Overview of colloquium on the topic:
"With households: A trans-disciplinary approach"
And further reflection on some of the questions that were asked

Presented by
Attie van Niekerk
Nova Institute

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On 27 March 2018 Dr Attie van Niekerk of the Nova Institute (link: www.nova.org.za) talked at an ISTP colloquium on the topic: *"With households:* **A trans-diciplinary approach."**

This document contains an overview of the talk as well as further reflection on some of the questions that were asked.

1 Case study

The Brickstar project is a good example of Nova's idea of working *with* households.

Residents will only use any given technical solution to a problem such as unsustainable wood use when it functions within a domestic practice and has become part of the daily way of living. That can only be achieved if the household members develop such a solution themselves, and that does not happen if we, as people from outside the community, work with the households to design a tailor-made solution.

In 2010, when Nova started to develop a more efficient cook stove for wood use in rural areas, we took note of a large number of stoves that were produced and sold worldwide. We selected six stoves that were representative of the most important available models, and asked a group of about twenty residents of Molati, a rural village in the Limpopo province, to use and evaluate the stoves. They did that, and it appeared that none of the stoves complied with their requirements.

Somewhere during Nova and the group's discussions of the pros and cons of each stove the idea started to emerge in the group that they can build a stove for themselves according to their own requirements, using materials that are locally available (e.g. cow dung, clay and water) and skills that people use regularly to build their own homes. That is an important moment in co-creating a solution: when the residents "see" the idea of something, in this case an improved stove, as a possibility for themselves, so that they begin to design ways in which this idea could work in their context. When that happens, it is an indication to us that we are on the right track.

We designed the stove together, providing technical guidance from our side. Initially, five different prototypes of the locally built stove were designed together and implemented in different households. These were then tested and developed towards a final prototype that forms part of a domestic practice. This milepost was achieved after two years, towards the end of 2011.

In 2012 - 2014, we focused on developing a business plan. That involved a lot of work: to qualify for generating Gold Standard carbon credits we had to develop ways to monitor the continued used of the stove in the future and ways to measure the savings in wood and the reduction of the emission of greenhouse gasses. We performed various tests such as a water-boiling test and a kitchen performance test. We experiment with alternative materials for building the stove. We had to ensure quality control during implementation and during the life cycle of the stove. We experimented, with some households, in mini-pilot projects in order to find ways to take the project to thousands of households, in order to determine who will do what, who will pay for what, etc. We had to determine what it would cost in order to develop a business case and a business plan.

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We discovered that most the first group of 40 households continued to use the open fire, because the three-legged cast iron pot remains popular. After the stove was modified so that the three-legged cast iron pot could be placed on it, the usage-rate improved and the use of the open fire was almost completely phased out among people who have a stove.

In this way, Nova and the households worked together to design a stove that is well integrated into the dynamics of the local households and to develop ways to take this stove to scale. That started in 2015, and after some complications were sorted out, the process has been running smoothly.

By early 2018 the stove has been taken to more than 5 000 households, not by selling stoves as products, but by community projects where people were assisted to build their own stoves, use them and maintain them on their own.

Up to this point, we have been funded by way of grants from *Kerk in Actie*, an office of the Protestant Church in the Netherlands, and EEP. To take it to a larger scale a different type of funding is needed, and we are developing and evaluating a model to do so in 2018 and 2019.

2 Levels of use

In the discussion after the ISTP, talk there was a question about the levels of use.

Approximately 25% of all cooking in the area where the stove has been implemented still involves open-fire cooking.

One year after building the stoves, the level of use of 2 085 stoves was monitored. The result is as follows:

Broken stoves: 159
Deteriorating stoves: 286
Moderate condition: 832
Good condition: 786
Excellent condition: 22
Total: 2085

We regard the first two categories as "lost stoves" (total: 445 stoves = 21%) and the last three as "functioning stoves" (79%).

	Totals	Percentage
Total_functioning_stoves	**1640**	**79%**
Total_stoves_lost	**445**	**21%**

There is a correlation between using the stove and maintaining the stove:

Regularity of maintaining the stove:	Condition of stove						Grand Total
	Undefined	Broken	Deteriorating	Excellent	Good	Moderate	
Every second day	5			1			6
Less than once a week		1	1		11	5	18
Once a month	14	6	27		38	58	143
Once a week	35	5	24	3	85	86	238
Never been used	101	103	36	6	102	77	425
More than once per day	207	22	87	4	218	319	857
Once per day	129	22	111	8	332	287	889
Grand Total	**491**	**159**	**286**	**22**	**786**	**832**	**2576**

3 SDG benefits

The stove provides benefits regarding nine of the 17 SDG's:

Figure 1: Nine of the 17 SDG's the stove provides

4 Trans-disciplinarily

The Brickstar stove was developed by way of a transdisciplinary approach. In the following section, we reflect on this approach.

- Trans-disciplinarity is a suitable approach to complex problems (see 7 below)
- Trans-disciplinarity involves researchers and practitioners/people in the situation; Klein (2001)[1] says: "The core idea of trans-disciplinarity is different academic disciplines working jointly with practitioners to solve a real-world problem
- Multi-disciplinary and inter-disciplinary research both produce texts that must be approved by other academics, while trans-disciplinarity produces solutions that must be approved and used by their practitioners; publications can be a spin-off

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[1] Klein, JT, 2001, Transdisciplinarity: joint problem solving among science, technology and society, Synthesebücher, SPP Environment, Basel, Birkhäuser Verlag.

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5 Trans-disciplinarity in practice

Nova's focus is on working with households to find ways (practices, products, processes) to improve their quality of life. For us, the trans-disciplinary process includes the following steps:

5.1. Step 1 is to determine the gap or dissonance between researchers and the research context – in our case households, e.g.:

- The academic world is characterized by specialization (tree of knowledge); it tends to be centrifugal: specialist fields move away from each other
- The "tree of knowledge" is an old concept but it is still common, e.g. Jacob Lehman's *how universities evolved tree-like structures* (2015)

Figure 2: The tree of knowledge (Photo by Adarsh Kummur on Unsplash)

- The household has a different structure:
  - o Many factors that are sudied in many diverse academic disciplines have an impact on the household (arrows moving inwards, centripetal)
  - o In the household they meet, interact and combine to form the household as it is (arrows going sideways)
  - o The household also has an impact on the world around it (arrows moving outwards, centrifugal)
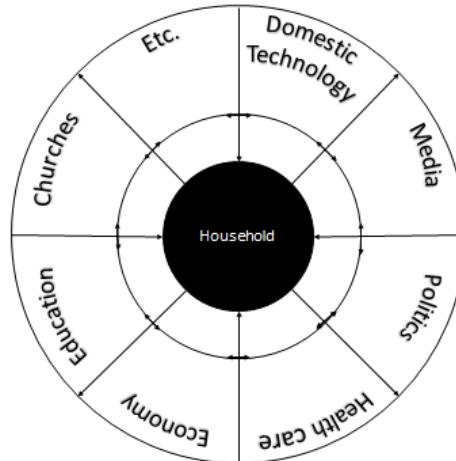
- The centripetal impact of households is very powerful, e.g. Eskom, South Africa's national electricity provider, struggles to survive because many household do not pay for their electricity, *inter alia* making use of illegal connections:

- Households are also vulnerable: Between 1994 and 2002 service cut-offs for non-payment for both water and electricity were just under 10 million: 7.5 million people had experienced both[2]; it is uncertain what the psychological impact of service cut-offs is on residents

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[2] David A McDonald, 2002 in a report of the HSRC, *The Bell Tolls For Thee: Cost Recovery, Cut-offs, and the Affordability of Municipal Services in South Africa* pp. 12, 21

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5.2.   Step 2 is to bring the structure of the research team in line with the structure of the household by forming a team with researchers from different sectors that can interact with each other and with household members:
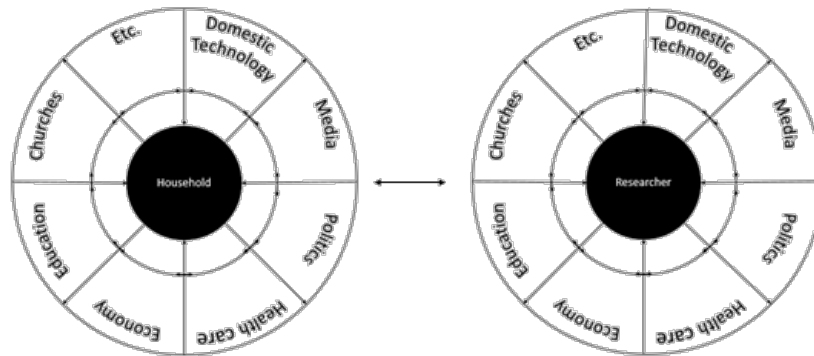
In the discussion after the presentation there were some questions that I would like to address again. They were:

- What did the reading of Heidegger contribute to the design process?
- What was the interaction between researchers in the trans-disciplinary process?
- What was the impact or the role of culture in the design process?

The first two questions are answered shortly in point six below and the third question in point 7.

6 Heidegger's influence and the interaction between researchers in Nova's trans-disciplinary process

In a previous project, we brought together two engineers, a theologian (myself) and a staff member, Riaan Ingram, who had studied theology but was doing his PhD in Philosophy at the time. Our task was to design a domestic biogas digester for low-income households in the South African context. The idea was that the two engineers would provide the technical expertise and the other two would explain the cultural background and the needs and requirements of the households, by consulting with households. The information from different sides would then be integrated *in the group discussion, through consensus.*

The process did not proceed well. Riaan concluded that the design cannot be constructed synthetically by bringing elements from different sides together that are then integrated *in the group* through interaction with each other.

Using insights from Heidegger, he said that the biogas digester can be seen as a phenomenon in a Platonic sense: it is still only an idea. It is a concept that we can theorise about.

For the idea to become a useful tool in a given context there must first be an *Ereignis,* that is, somebody must see this idea as a possibility for a specific context where people live every day. In addition, no *researcher* can see the final phenomenon*: the people who live in that context every day must see it as a possibility for themselves. Ereigness* means that it appears to them, it is disclosed to them, they make it their own. Nevertheless, the researcher has an important role to play to bring the idea to the people.

What happened then?

Before the *people* in the context can "see" it, a r*esearcher* may have to "see" something.

Riaan took the first step: he often visited the community in a nearby township, he studied the biogas technology, he visited biogas projects in the region (South Africa and Namibia), he studied previous biogas digester projects, e.g. in Nepal, and came to the conclusion that building the digester in the usual way in a factory with expensive materials, and then constructing a funding scheme to implement it, would not be sustainable without external support. To make it sustainable for the household itself, the household members must see it as something that they can build and maintain with the knowledge, materials and funds available in their daily context.

The digester, the product itself, the technology must not be seen as a given. The conditions in the community must be seen as a given and the technology must be designed to fit into that context.

As he gained more and more information, Riaan began to understand or see the idea of a biogas digester as a possibility for the specific context, namely, the context where the people for whom the digester is meant live every day.

It came together *in his head*. At this stage it was still theory, but it began to be *vorhanden (*present-at-hand), something that can be discussed and thought about.

Riaan then got a group of about five jobless people from the nearby township together. He told them about the concept. He asked them to help him to build one; making use of the materials, knowledge and money, they have available in their own context. For over a year, they met every day, experimenting with various ideas. He worked with them but took the lead. He consulted them and used their ideas.

One day he phoned me, very excited. The group from the community had taken the lead; *they* now consulted *him* when they needed advice on something. At some stage, they had seen this idea of a biogas digester as *a possibility for themselves* in their context, and were motivated to make it a reality. They started to build a digester with the materials and the knowledge from their own context. From time to time, they consulted Riaan, and he assisted as and when they asked.

In the end, they built a working digester. It was a big step forward. Some aspects of the digester were indigenised in the context of the township: cost, materials, and the techniques to build and maintain it. They saw it as a possibility to dig the hole for the digester, to build the digester, and maintain it.

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However, it was still *vorhanden (*present-at-hand), something to observe and theorise about, not something that was ready for use.

The process became stuck at the next phase. The aspects that were not indigenised were the following: the residents did not (yet) see replacing some of the present sources of energy with biogas as a possibility for themselves; neither did they see the possibility of ensuring a continuous flow of feedstock. There was also still much work to be done to connect the digester to the appliances in the house. All these are necessary before the biogas technology can become part of a domestic practice.

However, the funding for the project ran out before the next stage could commence. The digester was a partly-developed product, not yet a practice. It will only be a *griffbereit, zuhanden, Zuhandenheit* ("readiness-to-hand, handiness") when it has been integrated into a domestic practice will it, meaning, something that people can use in their daily context, something that they are used to and find useful.

Nova's research team also did not see this possibility for a biogas practice in the urban domestic context. However, Riaan visited a man in another province who lived in an area where there was no sanitation. He had a conventional biogas digester with a toilet on top. He invited all people in the street to use the toilet, and so got free energy for himself. Since this practice had made the technology *griffbereit, zuhanden, Zuhandenheit* ("readiness-to-hand, handiness") on the street level in that context, we would have liked to investigate it in our context, but without funding, we did not see the possibility of doing so. Other projects became a priority and it has not been followed up.

However, the insights and procedures we gained in this project became the basis for the method we used in the design of the Brickstar stove, and this time it worked. The stove is not as big and complicated as the biogas digester.

This does not mean that all trans-disciplinary process must follow the same procedure. It does not mean, for example, that the information from different sides would *never* be integrated *in the group discussion, through consensus,* or that technology or artefact may *never* be produced in a factory*.* That depends on different conditions. However, the insights of Heidegger proved valuable in the process of trans-disciplinary research.

7 An example of the role of culture in the design process

Another question that was asked during the discussion was what the impact of culture was in our project.

That is a huge and difficult topic and one does not know where to begin. As a small case study, some information is given about the way culture has influenced the way we approached the role of the stove in the context of the household.

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In 1997 Nova could include 12 questions in a survey among 500 urbanised residents. The results were as follows:

Question	Don't know	Not at all	Agree a little	Agree a lot
A fire or coal stove in the home brings and keeps my family together	1.6%	7.4%	10,6%	80.4%
It is better to live in a zinc house/shack than a traditional hut	5.4%	43.9	14.6%	37.0%
In our household we depend on our ancestors for our good fortune	6.0%	27.6%	16.6%	49.8%
Fire brings us in contact with our ancestors	23.4%	24.2%	20.0%	32.4%
Fire increases fertility	33.4%	23.8%	15.3%	26.8%
Fire can harm an unborn child	31.6%	22.0%	13.4%	33.0%
Fire is necessary to cleanse society of evil and of evil people	28.4%	26.2%	21.0%	24.0%
Fire causes smoke that makes us sick	3.4%	4.2%	8.8%	83.6%
Electricity increases the danger of lightning striking the house	26.8%	26.2%	11.0%	36.0%
I believe that if fire burns with a blue flame it is bad for your health	16.8%	6.2%	9.8%	67.2%
People who succeed/get rich often only do so because of witchcraft	30.6%	42.0%	10.4%	17.0%
A good funeral is essential as it prevents the deceased from harming family who remain behind	10.4%	27.4%	31.2%	31.0%

The first question, about the importance of the stove in bringing the family together, is part of a wider cultural pattern in which the symbol (in Jung's terms, the archetype) of the mother plays an important

role. Some call the stove "Big Mama" or "Big black Mama". In the South African context the mother is very prominent as the one who keeps the family together. In the urbanisation process the unity of the family is threatened: by urban family is removed from the traditional extended family; family members go out by day and experience diverse influences; some are bruised by conflicts or not finding a job. But in the evening in the kitchen the mother gives food to the family, it is warm, they all share together.

The symbol of the *mother,* also mother earth, is very prominent in Sub-Saharan Africa. Cartey (1969:3) called the symbol of mother and earth, the earth of Africa, perhaps the most dominant motif throughout modern African literature at the time. In an anthology of African poetry, jointly edited by Leopold Senghor of Senegal and Aimé Césaire of Martinique, the "chief celebrant is the Black Woman, the Earth Mother, the anthropomorphic symbol of primal sensuality" (Awoonor 1976:155). In the liberation struggle literature from Alexandra and Soweto in the 1970's, the mother predominated as a source of love and affection, of rebirth and inspiration.

The importance of the stove in bringing the family together in urban areas influenced us to develop a technique to have a clean burning coal fire rather than to switch over to only electricity. That was very successful because we did so with residents and the input of a certain grandmother brought about the breakthrough at a given moment; we generated more than 200 000 Gold Standard VERs from implementing this technique.

The image that emerges from the present research in urban areas, about 20 years later, is that the stove has become less prominent, while TV has become very prominent. In some families the children watch TV without their parents, while in some families the whole family watches TV together. A large number of women in some of the townships where we did surveys clean out the house in the morning, send their children to school, and sit in front of the TV until the children come back. Often they will then watch TV together with their families. The impact that this will have on family relations, values, and ways of thinking still has to be seen.

In the rural areas where the Brickstar project is, we tested the importance of a modern image for the stove, but that was not important for the residents. They still have the tradition of smearing their flours with cow dung every week, and they also do so with the stove. That is the way the stove is maintained. Younger people said that they were very glad to be part of the building of the stove, because in the process they picked up some traditional skills that they did not know.

Addendum: Key ideas of Nova (from modern African literature and experience of 16 years in the African context):

- Respect the community and work with them
- There is a gap between the assumptions of those outside the community and perceptions and dynamics within the households. The result is failure of development projects in Africa
- In Africa, the household is the only institution that takes significant care of people in need

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- Dysfunctional household systems are at the core of many dilemmas in Africa, including crime, air pollution and soil erosion
- Nova develops domestic practices, not products, with households; a domestic practice combines artefacts, social roles and consumer products in a characteristic pattern, to satisfy one or more fundamental needs
- Developing domestic practices requires the combination of technological innovation and social innovation
- A healthy household culture must grow from within but needs inputs from outside parties
- There is a difference between complicated and complex
    - An airplane is complicated but all the parts function as they should and can be controlled
    - In a complex system or process different factors interact and combine, and the outcome cannot be controlled, but you can navigate your way and innovate; combinations can be destructive or constructive
- Where two factors combine, you often get a predictable outcome, like two colours that produce a spectrum:

- Where more than two factors combine, you get an unpredictable outcome, like the so-called Newton's method in four cases where $x^4-1=0$:

8 Step-by step implementation of a trans-disciplinary project:

- Establish project in a specific place and community to address a real-world problem
- Find residents who are interested, available, and have insight
- Determine disciplines that should be involved
- Meet regularly with residents and in different groups, in context and outside
- Come to a common understanding of the problem (very important)
- Identify both the assets in the community and ideas from outside
- Brainstorm possible solutions
- Implement the most promising ones on a small scale
- Evaluate, redesign and iterate them until you have one that works in one or more households

9 Nova Phased Approach R&D and Implementation: