RTD2015

21ST CENTURY MAKERS AND MATERIALITIES

Proceedings of the 2nd Biennial

Research Through Design Conference | RTD 2015

Trojans & Drones: Materializing possibilities for transforming industrial infrastructures

**Lorenzo Davoli, Heather Wiltse
and Johan Redström**

Umeå Institute of Design, Umeå University
Umeå, Sweden
{lorenzo.davoli; heather.wiltse; johan.redström}@dh.umu.se

Abstract: Emerging post-industrial societal needs require the evolution of existing networks of industrial infrastructures toward more distributed and citizen-centered configurations. This opens up new questions regarding what design processes and practices are necessary to effect change within these systems that are often deliberately not accessible and open for design interventions. We here present a set of design explorations in tracing and materializing infrastructures in order to make them available for design and participation, taking logistic services in a remote rural area of northern Sweden as a case study and field site. A design concept consisting of a drone and drone postbox were used to speculate about the possibility of a community-owned delivery network operated by drones in synergy with existing infrastructures. We used these artifacts in staging participatory processes of imagination and experimentation in order to explore possible future configurations. The project provides an example of a possible framework for initiating and curating the transformation of industrial systems towards more open and locally adaptive forms and functions.

In particular, it illustrates the rich potential and opportunities for design when it comes to ways of knowing and designing with the infra-structural—that which is usually hidden beneath the surface.

Keywords: Drones; Logistics; Infrastructures; Fieldwork; Service Design; Speculative Design.

Davoli, Wiltse and Redström | *Trojans & Drones*

Introduction

In a remote and sparsely populated area of the northern Swedish countryside, a drone flies for tens of kilometers over forests, fields, and lakes before finally coming to rest on a partially enclosed platform. In the center of the platform is an opening into the large box below, and into this the drone drops the package it has been carrying.

After resting here in this drone-sized version of a red Swedish shed for a while to recharge, the drone takes off to make a pickup from a small local business before returning to the region's largest village.

Meanwhile, the recipient of the first package goes to retrieve it from the drone postbox in his garden after receiving an automated text message notifying him that it has arrived.

This drone and drone postbox, and others like them, together constitute a distributed, community-owned delivery infrastructure. A citizen becomes a node in this mesh network by placing a drone postbox on her property. The drones pick up goods from local logistic nodes, usually convenience stores located in the bigger villages in the area, and deliver them to recipients in more remote areas via the drone postboxes. When the distance to a particular destination becomes prohibitive in terms of battery capacity, drones can stop at any postbox within the network that is on the

way to recharge and hand off the package to another drone to complete the delivery. By placing a drone postbox on their property citizens help not only themselves through enabling this much easier method of receiving packages but also everyone else in the community who relies on the service.

However, this logistic network does not actually exist (yet): it is currently only a speculative design concept collectively imagined by design researchers and members of the small community of Floda in northern Sweden, using a small drone and drone postbox prototype as props. It is part of a broader design enquiry and exploration aimed at understanding how transitions to more open, adaptive, and citizen-centered forms and processes might be catalyzed within existing industrial infrastructures (cf. Morelli 2007). The abysmal level of logistic service experienced by the residents of Floda, as well as the rather unique conditions presented by this remote context, provided an interesting field site for exploring current challenges and opportunities in relation to logistic infrastructure. It also provided a concrete case study that allowed us to consider how logistic networks might respond to local needs.

Figure 1. The drone flies in the studio over a projected contryside landscape, Davoli & Redström.

Figures 2, 3, 4. Simulation of possible service scenarios in the studio, Davoli & Redström.
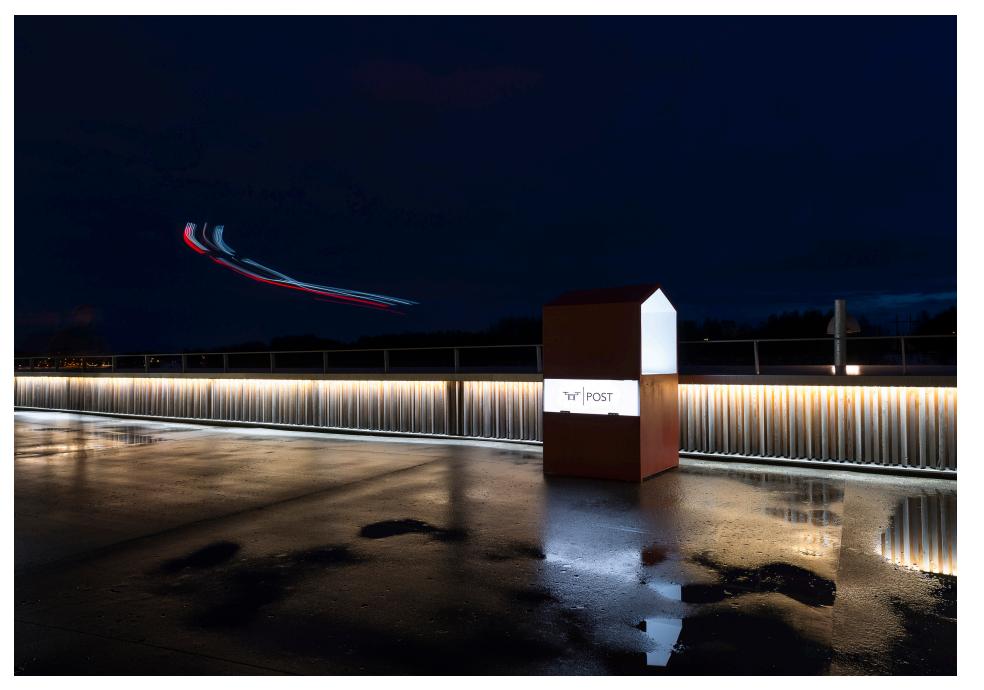
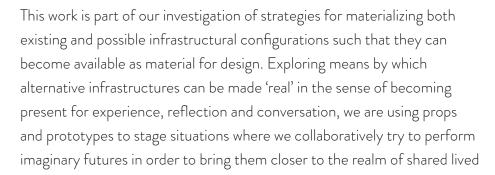*Figure 5. The Drone Postbox, Davoli & Redström.*

This work is part of our investigation of strategies for materializing both existing and possible infrastructural configurations such that they can become available as material for design. Exploring means by which alternative infrastructures can be made 'real' in the sense of becoming present for experience, reflection and conversation, we are using props and prototypes to stage situations where we collaboratively try to perform imaginary futures in order to bring them closer to the realm of shared lived experience. This approach shares several qualities related to participation with co-design and fieldwork interventions (cf. Halse et al. 2010; Sanders & Stappers 2014), but also with speculative design work where the 'experience' is primarily 'consumed' through exhibitions and media (Dunne & Raby 2013).

Materials

The process that led to the product service system concept described above started with explorations of how to make industrial infrastructures — networks not typically avail-able for this purpose — accessible as material for design and public participation (Davoli et al. 2014). Camera and GPS-equipped parcels named "Trojanboxes" were crafted and employed in a participatory hacking approach to trace and reveal the back-end operations of logistic networks. Once materialized and rendered available for design, new concepts and configurations were collaboratively conceived and discussed (Davoli & Redström 2014). A second stage followed where the material available for discussion was enriched by means of suggesting and staging new design possibilities. As a response to the results of this process, we created a speculative system of a local delivery service based on drones. A delivery drone and a drone postbox were prototyped and used to stage participatory processes of experimentation, initially in the studio and then later in the field.

Figure 6. A Trojanbox used in the first phase of the project.

To introduce the concept and process to the inhabitants of Floda, we prepared certain materials in addition to the drone and postbox prototypes. A Trojanbox and a collection of images were used to illustrate the project process and communicate what previously happened in the first phase: from videos and maps of the participatory hacking sessions to the staging of a service interaction storyboard in the studio. The scene of our staging in the field were the scattered houses along the sixteen kilometers stretch of road that connects Floda to Botsmark, the main village and most accessible logistic node of the area. The actual staging occurred on April 25th 2014 and went on from approximately 11am to 5pm. During the day, a local participant, Tommy, joined the research team, working with us as translator.

Wandering design encounters

Setting out from Floda we stopped home-by-home, engaging people by placing the big red postbox in their front yards and simulating the arrival of a parcel by flying the drone around their houses when possible. Eventually we stopped in front of the local convenience store that serves as logistic node in Botsmark. By the end of the day we had six encounters in total, which included engagement with both individuals and group, and people of different ages and cultural backgrounds. Each encounter lasted approximately forty minutes. These interactions raised a number of interesting themes, interpretations, and analogies.

Davoli, Wiltse and Redström

9

One dominant theme that emerged was the antithetical relationship between current urban-centric development of liberalized and global economies and local development (Graham & Marvin 2001).

Local economies and employment

Our first stop was at Floda31, the small architecture firm owned by Richard, one of the participants in the initial participatory hacking process whose challenges as a small business owner had also provided much of its motivation. Here we staged our first performance as a way to show Richard the results of our work and to introduce our translator, Tommy to the project, unloading the postbox from the cargo van and flying it around the house to evoke the idea of a package delivery. Richard watched approvingly from his balcony as the drone flew over the valley. It was a rather unusual sight but one that, for him, suggested the possibility of better logistic support for his own business and perhaps the inception of others in the area.

Tommy started to ask questions at this point, and in answering him we used the images and materials we brought to illustrate the motivations and process behind the concept. From the video snapshots captured by the trojanboxes he recognized some of his former colleagues from when he worked in the local post office of Vindeln, one of the main sorting centers for the area. Some time ago, the person he recognized in the images had migrated to Norway to work in a big sorting center close to Oslo. The

Figures 9, 10, 11. Local economies and employment, Davoli.

observation provoked reflection upon the lack of work opportunities for young people in the area who are therefore forced to move to bigger cities for employment. Tommy himself is in his twenties and unemployed and

empathized with the scenario. He saw the drone network as something that could generate work for him and other young people in the area, who could have the chance to do meaningful work for their community in supporting the drone network by maintaining and modifying the drones.

Industrial criteria and accessibility

Lutz, a retired network engineer from Germany, also brought up differences in accessibility between cities and countryside. He compared his current situation with what he was used to when living in Mannheim, saying that in Germany it is normal to have packages delivered to homes; and when people are not home, packages are left with neighbors. In Floda, he said, it was not so simple. After he looked at the results of our explorations with the trojanboxes, he claimed he often questioned the power of private companies to marginalize certain communities only because they are not big enough to be "a market." However, he also felt somewhat resigned about the possibility to change this power relation. In particular he found it ridiculous how inflexible and standardized the protocols of these logistic companies are. He told us how the last time he received something from DB Schenker (one of the main delivery firms operating in the area) it arrived at one of their main nodes in Tavelsjö, 46 kilomters away, so he asked if it was possible to send it to the closer node in Botsmark. To do this they first shipped the package back south to Stockholm. It finally arrived a week later after traveling more than 1200 kilometers because DB Schenker lacked the capability to transport it

locally for 20 kilometers. Lutz therefore could clearly see the advantages of a small public infrastructure like the one we suggested, as long as the technology is reliable and can provide some economic return to the community. He was also really concerned about technical issues, noting the small size of our drone and asking about how this would limit package size. In response we clarified the speculative intent of our work and also explained the numerous technical possibilities available that were not manifest in the small drone we had with us. At his invitation we finished our conversation inside over coffee before packing up and heading down the road to the next house.

Publicity and pre-industrial connectivity

Bo is a retired tractor driver who used to provide services such as cleaning roads from snow or plowing a field. His first reaction to the drone and the post box was to take a picture of it. He seemed very curious about what we were presenting, and thought carefully before expressing his thoughts. Initially he raised some concern about the trust and safety of the system. As a private person he wouldn't see any problem with it, he said, although he probably wouldn't send any gold that way! He also raised concerns about how public the system would be, and what would happen if his neighbors could see how much he received. However, he said that local maintenance and management of the system could limit misuse of the technology in relation to issues such as privacy.

Figures 12, 13, 14 (above). Industrial criteria and accessibility, Davoli.

Figures 15, 16, 17, 18, 19 (right). Publicity and pre-industrial connectivity, Davoli.

When talking about improving accessibility, Bo told us that the area wasn't always disconnected, but that actually this isolation is something that happened quite recently: 40-50 years ago, the area around Floda had dairy production as a main source of income together with small scale farming, including selling local products and vegetables. Each farmer used to produce small quantities of milk that were then collected and sold to the local dairy factory and then to cities and villages. Because of that business, the area was well connected, with 3 buses a day transporting people and goods. There were schools then, he said, and children to fill them with! When the effects of industrialization and globalization reached Floda, however, this market was not sustainable anymore. Population dropped as people moved to cities and bigger towns. At the same time the infrastructure disappeared and with it the area's connectivity and accessibility to services. '"Now there are only retired people like me!", he concluded.

Re-Connecting People

Proceeding towards Botsmark, we came to a small cluster of houses built around a narrow strip of land in between two small lakes where we stopped and staged our scene. Two annoyed cranes flew away, disturbed by the noise of the drone's rotors as it flew over the lake.

After a few minutes two women came out of their houses and approached us. The older one was Tove, the younger her daughter Karina. Tove used to own a shop by the road. Pointing to its crumbling foundations just down the road, she said the shop stayed open until there were not enough people living in the area to make it profitable anymore. She is now retired and lives alone in a yellow house just in front of where we stopped. Tove was quite excited about the delivery system concept, since currently she depends on family and neighbours for almost everything. She therefore saw in the system a means to become more independent, e.g. to be able to buy small groceries or, more importantly, medicines .

Karina works in the city all day. She leaves early in the morning and comes back in the evening. She said she would use this system for having the newspaper in the morning. Right now newspapers are delivered late in the day and she can read it only in the evening. She would love to be able to read the news at the same time as someone living in a city. The two ladies were so enthusiastic about the idea of a public drone delivery system that they started to ask if it would be implemented and how much it would increase their taxes.

Figures 20, 21, 22. Re-connecting people, Davoli.

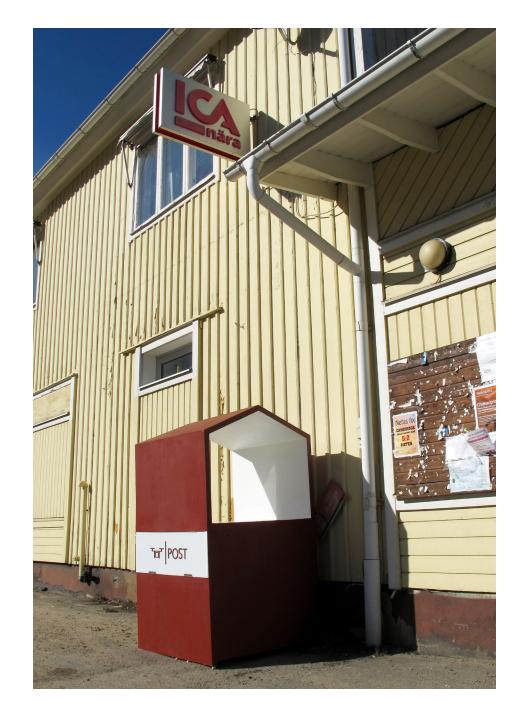*Figure 23. Re-connecting people, Tove posing with the Drone Postbox, Davoli.*

Figures 24, 25, 26. Safety and flexible designs, Davoli.

Safety and flexible designs

Arriving in Botsmark, we placed the drone postbox and flew the drone in front of the local minimarket, which is also the main logistic node for the area. Our first encounter here was Pontus, a construction worker in his twenties, and his friend. One of their reflections was to adopt a system like this because of drivers' safety. During severe winter weather vans and trucks delivering in the area often end up in accidents, causing delays and, in some cases, even loss or damage of parcels and goods. Occasionally delivery vans also get robbed,they added, expressing also their doubt about how this issue could be possibly solved. They also suggested the postbox design shouldn't be fixed and standardized, but that it should be possible, given the technology and some basic requirements, to build and customize it according to people's homes and needs. Pontus has a dog, and said that if the postbox were configured as the prototype, the dog would probably try to chase the drone.

While saying goodbye to the two men, a woman named Eva stopped by to see what our discussion and the props were all about. She lives in the countryside outside Botsmark, and although she was in a rush she immediately understood the issues we were trying to address. It would be perfect for delivering her orders from Internet purchases, extending the flexibility of digital services into the physical world she said.

Figures 27, 28, 29, 30. Safety and flexible designs, Davoli.

Changing perspectives

Our last objective was to interact with one truly important individual for our speculative system: the owner and manager of the local shop and logistic node, Inge Marie. The shop was full of customers who naturally became part of the conversation since they saw us outside. Initially they were quite skeptical, laughing at the possibilities we presented, drone in hand. However, once they understood we were serious in our questions and that this actually could be a future possibility, they suddenly stopped laughing and became more thoughtful. Inge Marie said that as long as one pays in advance for the service it would not be a problem for her; and since she had to sort and store packages for the different couriers in any case, it wouldn't change much if she had to do it for a machine instead. However, watching the friendly scene at this small community hub by the side of the mostly empty road, we couldn't help but wonder if loading packages for delivery by a machine wouldn't have more of an effect on Inge Marie's life—and the character of the community—than she or they could anticipate.

Probing future infrastructures

The insights gained from these interactions calls for some methodological considerations about how to open up for a diversity of interpretations of a future infrastructure with such distributed and glocal qualities. The daunting task of redesigning infrastructures will involve a significant range of skills, professions and areas of expertise extending far beyond the reach of the (industrial) design discipline. Clearly, we cannot claim to have any solution or recipe for how to deal with infrastructures and their implementations; but we do want to bring something to the process of rethinking them.

The process presented here is not about problem solving or evaluation of this specific design concept. Rather, it is about exploring what conversations emerge when something that is otherwise invisible is made tangible and present in a context through prototypes in the early stage of the design process, when focus lies on opening and becoming.

The material we produced obviously embeds specific values and represents only one of the many alternative scenarios that could and should be explored. However, by performing, or perhaps rather rehearsing, a speculative service concept in the field, we opened up an opportunity to, for a brief moment, interface with networks we otherwise cannot access directly in the context of our everyday lives. The field material became the point of interaction, literally a materialization of the infra-, between the global untouchable and un-relatable reality of industrial logistic infrastructures and a hypothetical new hyperlocal one. Through this open and active dialogue between the material, the context and us, participants were able to form ideas about these networks based on their

particular individual interpretations, continuously shifting between present and future. At the same time, the staging of the speculative concept allowed us to probe into a community and its environment. This offered us an impression of what the collective experience and agency of a future infrastructure might be and, in a relatively short time, get a glimpse of the complexity of relations, attitudes and mediations otherwise difficult to sense.

In particular, connections between abstract theory and concrete reality continuously emerged, facilitating a rapid dialectic between situated and systemic thinking. Through such a loop new possible crossover points between an envisioned system and a specific context emerge, allowing the identification of design criteria and themes that are relevant when staging interventions with the purpose of enabling symbiotic relationships between local systems and global industrial networks.

The purpose here is not simply the reconfiguration of a specific design space towards more environmentally and socially sustainable forms; rather, it is to understand what post-industrial practices would be necessary to drive change within the industrial regimes in which these new ways of thinking and doing design must take shape.

References

Davoli, L. & Redström, J., 2014. Materializing infrastructures for participatory hacking. In Proceedings of the 2014 conference on Designing interactive systems, New York 21-25 June: ACM 121-130.

Davoli, L., Redström, J. & van der Vleuten, R, 2014. Hacking delivery Systems: exploring design tools for user- led innovation in urban infrastructures. In Proceeding of Design Research Society conference, Design Big Debates, Umeå, 16-19 June. Umeå Institute of Design, 1014-29.

Dunne, A. & Raby, F., 2013. Speculative everything: design, fiction, and social dreaming. Cambridge: MIT Press.

Graham, S. & Marvin, S., 2001, Splintering Urbanism, Networked infrastructures, technological mobilities and the urban condition. London: Routledge.

Halse, J., Brandt, E., Clark, B. & Binder, T., 2010. Rehearsing the future. Copenhagen: Danish Design School Press.

Morelli, N., 2007. Social Innovation and New Industrial Contexts: Can Designers "Industrialize" Socially Responsible Solutions?. Design Issues, 23 no. 4, 3 -21.

Sanders, E.B. & Stappers, P.J., 2014, Probes, toolkits and prototypes: three approaches to making in codesigning, CoDesign, 10(1), 5-14.