second fieldwork.[I]

Now, if we follow very carefully, the reason why are they using mercury? The answer is straightforward: because they were told for many generations before, that the "best" way to extract the gold is with mercury. And this argument allows me to explain the next part of the analysis, the de-contextualization of the situation.

2 Original quote from spanish "De ahi la necesidad que se impone de superar la situación opresora. Esto implica el reconocimiento critico de la razón de esta situación, a fin de lograr, a través de una acción transformadora que incida sobre la realidad, la instauración de una situación diferente, que posibilite la búsqueda del ser más" Translated by the autor.

3 The buyers are also called by the miners the "Burners Guys" or the "Torch guy" because they are in charge to burn the amalgam and usually buy the gold. These people are the most exposed to the dangerous vapours of mercury.[E]

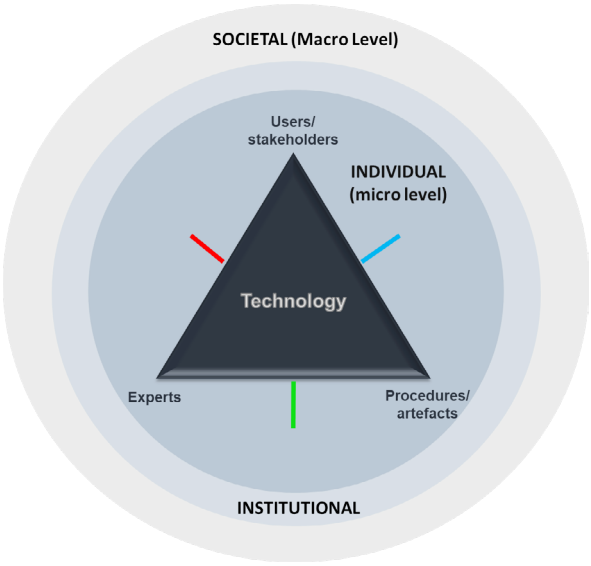
8.2 Part II

8.2.1 De-Contextualisation (C)

De-contextualization implies understanding how the interventions prioritise the technology and the vision of the experts as the **technological rationality** that unintentionally generates oppression over the miners. One needs to analyse this from a macro level, that is, at which one explains the technology, regardless of where it is located, who uses it and how.

Here I would like to refer to a valuable interpretation of analysis in Techno-Anthropology. According to Tom Børsen and Lars Botin, in one of the sharing sessions with undergraduate and graduate students, possible levels of evaluation of technology were discussed[4]. Tom and Lars explained that there are three levels to approach techniques: The micro level that explores the direct relationship between the user (individual) and the technology. The medium level in which the impact of technology is studied at an organisational or institutional level; and finally, the macro level at which technology and its effects are considered at a global scale as broad as society itself. See figure 14 below.

Figure 14. Model in T-A presented by Tom Børsen in the first international encounter of techno-anthropologist Barcelona 2018



Source. Tom Børsen

4 Tom Børsen, Lars Botin, Alberto Mendieta. Lecture Critical theory of technology CTT - T-A 7 Autumn 2018, October 30.

I consider that the situation I am evaluating is located at the institutional level because the impact of the intervention will modify the organisational process for the miner ´s associations. It means that some changes are needed at this level in the miner ´s community if they want to stabilise the use of the new technology among them, and from the NGO ´s perspective it is also in this level, because they need to re-think their position towards the miners and balance their interventions between the technical and the social point of view.

Moreover, this change needs to be done at an institutional level if they want to affect in the macro level, it means in the Society as the dream most of the NGO has.

For this analysis, technological rationality without context has two dissenting positions:

1.) The first position explains the amalgamation process as a technology that involves mercury for trapping existing gold in the excavated material. According to experts, this can be achieved by grinding the ore in steel ball mills with water and a variable amount of mercury on it [F]. After the process, which may take several hours, the goal is to recover as much of the mercury used; since the physicochemical property of mercury is to form an amalgam with the minerals with which it comes into contact. After recovering the mercury, miners use a thin membrane (a semi-waterproof piece of cloth) to obtain the amalgam by squeezing the mercury from it. To eliminate excess mercury, miners subject the amalgam to fire, with which the mercury evaporates; the final result is gold in alloy with other metals. (Teschner, Smith, Borrillo-Hutter, John, & Wong, 2017).
2.) The second position exposes another method called gravitation, in which the material extracted from the mine and previously milled undergoes a slow and controlled path through a constant stream of water by a chute already covered by a carpet. The specific weight of the gold causes it to precipitate and become trapped between the fibres of the rug. The process involves carefully washing the mat and then concentrating the heavy minerals in a pan for gold. This material is then melted to obtain the gold, which has a higher melting temperature than other metals, so it is easy to recover it from the melted minerals soup. "*As well as this method, many others deal with the concept of efficiency, convenience and viability.*" (Veiga, 1997). The rationale behind the two ways is that both comply with physical and chemical principles that are not naturally part of the miners' imaginary. In other words, they do not necessarily know these precise details.

8.2.2 Technical Code

In the process of de-Contextualization, it is also essential to identify other elements to understand how the situation of the miners becomes more complicated with these methods and where the difference that this oppression generates begins. If we observe the following explanation, we will be able to understand where my reflection continues:

> "*Artifacts have standard forms that reflect the social world in which they are situated. These forms do not conflict with efficiency but are the framework within which efficiency is achieved.*"(Feenberg, 2017b)

In this order of ideas, Feenberg exposes another normative concept linked to the social and cultural conception of its context, and this is that of efficiency. Feenberg reveals in his theory that this concept is socially constructed (Feenberg, 2016, 2017a). Empirical evidence of this is that while in Colombia, for example, the efficiency of the method would be established based on the quantity and quality of the gold obtained. In Uganda, in contrast, everything seems to indicate that the effectiveness of the technique is linked to the effort that the method requires, its complexity and the time needed to implement it in the region. Later on, we will be able to go deeper into this matter.

Now and considering the following expression: "*The 'formal bias' of technology5 is reflected in what I call the 'technical code' that translates between specific social demands and technical specifications*" (Feenberg, 2017b)

We can say then, that a technical code required to design a better approach for the situation that the miners are experiencing in Uganda and very possibly in the countries where the method has been implemented, is the harmonization required between the local interpretation of the effectiveness of the new approach (MFM) as opposed to the conventional way that they have been using it means the Mercury Method. The question is, how can this be harmonised to establish the technical code for a better design?

5 "formal bias" is an expression used by Feenberg that explain the bias present when an "outcome is prejudiced by the rational form of the social arrangements rather than any particular content of belief"(Feenberg, 2017b, p. 9).

8.2.1.1 Clash of visions

So, the analysis regarding the technology is related to the clash between two positions, the NGO as experts and the Miners as users. a) Experts intention is to promote the effective method for extracting gold free of mercury and b) Miners arguments as "The multiple" inconveniences that this implementation can generate for the village.

The resistance of the miners to the technology is through the miner to miner training, because they experience the technology in direct contact to it, they do not necessarily know the technical details of the MFM and the rationality behind it. As it was mentioned before, miner to miner training as a procedure or "artefact" is located in the lower right corner of the T-A triangle ( ). Thus, is this training process what we need to decipher and re-design.

8.2.2 Technogram (C1)

For deciphering the primary instrumentation (technogram (C1)) of the training process, we can say that for NGO and the Philippines Miners as experts the method is effective because:

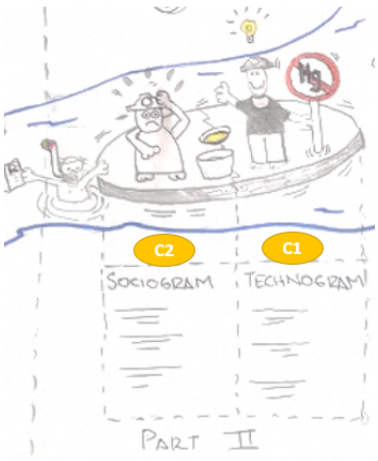
1. The miners can recover more gold and with better quality. The reasons are that, a) the miners learn how to prevent gold loses during the whole process, and in the panning part, they learn how to be aware of not discard big pieces because they are not golden. They need to grinded it by using another stone, and possible, more gold can come from it. Moreover, b) in the casting process, the high temperature discards minerals with a lower melting point than gold.
2. Operating costs decrease because, among other things, mercury should no longer be purchased. The value of mercury is very high when the supply chain includes smuggling as the only measure to get it (in Colombia there is a law prohibiting the sale of mercury), or as in Uganda where there are a few numbers of suppliers that distribute mercury.
3. As the miners develop the skills and abilities to execute the method, the time tends to be the same and even better than the time needed for the mercury method.
4. There are fewer risks to health, and the impact on the environment is much lower. Thus the community of miners begins to comply with the norms of law and the international governmental commitments related to the prohibition of the use of mercury.
5. Experts suggest organising a side by side comparison (competence) with the community to legitimise the method and demonstrate efficiency in the results publicly. In this competence, the ore is dry milled and then equally distributed for the two teams: the miners who will be using mercury versus the miners from the Philippines, who will

practice the MFM. Neutral judges from each part measure the time expended and the weight of outcomes of gold. Typically the MFM produce more gold as stated in: (Appel & Na-Oy, 2012; Køster-Rasmussen et al., 2016).

6. The experts also recommend that daily repetition for at least eight consecutive days would help trainees to master the method because by doing miners can solve all their questions and concern.

To sum up, the method fulfils all technical specifications from western rationality, it works and should not be doubt about its efficiency. It has been measured everywhere [F].

8.2.3 Sociogram (C2)



Considering Freire's recommendations, I evidenced that the model of training has several successes. In the next paragraphs, I will make a parallel between the evidence and some theoretical considerations:

- a) "*men are educated in communion, mediated by the world*"(Freire, 2005, p. 71), and the training is organised in groups, and the mediation with the method is by doing, touching, getting involved directly with the activities and the technique, in other words, participating and living the process [A];

- b)"*He [Freire] practised a "situated pedagogy" in which it was essential to teach in the vernacular of the people and use cultural symbols and forms familiar to them. Freire believed the educator must first seek to understand reality from the perspective of the students before he/she could encourage them to resist and transform their reality*" (Boyd, 2016, pp. 166–167). The issue of language is something we need to address better in the interventions, as "vernacular" implies a process of communication in a local and familiar language. Although in Uganda it was not possible to have a local expert trainer, I consider it very positive and far unique that the trainers of the method, who travel around the globe with the NGO, are also miners and expert miners. I believe that miner to miner training is a great success, as meeting other miners, the locals felt more confidence and legitimacy to the new method [A].

- c.)The skills of Leoncio, Ruddy and Debbie, the Filipino miners, allowed them to demonstrate the universal language of the miners that do not need words. This language is no other but the body, with movements, with intentionality. A miner, when in the washing process, demonstrates with his body the "desire" to see the reward for his hard work; during the panning process, he reflects the care, attention, dedication and patience to rescue every tiny gold particle he can identify in the ore concentrate [A][G]. And it is worth noting that the Philippines miners confirmed this experience with their magnificent work, who are the best expression of a positive attitude with a disinterested approach to sharing their knowledge and their old method free of

mercury. Paulo Freire highlighted this kindness in his concept of the "pedagogical link" in which the teacher knows the student's environment, and both create an atmosphere of mutual learning, role exchange and enrichment of knowledge through dialogue. (Boyd, 2016; Freire, 2000; Ocampo L., 2008)

- d.) Another positive variable is that during the process of observation and then the action, students are promoted critical thinking that helps them build their interpretation of the complexity of each of the steps of the method. In the stages of observation, the coaches explain the physical behaviour of the gold, and during the practice all the time they are making reflections on the attention and cares that should be taken. At the end of each daily exercise, the discussion with the miners is encouraged in the search for a collective understanding of the problems and challenges evidenced with the method. Freire mentioned that he is not against praxis, and he cannot imagine reflection without action they need to go simultaneously (Freire, 2005, p. 114)

However, there are still recommendations from the Pedagogy of the oppressed and from post-development theory that have not been considered and that can help miners develop more significant commitment and produce new knowledge rooted in their own culture. These other considerations I will specify in the next part where I will discuss alternative rationality and the model of re-contextualization.

8.2.2.1 Contrasting position- Womens´role

On the other hand, in secondary instrumentalisation (Sociogram (C2)), the miners present a slightly different panorama. They have, at the same time, the current method fully articulated with their culture, there are, for instance, some intrinsic values such as the political structure, the leadership or the role of the women can change the perception of the miners towards MFM (Fernandez M., 2009)[A][D]. For the Philippine miner, it was common to see a woman assuming her role in society just being a miner [F]. In Tiira, it is not that easy, women can do mining activities, but they also need to assure the household activities back home after work [A][C]. Older people, political and religious leaders are those who usually legitimise any change first; otherwise, the people can lose interest in it; no matter if everyone recognises that a change is worthwhile [D].

8.2.2.2 Physical working procedures

Physical posture is another example for this cultural articulation [A]; with the new method, positions for washing the ground mineral and for the panning process might suggest modifying something that had set in their habits and daily life. Picture 15 shows the typical posture of working in Uganda. The miners of Tiira are accustomed to carrying out the process of panning while standing and their body completely bent forward. As suggested by

the MFM the miners should have a sit, put the bucket in between your legs, hold with both hands the pan while it is floating in the water of the bucket, this way is more comfortable [F].

It should be noted that ergonomics is an alien technical concept for them, and it is not possible to determine if it is convenient for the method to induce them to change these posture habits. Though, some positions according to the Philippine miners go beyond ergonomics and argue that it has more to do with the convenience for the process of eliminating unwanted material in the process of mineral concentration, in the other position they cannot be aware of details [F].

Fugure 15: Postures of miners from Uganda for different activities.

Source. Pictures are taken in 2018 and 2019 by the author [I].

The following photo illustrates the most comfortable posture, which in turn helps develop the skill of the hands with the pan in the water to generate a constant movement that allows the gold precipitate, thus, making easy to eliminate unwanted material [A][F].

Figure 16. Miners in Tiira Uganda practising the posture recommended for panning.

Source. Pictures taken in 2019 by the author [I].

8.2.2.3 Conscientization

My reflection from a pedagogy of the oppressed perspective is how far some recommendations can be seen as convenient and when they cross the border of a cultural invasion as an anti-dialogical element for the intervention (Freire, 2000). I reflect that one needs to be aware that, according to Freire, there is a natural prevention for learning if the new knowledge contradicts your own experience (2000). That is why the dialogue around cultural matters foster the conscientization, also called critical consciousness. The trainees and the trainer's comprehension of this are decisive. This means training around technological matters must be based on an in-depth understanding of the local communities and their culture allowing for the perception and exposure of social and political contradictions that connect to the technologies. Critical consciousness also includes issues appearing when miners need to take action against the oppressive elements of the technology (Freire, 2000).

8.2.2.4 More observations of further concerns

Linked to their social interpretation, I have compiled a list of other implications and worries miners experimented and expressed during the training process. In the next part, we need to address them as considerations for include some changes in the training process and in further steps that I will also recommend.

1. In the conversations I had with miners from other milling stations [C][E], there was a concern because in the village people was commented that the trainees said that the process required much dedication and that there were many steps to learn. They also

said that they were throwing away the gold with the past method and that this made them more anxious to practice the new technique. They said that there are many more risk factors for loss of gold due to human error that they did not take into account before [C]. I was amazed, but good practices spread everywhere very fast. The first one was the use of soap or borax to break the surface tension of water and help tiny particles of gold to sink; and second, the use of stone to powder the mineral while panning [C][[E]. The problem from a pedagogical point of view was that they knew "what" it was and how it was but the "why" was not crucial for them. And according to Freire, the main idea is that learning in communion requires to develop a transformational capacity thanks to the group reflections where new shared meanings show during the dialogue (Álvarez G., 2018; Freire, 2005).

2. The use of water is of great concern to them because it is a factor that involves not only that the water pump works, but that there is an attentive operator to ensure the water reservoir is full to start the washing process [D].

3. Equipment such as pans are in different shapes and materials than those available and known on site [A].

Figure 17. Comparison between the traditional African pan and "ninja" pan used by the trainers from the Philippines.

Source. Pictures taken by the author in Uganda 2009.

4. They asked for a straightforward way to replicate the assembly that would allow them to develop skills with the new model. In the next photos, you can see the differences. They were expected to have something as simple as the one they were accustomed to using. In contrast, they saw the prominent structure, and it generated according to them a high frustration [D]. In the left photo, miners use a plastic pan with holes to "control" the flow or the wet ore which is going to be poured over a wooden made chute that is covered with a blanket. In the right photo, the training facility arrangement assures a constant flow of the material, you can be conscient what is happening with the gold in every moment. Nevertheless, it requires to install and build a more complex infrastructure.

Figure 18. Comparison between the traditional African chute and the training facility implemented in Tiira.

Source. Pictures were taken by the author in Uganda in 2019.

5. Some participants (trainees) expressed their concern about the impact that some power relations´ network might have with the project [C]. They believe this can become a threat soon. For instance, the burners and gold buyers were not prepared to buy gold with higher quality and the burning process would disappear if miners keep learning how to smelt their outcomes directly [A]. The milling station owner deals with a dilemma, are they going to promote the MFM genuinely, knowing that they are going to stop earning money with the other business related to mercury and other machinery associated to the old process? And the last one, the level of involvement that other milling station owners had in the process, was shallow [A]. In a competitive market to attract miners, the milling station owners see as a disadvantage that only one milling station has the new technology. The natural rivalry with the host milling station owner for the project with other owners can transfer the competition against the method as well [C][E]. In the book What is Techno-Anthropology? Vibeke Anderson mentioned something very appropriated that I do not only agree with, but that was evident in the three fieldwork experiences: "*The insights into power structures, context a conviction of technology as the solution gained through the analysis have shown that technology transfer without including the human aspect is not feasible within developing projects.*" (Andersson, 2013, p. 326) It means that implement a training project is not only about infrastructure and procedures. A Techno-Anthropologist Action Researcher needs to go further as a mediator but also as an energetic agent for a change, at least to achieve something that modifies that simplistic conception.

6. Something that for me at the time was not easy to understand is the great relevance represented by the cultural differences between the working groups and the intervened communities. Several papers and articles related to development projects talk about this and warn of its importance.(Czarniawska-Joerges & Sevón, 2005; Escobar, 1995, 2007a, 2016; Jamison, 2001; Latapí Agudelo, Jóhannsdóttir, & Davídsdóttir, 2019; Schuiling, 2014; Snow, 2013; Ziai, 2017). But I believe, it is only by interacting and living a real experience that a researcher comes to understand the impact of cultural interchange in projects. I believe, that difference allows us to enrich the processes

> of knowledge production, as proposed by the PBL model of Aalborg University, but if we are not aware of this, this difference becomes a determining factor to generate conflict. It should be noted that in the intervention in Uganda in 2019, we participated people from Denmark, the Philippines, Colombia, and from Uganda, we had team members from at least 2 different regions. I want to specify this because the last element that some mining leaders made explicitly was that the project should have a dynamic agent that supports the future of the project locally. They consider that it would be simpler for people in the community to reaffirm their commitment to new technology or change if they find an empowered person who has become the referent for the project, including someone who has mastered the process and motivates its use [D]. Currently, the mercury method has people who are part of the milling station equipment that fulfils this function. They guide, help and dynamize the process. The same practice persists with other development projects in the region such as the one led by the Dutch NGO Solidaridad6. The dynamic agent is an individual from the village that becomes the known link between with the local culture and knowledge that comes from abroad [D].

8.2.2.5 Dialogue prior to interviews

I cannot imagine having explored this part of the project (the sociogram) under other methodology different from Action Research. For instance, this information would not be possible to be obtained by simple interviews or doing workshops and playing with kids in a village. You need to prepare from your humanity other elements such as humility and vocation that the others can recognise genuinely on you. Subsequently, you can be able to establish "the link" to start opening a transparent dialogue with the people. Miners do not trust others easily; I think it is part of their nature.

At this point in the analysis, I have identified from the MFM and the training process their simplest elements De-contextualized, again, it means that exposes the rationality that explains the nature of the method. And then I translated from the culture and the social part (the people) how miners from Tiira Uganda interpreted both the MFM and the training process.

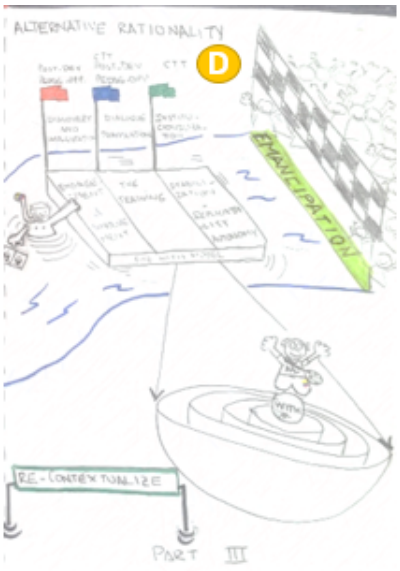
I am ready with this information as a conditional on formulating alternative rationality for the MFM and its training process; I mean in a revolutionary way. Because changes suggested requires all the stakeholders consider modifying in some extend attitudes, roles and moreover mindsets, for instance, the preconceived concept of "help".

6 https://www.solidaridadnetwork.org/supply-chains/gold

8.3 Part III.

8.3.1 Re-Contextualization (D)

8.3.1.1 Difficult role of the action researcher



I need to be aware of a severe risk that Feenberg calls attention to the CTT followers. A deficient "Re-contextualization" processes can fall in some bias of the designers (Feenberg, 2005, p. 57). In other words, in this process is where the Techno-Anthropologist Action Researcher needs to show his autonomy, independence, objectivity, ethics and transparency to facilitate this step with democracy as a value and supported undoubtedly in dialogue with the stakeholders.

Personally speaking, this is the hardest part of this Master´s thesis. Because to be unbiased and to be objective is not easy when you are conscient that your people in Colombia, friends and family are directly affected by the issue of mercury and the legality of SSGM. I do want a change and would like to be more productive with the money we might have from the Danish government in a possible intervention in Colombia, but my role now is as a researcher, and I need to protect my position.

It is not easy neither because I am very grateful to the NGO who has been supporting me during the last year. I do not want to criticise the labour that Dialogos is doing with its projects; I am not going to mention that they are doing wrong things neither. What I expect with this thesis is to indicate an alternative way to approach future interventions from a T-A point of view. And if we are going to make more responses in the future, my interest is to be sure that most things here would be considered to be included.

You may notice here that the NGO rely on the conditions for funding set by the donor (DANIDA- CISU) in our case. The lack of understanding the biases I mentioned before, goes deep in the whole structure of development aid. Further work to explore in a future could be identified if these organisations have room in their budgets for funding studies for contextuaisation or re-contextualisation for development aid projects.

One position that comes to me in this part of the analysis is that it can be possible to standarise some elements in the training process, and it can succeed in a possible intervention in Colombia; but the rest of the design must be contextualized and developed case specific, as we are going to show in the next parts. I believe that these arguments give us an idea to answer the next question from the problem formulation: *Considering the complexity of the situation in Colombia, is it possible to think that if the procedure works there, it will work everywhere?*

8.3.2 Alternative Rationality

8.3.2.1 Elements in training

The construction of the Alternative Rationality requires to be a democratically and collective work. And I wrote most of it on top of miners and locals' thoughts and recommends. However, I recognise that this part of the projects has also, elements that I consider necessaries to be included as part of the re-design of the training and the whole intervention. Those elements belong to the theories and from a personal adaptation of many other concepts that I am sure could be useful not only for Dialogos but for the University and all (the full explanation of it will be in the Appendix 12).

Readers need to be aware that the primary purpose of this part is to show only one possible path among endless more possibilities to approach the current situation.

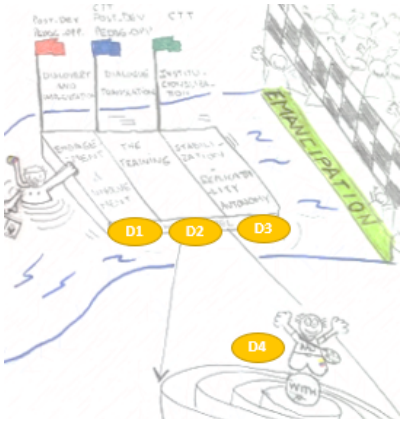
The alternative rationality part is supporting the answer to the question from the problem formulation: *what elements should be considered to be changed to guarantee and optimise the process of training the MFM in a future intervention?* I was discussing this question and talking with people from the community, with miners, leaders, women, traders, older adults and for sure, with the trainees and the trainers. Action Research empowers you as a researcher to facilitate action groups also to have empowerment and contributes to the main reason or thing to be changed. The best opportunities to open the dialogue was in the time for reflection that we implemented after the daily sessions, during the workshop to build the Fuigo, and due to a small accident that I suffered when I was buying some supplies in a hardware shop in Busia. A nail crossed through my shoe, and it went into my feet as deep as its size.

8.3.2.2 Accident promotes conversation

The accident was the breaking ice for many good conversations, in Colombia, we use to say, "no hay mal que por bien no venga" the English version is "every cloud has a silver lining". That means that you can turn a negative thing into an excellent opportunity that can benefit you. I took this as an advantage; they realised that the "muzungu" "had blood too", that I was weak and that I cry and have pain as well as they do. These words are not part of my self-reflection they were saying things like that in their native language every time they saw me. Some miners explained to me why people were so curious at me when I was crying on pain and hobbling around. In the imaginary of the village, white people are different from them. That difference transcends because they think we were "special". My accident changed their conception of us abruptly; placed me in an equal position, even in comparison to the other members of the team.

8.3.2.3 Elements in Alternative Rationality

I fragmented this part in three categories, or three analysis focuses, aiming to get a structured way for doing the interventions. Each section is going to be supported by the theoretical framework as it is indicated in figure 12 with the flags red, blue and green in the upper of part III:



1. Engagement and involvement
2. Training process
3. Stabilisation, replicability and autonomy
4. Finally, I propose a fourth category so that it impacts the DNA of the team that could ideally lead the interventions. The "with" model (D4) is a reflection that aims to develop a sensitivity, and awareness for the role as mediators the Techno-Anthropologist could play in this category of projects."

This balsa represents all the elements that Experts and Communities should be aware of in interventions oriented to the emancipation of the miners. The first three elements are the results of the collaborative work both with locals and experts during the four months that I was involved in this project. The last contribution is a freestyle contribution that I would like to include in the interventions where I will participate after my graduation. But this can also be a paved road as a reflection for development aid projects all around the world. The whole description of this model in included in the appendix 12

8.3.2.4 Discovery and Implantation (Red Flag)

Post-Development and Pedagogy of the oppressed are the guides for this first stage. Besides, this part suggests a significant paradigm change both for miners and for NGO ´s.

The next phrase is from a local leader from Buhweju: "we are a young civilisation, we need to develop it by ourselves" [D], and after reading about post-development theory I began to understand it better. It has a deep meaning moreover if you combine it with this one: "We are tired to see how you come to tell us what to do and how to do things better, why don't we develop new knowledge together?" [D]. This leader Tiira has enormous respect among the miners, and after these words, I have understood why. Arturo Escobar calls these situations as the practice to change the discourses (Escobar, 2007b). In the same direction, the pedagogy of the oppressed indicates that another way for oppression is through the denied access to knowledge, technologies and models, but also when trying to imposing them (Álvarez G., 2018). Us as foreigners, should not assume people need "help", one cannot expect our knowledge is suitable for all the situations or all societies. I believe with my personal experience that patriarchal and assistive approaches produce more weaknesses and dependence in immature societies. That also happened to Colombia and many countries from the "south" that felt in the denominated as third world country after the second war world (Esteva & Escobar, 2017a).

I reflect that interventions need to be focused on building bridges for new collective or assisted production of local knowledge. An NGO discourse needs to be also changed in the designing process of the proposal to the donor, indicators and terms of reference should measure impact and other things that can make blow your mind with innovative ideas. I know it is not possible now because donors have standardised most of their goals, indicators and even activities that NGOs have to fulfil during the interventions. I am afraid there is not much room for disruptive ideas and this kind of transformative approaches in these traditional organisations, but it needs to start from one side. I want to believe that the best option needs to come from the grassroots. I have all my hope in the bottom up associations that needs to include this new discourse in their DNA and their daily language. But I do not lose the hope that some visionary members from "top-down" organisations implant the seed there too.

When one talks about involvement and engagement in communities it means that a quality indicator for Action Research is that you make somehow, people work near to you and that they tend to feel that the project belongs to them, not to you. It sounds easy, but it is not. Paradoxically, the first recommendation I received from many people from Uganda, not necessarily miners,

was: "Do not say the project is yours". The language is potent, and words have much power, even more in the ears of the oppressed, moreover when the common language is your second language or your third language as it is the case for the Ugandans (Local dialect, the national language and English). According to Freire, the training process in the MFM should be called "Cognizable Object" because it is the mediator between the Cognitive subjects (trainers) and the trainees. And he highlights that the Cognizable object should not be the **trainers' property**; it needs to become the incidence of the reflection of all the participants. (Álvarez G., 2018, p. 33).

So in this regards, the first step of any intervention, the exploratory stage, should be focused on understanding, analysing the context, the actors, the interaction between those actors and power relations. The researcher needs to develop a strategy using participatory ways to discover their cultural values, what their primary needs are, and she need also to identify with those people, what is the need to be addressed either in the intervention. The researcher needs to facilitate the locals explain their context in their own words, how they are organised, before the interventions, how they understand, for instance, a novel concept as sustainability. Furthermore, the researcher needs to map how their value chain is, and he needs to identify the central links in its supply chain. And it is desirable that the Researcher also identifies who genuinely want to be involved in the process and who does not want to be part of it and why. All these steps belong to a combination of methodologies referred by scholars from Transformative Action Research and Participatory Action Research (Børsen & Thorsen, 2019); but, also as recompilation of my experience after the fieldworks, I participated in during the four semesters of the Master´s program. It is advisable that the person in command collect all this information develop trust and legitimacy within the action group. This activity is not trivial but essential. I want to use the word inception.

The NGO needs to ask internally, why I want to go there? Do I want to replace something in that region? My conception in T-A9 without knowing anything about post-development was: "we need to eliminate in the miners´ communities the use of mercury and promotes among them the use of the MFM". Now I think my conviction changed and now it could be: "*we want to develop a "hybrid" approach for an MFM being aware of the risks mercury has for the miners' communities and the world*"[A]. The concept of hybrid respects the traditional and the locals´ culture and harmonises with the "White's" idea of modernity or progress. The new approach needs to come as a result of continuum interaction between the heterogeneity of the cultures involved (Matthews, 2007).

8.3.2.5 The training through Dialogue and translation (Blue Flag)

The training process, as it was mentioned has many good practices, it also has an incredible balance between reflection and action, and it is well known that the magic happens thanks to the passion of the trainers, their experience, patience and attitude. However, both Dialogos and the Filipino miners, trying to standardize the training processes in the countries, focused on the technical part, forgetting a little the relevance of the context in which they perform the interventions.

Alternative rationality flowed into a list of activities as a result of reflection with some of the people who were involved in the last field work. I decided to organise them in two moments: The before and during the training.

Before

The local organisation need to work in the recruitment of the people who will participate in the training, but that work should be coordinated with a local figure that I prefer to call the "local seed" as I mentioned in a previous part she is called the "dynamic agent". This person needs to be available in this stage, and need to understand everything about the construction and the selection of the materials and all the supplies required. The local seed is in charge of logistics, but she also needs to be a miner and know how to speak and write in English and need to be native in the local language and belong to the community.

In appendix 4 you can see a Gantt diagram that I prepared for a possible intervention in Colombia, the graph highlights the importance to have a local person in charge of the logistics in place, in the example I assigned myself to do so. But in other interventions, it needs to be the "local seed" in coordination with the Local NGO partner.

It is advisable to prepare in advance the equipment for the training. The leader of the intervention must assure the training facility fulfils all the necessary technical requirements, and everything is in place for the day the trainers arrive at the village. It sounds obvious, but It is not. In appendix 5, there is a checklist I prepared after my observation. The list contains elements from the infrastructure, supplies, and machinery. In appendix 6, there are some drawings, examples and sketches for the setting, it also seems evident and easy to understand, but it was not for a local mason easy to interpret [A]. It was also mentioned that develop some pedagogical elements to show in training would help the miners to understand better some concepts. These elements are related to the technical part. However, there are some elements of human-related that I consider can contribute positively during the process.

The pedagogy of the oppressed establishes that as oppressed, we are dual, inauthentic beings lodging the oppressor in us. Only to the extent that we discover this and understand the causes of our oppression, can we contribute to the development of our liberating pedagogy. (Freire, 2005). The problem here is that we, as participants in the process, are oppressed as well as them, and the critical part of the training is that the role of trainers and trainees needs to disappear. It is necessary to create a space for the dialogical interchange that provokes the emergence of new meanings. Another issue is that we need to develop the ability to define when it is necessary to go back to the role of facilitators of such dialogue. The Action Researcher needs to dive with the group, but sometimes it is essential that he takes some distance to trigger the reflection and the next steps in the intervention process. It is like a living laboratory where you need to play different roles to assure that the participants are also enjoying the game and learning. The pedagogy needs to help oppressed to reflect on the reasons for a liberation. Then the process of reflection of new knowledge and the production of new knowledge is more fertile and virtuous.

I identified that differences in language could challenge a bit more the process [A]; that is why I recommend using another global language to support the explanations. I learn from my mother, who was a pedagogue and work for many years teaching to adults and kids to read and write in rural areas in Colombia, that using modelling clay (plasticine), pottery or physical artifacts and drawings can give matter to ideas or to concepts when the language is short, hence facilitate the learning process. Lego bricks are a good example; you can make tangible something that is in your imagination and the other way around. I want to encourage participants of the training to have paper, clay or modelling and use your imagination to be more explicative or to challenge the locals to explain themselves using the same. You can see in appendix 7. Some hand drawings, and arrangements I used during the fieldwork trying to make clear some concepts [C][H].

According to Freire, one needs to help the oppressed to develop the language that allows them to denounce reasons for their oppression (Álvarez G., 2018; Freire, 2000). And knowing some **translation** issues the drawings and all those elements can be understood as a language, in addition to the body language that we also mentioned before.

It is essential that the NGO include in terms of reference and in the budget this previous work and the process to establish and promote the constant dialogue in the field. This requirement might need the sensibilization of Donors such as DANIDA in Denmark to find this suggestionsas a new must in future development aid projects.

During

I mentioned that learning by doing promoted in the miner to miner training is a substantially positive method. Thus, my inputs in this stage are only focused on two lines: 1) the awareness the trainers need to have during the process; being conscient that the trainees are not "empty deposits to be filled in" with their knowledge(Freire, 2005). And that they are not going to foster a new oppressive model that local people want to copy, generating another form for their oppression. "*Due to this ambiguous duality and the internalisation of their oppressors, the oppressed seek to become like the oppressors and share in their way of life*."(Fieser & Dowden, 2019). We need to be attentive and identify if the trainees understand and get the method ´s whole idea. We need to be sure they know the WHAT, HOW, and WHY are the things that are happening during the training. It encourages them to be more critical and reflexive all the time [H]. And, 2) from the organisational and logistical part of the process, we developed with the help of Rudy and Leoncio (Philippines Senior miners) a necessary procedure to organise the people during the training[F][H]. The idea is to implement a circular model for changing shifts every day; given the opportunity to pass over all the steps of the procedure, the main idea is that participants can become experts in each of them. The images of the process are in appendix 8.

After the first week and after several reflection sessions, we noticed that the recurrent complaint about the time needed to run the process was an intentional distraction of the miners [A]. It was motivated by the amount of new equipment they saw and that they did not have in place. It made them feel threatened, seeing tools that they do not know how to use, and because the process required them to make conscious where the gold was at all times [C][F]. This discomfort generated at first a higher tension and a lot of frustration and resistance. The perception of complexity and long process overshadowed the joy and surprise of obtaining a quantity and **quality of gold never seen before** in the region, according to them the training facility is bulky and disproportionate for the region [A][C][D].

Picture 4. The outcome after the first milling in the facility and the amount and quality of gold never seen in the village before.

Source. The picture was taken by the author in Tiira Uganda in January 2019 [I].

My reflection here is that despite the miners were very sceptical at the beginning of the training, after few days, they were very involved and empowered with the activities, in the end, they were very purposeful and engaged [A]. I evidenced that trainees gained legitimacy within the community, and they realised that the new method gave them a little more power for the underlying reason of having mastered a technique that well-conducted has shown that can provide them more outcomes and better quality of gold with the same ore.

From an action research perspective, I conclude that as a spiral, I was identifying systematical problems, then we discussed with the locals and trainers, then we decided to implement the changes, and we ended with communitarian reflections; it confirms that I was implementing consistently and naturally the methodological Action research phases.

8.3.2.6 Institutionalization (Green Flag)

Next is the most special part of the new rationality for the training of the MFM because this is the link that I consider was incomplete all the past interventions. The most beautiful thing was that I did not have to overthink on it. The three theories have this in common; the Pedagogy of the oppressed says that changes generate modifications in the structure of the local's institutions, the equilibrium is broken, so it is needed to recompose the balance through the empowerment of the people, Freire calls this as "Cultural Synthesis." (Freire, 2005, p. 165); CTT, specifically in the concept of technological transitions, arguments that the re-contextualization requires new structures and new socio-technical arrangements that support the re-interpretation of the latest technology implemented, institutional innovations, policies and even new infrastructure (Geels,

2002). And finally, Arturo Escobar in Post-development talks about Autonomy in which the communities open space to discuss the best way to give to the project life, the need to develop an interconnection of heterogeneous networks and assure their functioning in a cooperative and a co-existence way of operation after the NGO leaves the village

> "*Generally, there is a feeling that network structures are commendable because they allow for greater cooperation and mutual support between different organisations and movements without endangering heterogeneity. Another advantage attributed to network structures is that they are said to function in a more decentralised and less hierarchical way.*" (Matthews, 2007, p. 138)

The local associations are no strong enough to form a hybrid organisation that can support the sustainable operation of the project [A][D]. This is part of the work the local partner has to do. However, that is not enough unless they first stabilise the process, the facility needs to be working with no hesitation, the supplies need to be there, the trainees need to start sharing their knowledge with other miners. That enterprise is not set yet.

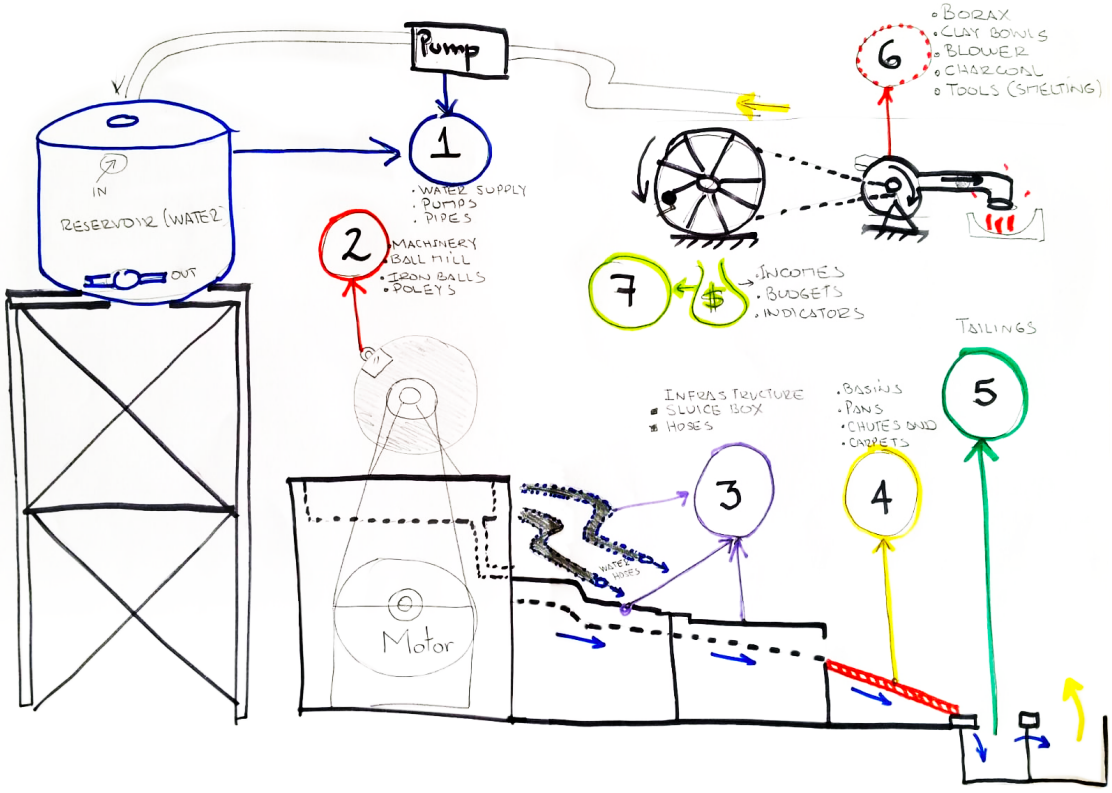
In this respect, I also have an additional reference, that supports my argument, coming from Alberto Mendieta, a guest professor from Bolivia who shared with us, in a class in T-A9, his experience working in action research in the University of Santacruz (Bolivia). In a privileged opportunity I had to discuss with him about my project, he mentioned: "There must be local roots to guarantee sustainability in projects that seek impacts in communities. The support of a collaborative network is important also to guarantee control and interaction"[7]. After the fieldwork in Uganda and part of my research, I respectfully would like to paraphrase him adding: The supportive local network needs also need an institutional infrastructure that protects the practices with explicit rules to follow. I believe that the required institution should be based on the same association that received the property of the facility training, Tiira Small Scale Gold Miners Association, but with explicit and agreed rules, accounts and a person in charge.

For the institutional part, it is well known that funding is an issue for the small bottom up NGOs. The local association expect the project will keep covering all new expenses [A]. That would be a wrong interpretation and a mistake if the plan allowed it. This kind of issues needs to be addressed in future interventions.

7 The meeting with Alberto Mendieta was in October 30 2018. Due to he does not speak English (only Danish and Spanish) I supported him as interpret in two lectures with international students from T-A7 and T-A9. We had the opportunity to discuss about my T-A9 project and he gave me very insightful comments from his experience with indigenous from Bolivia.

Consequently, the next figure shows a proposal that I was working initially with leaders from the community, as a perfect example of collaboration, but after the fieldwork, I have been discussing it with other people [H]. The figure shows a sketch of the facility and every part of it has assigned a number as a label. The central idea is that in the community, there must be a public known responsible for the correct functioning of each number [D][H]. It may create a sense of belonging and accountability as well as a clear commitment that everyone must have with the training facility [H]. There was a common worry, in the official launch, it was explicit that It belongs to the entire community. But it is situated in private land [J]. The suggestion was that there must be a clear rule that recognises the place as a public place for learning the new method and the responsibilities can foster the general understanding of the functioning [J]. Please notice that the full description of this proposal is in the Appendix 11.

Figure 19. Assignments by groups to preserve the training facility operation.



Source. A collaborative contribution to the institutionalization of the MFM in Tiira Uganda [H][D].

Finally, there should be a team in charge of thinking in the Ugandan version of the training facility (it is not indicated in the picture) [D]. And our (intervention team) responsibility is to assist them in that "Organization" of the site. The next phrase was mentioned by wise older man from the village of Tiira: "Our people learn more with their eyes, and there are

a lot of ancients believes that your new methods are trying to demystify us, and that is so hard to change. Show me a video if you want to explain but never forget to show me also by doing what the changes are with the new method. **Then I will do my version of it.**"[E] The training facility is a vast infrastructure built to facilitates training with a significant number of participants, should be open to the public and managed by a local association. But for the milling stations owners, the conversion of their infrastructure to the MFM involves a significant investment and new knowledge they cannot afford [C][D][E]. That is why they need to develop a convenient and straightforward version of it.

The three flags; red, blue and green, compiles all the collective and experiential production of knowledge around the implementation of the miner to miner training and new contributions also are part for future interventions. The critical theory seeks to develop a new paradigm, the new socio-technical configuration that the three flags of the figure represent.

Nevertheless, I consider that the emancipation only would be possible to achieve if we incorporate a new model that can facilitate the approach of the Techno-anthropologist Action Researchers, or the Techno-Anthropologist Project Manager. The following explanation is the final element that belongs to the Re-contextualization of the training of the MFM and is **my contribution** to all NGO ´ s interventions and also should become part of the competencies a T-A Action Researcher should have in her DNA for future projects.

8.3.3 The "W" model approach.

The figure represents four layers of "protection" interventions focused on working with the people need to overcome the risks that researchers are facing in developing aid projects.

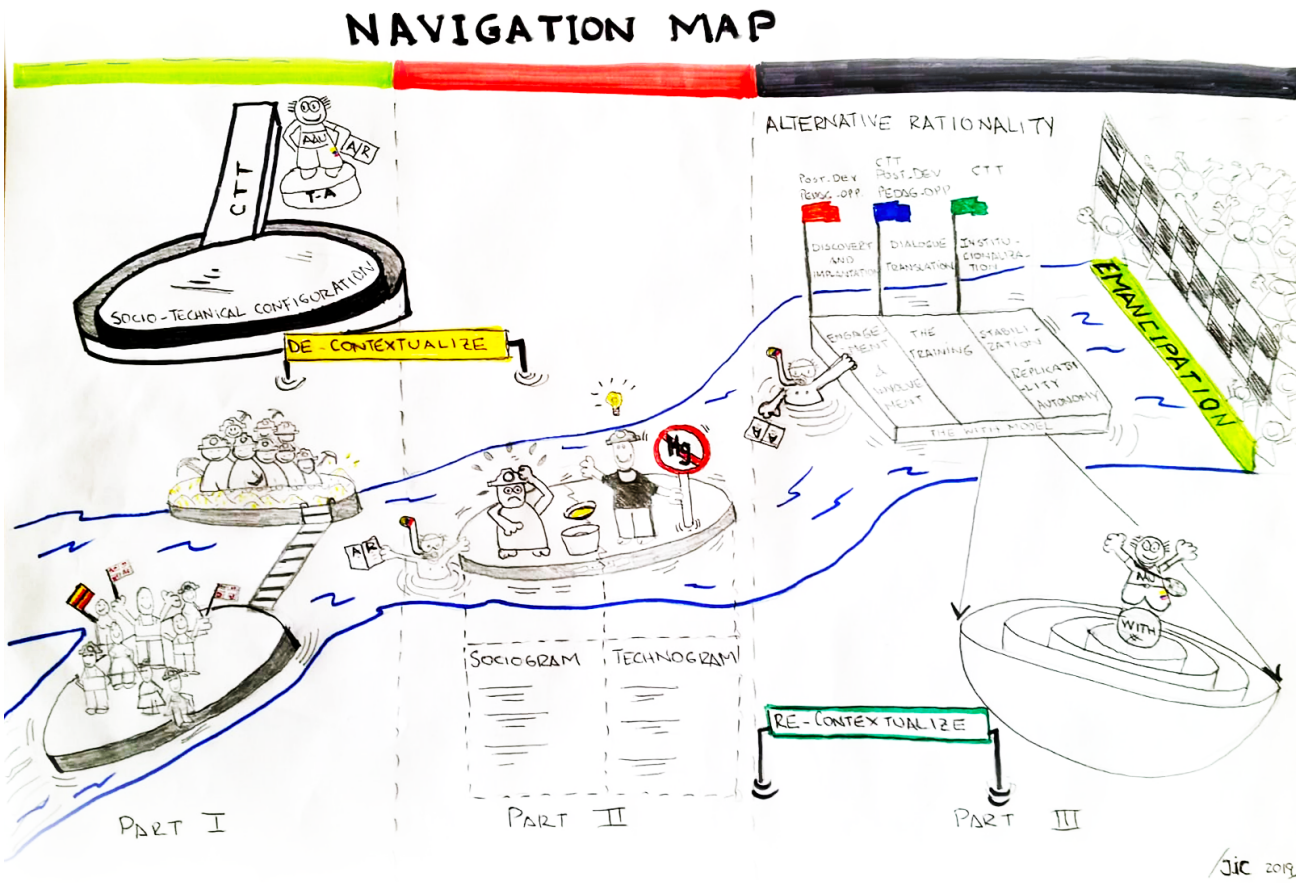
The central idea if this proposed model is to open a discussion about the role, the competencies and skills a T-A Action Researcher has to strengthen in order to participate in projects that involve communities being marginalized or under any oppressing circumstances linked with technologies.

Figure 20. Graphical representation of the "with" armoured for Techno-Anthropological Action Research interventions, developed by the author.

Critical Proximity, Cultural Values, Social Responsibility & Ethical judgement and Sustainability are the four layers that protect the WHIT; it will allow the T-A Action Researcher to face the fieldwork with competencies, skills and values that will make the difference in the new generation of interventions.

You can see the argumentation for this model in Appendix 11, and also scanning the next code:

To sum up and conclude the analysis, I want to show again the figure shown at the beginning of this chapter. It can give you an overall of the situation under investigation.



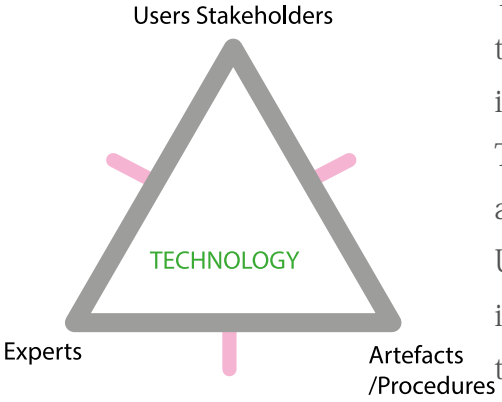
9 DISCUSSION

In this section, I outline two main elements that call my attention while I was doing my Action Research.

The first element is that I reflected on how we can situate and understand better the Action Research approach as a Techno-Anthropologist and what does it entails.

Moreover, the second concern is where we can situate a Techno-Anthropologist in the organisations and this regard, what might be lacking the master ´s program.

The Techno-Anthropological triangle.

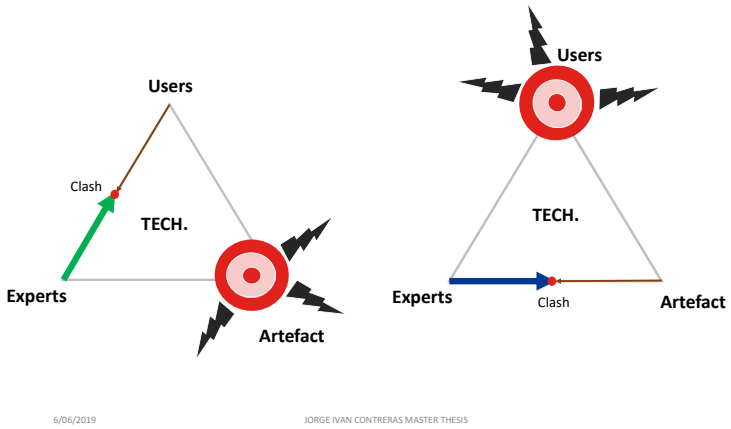


The aim of the graphical explanation of T-A with this triangle is to help students and researchers to visualise the interaction between the three central elements that a Techno-Anthropologist needs to take care about when analysing a given technology (Børsen & Botin, 2013). Users, experts and artefacts (procedures), find their forces in equilibrium in three sides figure. When for any reason that equilibrium is broken, the techno-Anthropologist duty is to find the way to recover the balance, solving or identifying the causes and ways to manage the situation. For instance, in the case of the miners, there is no equilibrium between the experts and the users of the MFM (as the technology). In this case, my motivation was to find reasons, options and elements to solve the situation.

What I realised, combining the triangle and how forces should find its equilibrium, is that the vertex of the triangle that needs attention from the researcher necessarily is the one who

is situated in the opposite direction of the conflict area. For the miners ´ example, the Artifact is the one which needs to be revised, because something was happening between the experts (NGO) and the users (miners), see examples in the figure below.

Figure 21. Example of vertex affected due to the clash or disequilibrium between the opposite side vertexes.



Source. Developed by the author.

In my opinion, a T-A researcher needs to identify where the conflict is situated, and to do so; she needs to focus her attention in the voices of the conflict, based on the problem or the controversy. Then the researcher needs to define her role in the project. Is she going to be a consultant, taking a side on one part of the conflict? Is she going to be a facilitator from a neutral force or a governmental regulatory entity? Alternatively, is she going to be an Action researcher involved in the process of change or empowerment? Afterwards and depending on the role chosen, the researcher needs to identify the theory or the group of approaches from the T-A repertoire that suits better to analyse and develop; and try to give options to facilitate or to solve the problem.

Considering my T-A9 and T-A10 project experience, I describe AR as a very adaptable and flexible methodology can be used in all the interactions between Users and Experts, Users and Artifacts and Experts and Artifacts. The only thing is that a Techno-Anthropologist Action Researcher has substantial responsibility in two main lines:

1. Any change or an empowering situation under analysis must be linked with a technological matter; otherwise, the technology would be neglected. Thus T-A would lose pertinence and meaning. In other words, never lost the focus on the technology that you want to assess. It is effortless to get distracted with so many humans' factors around you in this kind of research.

2. What is the legitimate and responsible way to support empirical evidence? You may be aware that it is understandable that dialogue, narratives, and people´s life cannot be tracked so easily, and you can be overwhelmed with so many information. What is relevant? What is not? That place all the responsibility in the name, the professionalism, ethics and trust of the researcher, and sometimes you experience gives you the sensitivity to do so. This issue is one of the critics of AR receive from the academic's standards. Nils Thorsen and Tom Børsen in his reflections about action research, discuss that "ethical aspects and value considerations come into play as well." (Børsen & Thorsen, 2019). Before starting a project, the researcher must convey with supervisors and colleagues what are factors that represent quality in the Action Research project and what the procedures to collect and expose the empirical evidence of the intervention is. Stringency should not be optional.

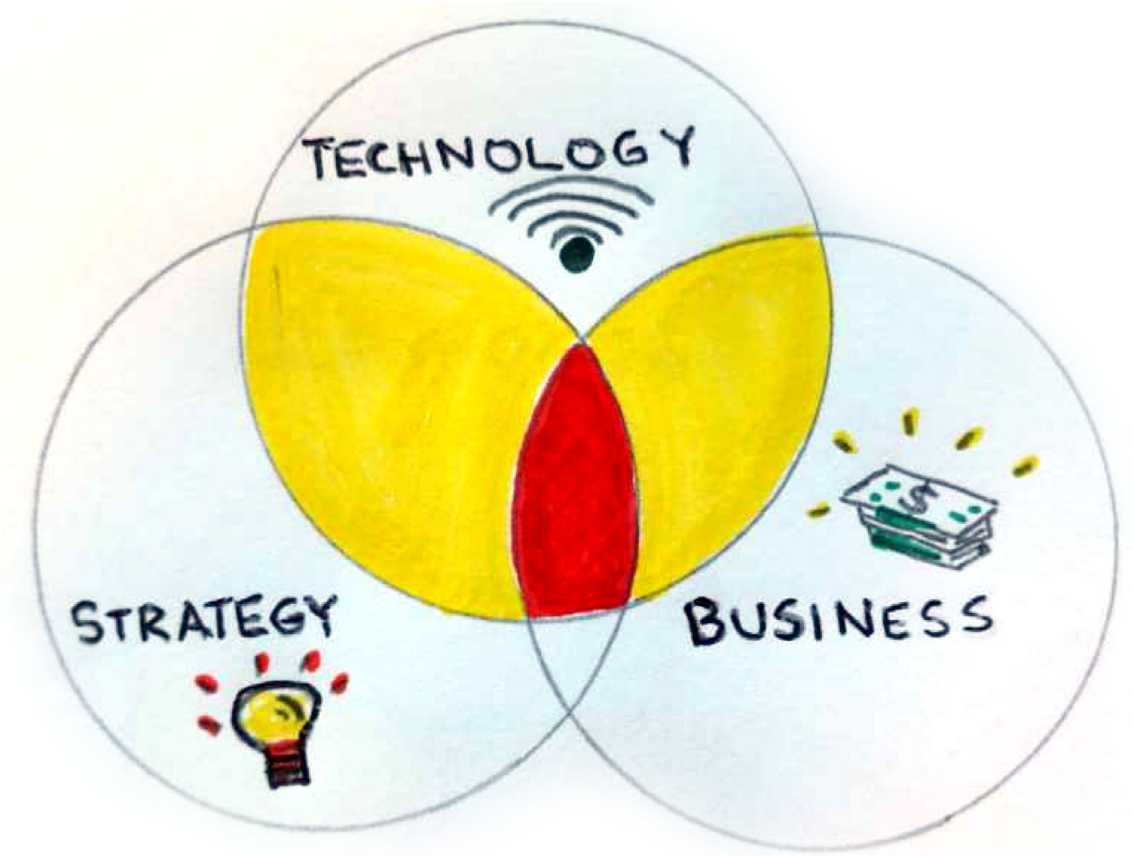
T-A should adopt action research as the hands, the determination and inspiration a T-A researcher can use to strengthen in practice the power of the theories and method from our T-A repertoire.

Techno-Anthropologist in the Organizations

I want to open another discussion concern where should be situated in the organisations a techno-anthropologist. I have some ideas, but I think this requires further analysis and perhaps it might need a multidisciplinary discussion.

Considering three institutional dimensions from the organisational architecture, Strategy, Business and Technology and the relations between them, I am sure that a techno-Anthropologist can be bridging the ties between the Strategy and the Technology and between the Business and the technology. The next figure can explain my point of view. The area highlighted in yellow, in my opinion, should be the natural environment for the T-A practitioner in the organizations, but I also want to challenge a future discussion thinking what should be the skills and competencies missing in our students, such as projects management and conflict resolutions, to be able to participate with pertinence and relevance in the red area indicated in the figure. I want to believe that this is the path we need to take, aiming to improve the employability of our professionals.

Figure 22. Organisational dimensions and space suggested for a Techno-Anthropologist.



Source. Developed by the author inspired by previous experiences with IT management models such as IT4+ (https://www.facebook.com/it4plus/) and the Colombian ICT ministry (https://www.mintic.gov.co/gestionti/615/w3-property-value-6204.html)

10 PERSPECTIVATION

Looking in perspective for future research, and after having enjoyed my process as a researcher focused in action, I have some suggestions in which I would like to collaborate hopefully soon within AAU :

1. The first exploratory research could be identifying if organisations such as DANIDA and other private funds that become donors for development aid projects have room in their budgets for funding studies for contextualization or re-contextualization as a foundational work before implementing future projects.
2. We need to encourage our students both from bachelor and master and some teachers to write academic papers and participate in events relevant to our studies. Action Research recent projects could be a good starting point for that.
3. Another exciting field to research is to explore similar projects that highlight or speak up about related issues with development aids projects.
4. It is necessary to design and implement a T-A Action Research Lab, sponsored by AAU, in which we can train, challenge and have a direct contact with local NGOs that need support; newly oxygenated blood (energy); and brains with ideas and methods, to face their institutional and global challenges. It could be a greenhouse for implanting the seed and grow the new generation of Techno-Anthropology Project managers that NGO ´s would need shortly.

CONCLUSIONS

Research question formulated:

How can an NGO develop a sustainable model for engaging and empowering small-scale gold miners´ communities in the adoption of a Mercury-Free Method?

With this project I could evidence that despite it was not possible to witness the miners' emancipation before I finished this Master ´s thesis, one of the aims of this project was to contribute in the analysis and consciousness that needs to start within the NGO in two appearances:

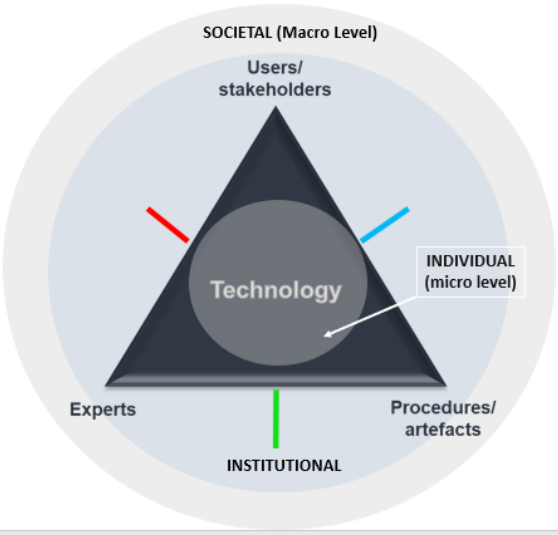
1. Paying more attention in the early stages, to discover the real need of the community, to develop new discourses in communion with the locals; and to the attitude and critical consciousness once in the field, taking care not to configure more factors that generate more oppression.
2. The NGO need to re-think their position towards the miners and balance their interventions between the technical and the social point of view. Furthermore, this change needs to be done in the institutional level of the NGO; if they want to affect the macro level, it means in the Society as is stated in the vision of most NGOs

With these two considerations, based on the evidence of this master's thesis, I genuinely believe that it can contribute in the development of a sustainable model that is mentioned in the research question, but I think it relies on their autonomous decision.

On the other hand, I consider that the whole situation I was evaluating with this project, may contribute in general in projects that involve Action Research in combination with development aid initiative. Likewise, the main conclusion the researcher needs to be aware

of is that the projects need to be allocated at the institutional level as is mentioned in the T-A model. The main reason is that the impact of the intervention will modify the organisational inertia in the communities affected (miners in my case). It means that permanent changes need to be implemented, accepted and promoted at this level in the communities. Developing supportive networks among users (citizens, miners, oppressed, Marginalized) would reinforce their collective agreements. The change can be promoted from an individual level, but if they want to stabilise it, is the institutional support that can legitimate that effort.

Figure 24. Models at T-A. Example of a project situated at the institutional level.



Source. Author´s adaptation from the original version shown by Tom Børsen in the first international encounter of Techno-Anthropologist in Barcelona Spain 2018

Finally, I could evidence and conclude that working WITH communities requires an individual consciousness that I call "the armour". The armour should have four layers that I wanted to propose as essential to protect the researcher from the inherent risk she faces in Action Research or developing aid projects. Those layers are Critical proximity, Cultural Values, Responsibility and Ethical judgement and Sustainability. I believe that it can be used for a new Human-Technology revolution far away from weapons.

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Empirical Data References:

[A] Observations on site

[B] Dialogue with miners in Colombia

[C] Dialogue with miners in Uganda

[D] Dialogue with miners´ leaders in Tiira-Uganda

[E] Dialogue with other stakeholders from Tiira-Uganda

[F] Dialogue with experts (NGO+Philippines Miners)

[G] Working activities with miners

[H] Modelling based on dialogue with experts / miners

[I] Photo or video recording

[J] Phone conversation- WhatsApp interaction

[K] Email interaction

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