Rhizomatica -
High Frequency Emergency and Rural Multimedia Exchange System (HERMES)

ORGANISATION
Rhizomatica

LOCATION
Americas

INNOVATION SPECTRUM
Digital equity

MATURITY LEVEL
Emerging

The organisation

[Rhizomatica](#) works globally using new information and communication technologies to support communities in building and maintaining self-governed and self-owned communication infrastructure. The works with communities to provide them with the knowledge and tools to build their own communication networks through open source technology. Rhizomatica takes a two-pronged approach to ensure communities are well supported - through its technological expertise and necessary policy and advocacy work.

The big idea

The High Frequency Emergency and Rural Multimedia Exchange System (HERMES) is technology that aims to address the communication challenges of isolated communities across Latin America where indigenous populations have limited access to telecommunications infrastructure.

HERMES is a digital information platform that enables information such as files, emails and chats between two points over High Frequency (HF) radio. The system provides stable and accessible communication in rural and remote places with no Internet access due to either a lack of infrastructure or the effects of disasters.

The challenge and the power dynamics of the system

The rise of Internet connectivity and mobile phones has seen the digital divide widen as governments and commercial operators invest heavily in urban areas, while rural and isolated areas are often left behind in communication services. The result is slow or non-existent infrastructure for communities that are located far from economic centres. In the Latin American rural Amazon, Internet usage is only at 3% through limited satellite base access. This creates communication siloes that adversely affect the people living there. For example, when trying to coordinate emergency relief services during the COVID-19 pandemic, the heavy rains and floods typical of the forest environment destabilised the already limited Internet connection. Adversely, during dry seasons, traditional communication routes are often halted as the river dries up. The remote communities in this area have long depended on radio communication, but before the HERMES platform, only real-time voice messages could be transmitted via HF radio.

The policy and regulatory environment around connectivity also does not work to serve these communities. While licences to get frequencies may seem relatively affordable at US$250 per year, there is a complicated bureaucratic process around acquiring them. Engaging these administrative bodies is critical to developing a people-centred narrative for community networks and conducive regulatory frameworks which enable them to develop and grow. Rhizomatica works with telecommunication regulators in Latin America to provide communities with the necessary licences they require.

Additionally, isolated regions not only experience a lack of decent communication infrastructure but are also prone to dangerous activities such as illegal mining, logging, deforestation and violence against indigenous communities. This is particularly true in the Brazilian Amazon rainforest where Rhizomatica works with communities. Indigenous monitors work to surveil activity and relay information about what is going on in the forest which can be a risky undertaking. Previously, the only mode of communication was through analogue radios which are prone to eavesdropping as the network is not secure. So there has been a strong need for not only reliable communication but also safe and private channels.

Intervening in the power dynamics

Rhizomatica, through the HERMES platform, works to address this critical communication need and digital equity and security gap for excluded communities. In these areas, the required technology for stable Internet connectivity can be a heavy burden to overcome. Satellite connections are not only expensive to install, but there are also monthly rental costs due to commercial providers. In other cases, the lack of foundational infrastructure is a significant barrier, for example installing terrestrial connections is not possible in areas without electricity.

The HERMES platform is not only cheaper but also builds on the tools that communities have been working with for a long time. Communities working with Rhizomatica have been eager for this intervention as HF radios are not new to the region, but the options made possible by the platform are. Previously, only voice messages could be transmitted and with limited security. Now, multiple forms of media can be sent securely through digital transmissions via radio, such as emails, pictures, and GPS information. This includes information and insights which can help support territorial protection insights, like pictures of illegal logging or mining, important trees and wildlife, which can be sent quickly through HERMES to other organisations also working to protect the rainforest, such as WWF, a partner of Rhizomatica.

The HERMES platform offers three common communication scenarios:

1. Community to Community
Here, digital files can accompany voice messages via HF radio. A person in one community can send a message or image to a person in another community who only needs to log into the HERMES platform on their radio to access the information. Secondly, the messages can be sent to a public bulletin board. As this communication is going to a wider audience, there needs to be a vetting process. This can be done via administrators either where the information is sent from or where it is received.

During the pandemic, public bulletin messages allowed communities to receive and share information about the virus, how it spread and mitigation measures. HERMES served as a lifeline, keeping people informed as they remained physically isolated.

2. Community to Base

Here, a base is the office of an NGO or national entity that allows information to pass through to many communities with communication happening in both directions. For example, multiple communities can send encrypted monitoring information that can be dispersed to national authorities or the wider public. In the reverse case, the base can relay broadcast alerts to communities in emergency scenarios, such as COVID-19 restrictions or forest fires, etc. The information can then be received by the HERMES administrator and shared with residents.

3. Community to Base to Internet… and back!

There is also the option to send information and communicate with the wider world via the Internet. Here, users have an HF radio connected to the HERMES platform in a location with Internet - this may be a city or regional town with satellite connectivity. A chat interface called DeltaChat can be used which functions similarly to WhatsApp. Information comes in from a community to a base where it is automatically sent to the Internet. From there, the message will reach a Rhizomatica data centre with an email server and be transferred to the final recipient in email or SMS form.

There is also an additional fuctions for information retrieval, like news about a region or market prices of the goods produced by communities, where a community can send a word or phrase to a search engine and the corresponding information will be sent back after a while to the user community or individual, much like the early versions of mobile Internet search functions.

" Think about autonomy… because it's good for us to have a network that we can control. „

RAFAEL DINIZ, LEAD DEVELOPER AND PROJECT MANAGER (HERMES) WITH RHIZOMATICA

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Aspects underpinning innovation

HERMES is a low-cost, easy-to-use system that provides essential communication opportunities to communities that have limited options. HF radio has largely been viewed as an outdated mode of communication, a 'forgotten' technology where there has been little to no effort to develop it further for modern day use. The Rhizomatica team has taken on this challenge in order to provide isolated communities with a communication system they can oversee and use to send encrypted digital messages. This aspect of privacy adds a layer of safety for people working in risky contexts, as mentioned above.

Innovation efforts often tend towards introducing 'the new', especially when it comes to technology, but this is an excellent case where the innovation applies to the novel and original application of old, but tried and tested, technology already in widespread use in many communities around the world. It brings digital choice, control and safety whilst still using familiar, uncomplicated and reliable technology.

The Rhizomatica team was rewarded for their ingenuity in 2017 when they won the Mozilla and National Science Foundation [Wirless Innovation for a Networked Society (NSF-WINS) challenge](). NSF-WINS was launched to address the staggering number of Americans lacking consistent, high-quality internet access. The aim was to get internet connectivity into rural areas, disaster-struck regions and other offline or underserved areas.

Rhizomatica was awarded $400,000 due to the affordability and scalability of the HERMES network plus the ingenuity of using GSM and shortwave radio to enable local calling, SMS and OTT messaging all via equipment that fits into two suitcases!

Impact and influence

A large-scale test of the HERMES platform was performed in Brazil with rural trading outposts along the Amazon River, where communication can stagnate in the dry season. In places where people were previously only able to use radio to communicate over short distances with voice messages, HERMES has now extended the transmission coverage area to a range of 800 to 1,000 kilometres. Additionally, through encryption, HERMES allows communities and people to send secure messages where voice over radio lacked privacy. This test was conducted during the COVID-19 pandemic when inter-community communication and the exchange of information became especially critical to isolated areas and many communities reached out to Rhizomatica. The need for this innovation was clear with the urgency for rural and isolated communities to be able to communicate with each other and national health entities in order to coordinate relief services. In turn, this provided an opportunity for the organisation to assist these communities in becoming autonomous in their connections and communications.

This work has also been a research project in terms of confirming feasibility of the approach, and as a result, Rhizomatica launched it in specific communities and has used metadata to track if the system is being used. Logs are used to monitor how many emails per day are being exchanged, how many contain images and how many direct messages are exchanged when emails cannot be sent.

Key takeaways

1. When working with isolated communities, it is important to think outside of the box and away from the technology available in urban areas/cities. Useful solutions may not be what works in areas that have better infrastructure and connectivity options.

2. It is crucial to understand the needs of the communities you intend to serve to be able to envision what will work best for them. Think of digital communication formats that use less data, yet still transmit a variety of messages effectively.

3. Rural and isolated communities are disconnected to state powers in more ways than one and autonomy can be critical. When setting up communication networks, try to devise options where the community can directly control the system without needing to involve commercial providers or national entities.

The next 5+ years...

Currently, Rhizomatica is the sole provider of equipment, training and support for the HERMES system. As uptake and interest in Ecuador and Brazil grows, the team is looking to outsource production to a large-scale manufacturer in the region, as they lack the manufacturing capacity to meet the demands of all interested parties. In the next few years, Rhizomatica will continue to work on developing a wideband option of HERMES that allows more data to pass along its channels. The organisation continues to explore ways to build high quality hardware that is able to meet demand at reasonable pricing. HF radios can provide further messaging options beyond emails and allow communities to opt in to which services they want, such as instant messaging. In this way, they not only have greater choice, but also control, over how and what they communicate.

As Rafael Diniz, Lead Developer and Project Manager (HERMES) with Rhizomatica explains: "This is the dream – to make the system, to develop it and to have wide-spread adoption...If we can scale up to certified equipment to meet all regulations, that would be wonderful."

There has been wider interest in HERMES from people working in high conflict zones and exchanging sensitive information, in places like South East Asia. As the system does not need information to pass through the Internet, messages are indecipherable. However, the team wants to first fully consolidate use of the system in Latin America - where Rhizomatica primarily works - before it is deployed to other parts of the world.

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