EMBRACING COMPLEXITY

BECAUSE IT IS HERE TO STAY

Product Service System development is hard, but pretending complexity disappears when you ignore it solves nothing. PSS design teaches designers **to embrace complexity and discover the rich insights that lead to excellent PSSs.**

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Illustrations & handwriting
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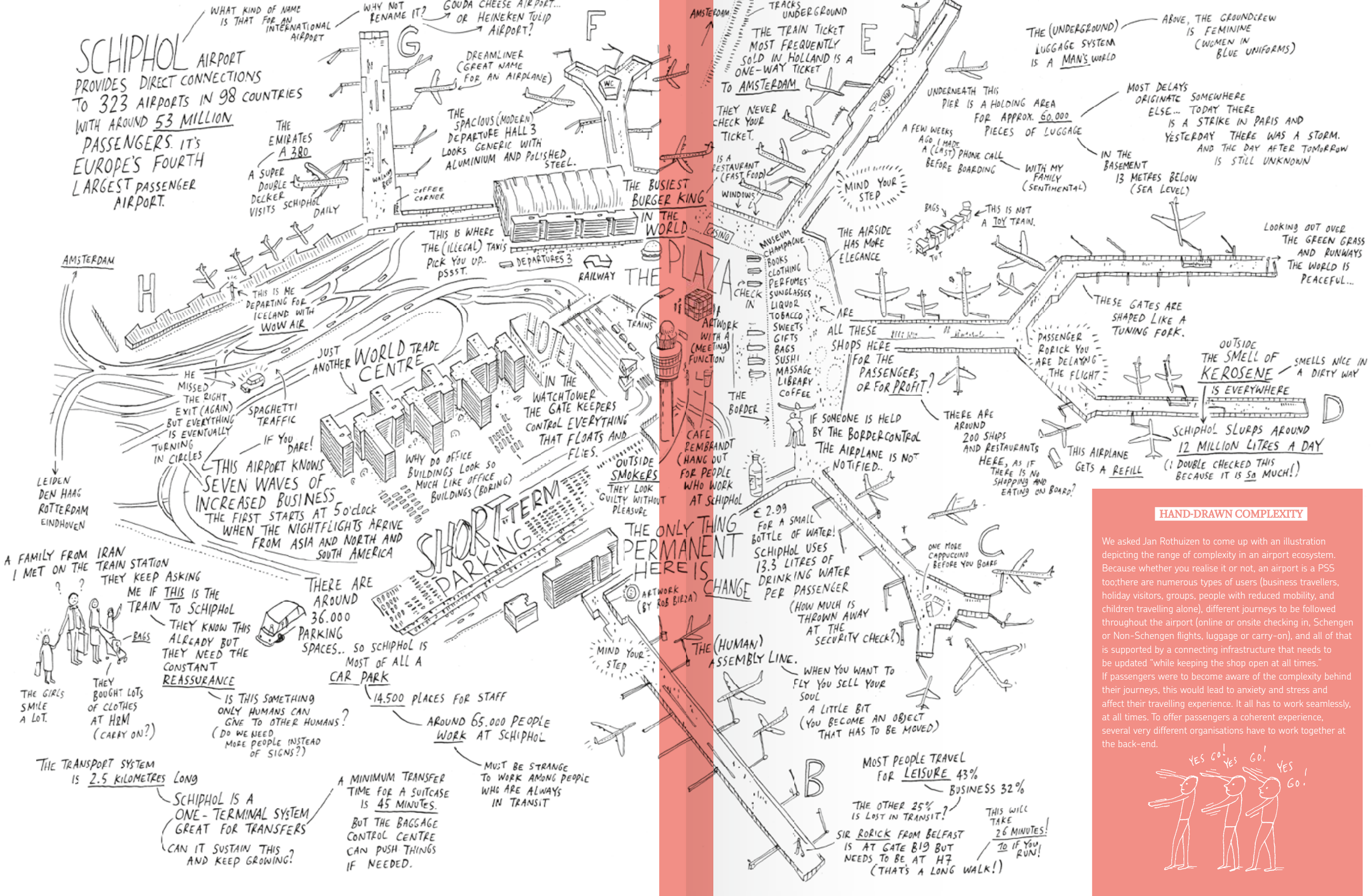


HAND-DRAWN COMPLEXITY

We asked Jan Rothuizen to come up with an illustration depicting the range of complexity in an airport ecosystem. Because whether you realise it or not, an airport is a PSS too;there are numerous types of users (business travellers, holiday visitors, groups, people with reduced mobility, and children travelling alone), different journeys to be followed throughout the airport (online or onsite checking in, Schengen or Non-Schengen flights, luggage or carry-on), and all of that is supported by a connecting infrastructure that needs to be updated "while keeping the shop open at all times."
If passengers were to become aware of the complexity behind their journeys, this would lead to anxiety and stress and affect their travelling experience. It all has to work seamlessly, at all times. To offer passengers a coherent experience, several very different organisations have to work together at the back-end.

When they set out four years ago, little did the intrepid group of designers and researchers know what challenges and discoveries would lie in store for them.

All they had to go on was the promise of an interesting transfer of the knowledge and practice of the conventional design discipline to the creation and development of Product Service Systems. The challenges they faced can only be properly understood in hindsight; there were many, none was small, some turned out to be huge, and their root cause lies in the complexity of PSSs themselves.

Because all is not what it seems in Product Service Systems: the product part is often not 'a' product at all, but more than one, a whole suite of technically advanced elements and systems that function through a connecting infrastructure. The service part is often also not one but several services, each consisting of many elements, relationships, and interdependencies. And the user of a PSS is hard to identify; in many situations, there are various groups of people, or even a whole segment of society that fit the user role. And what to think of the complex web of stakeholders that needs to be built to create the PSS, and to develop and implement it?

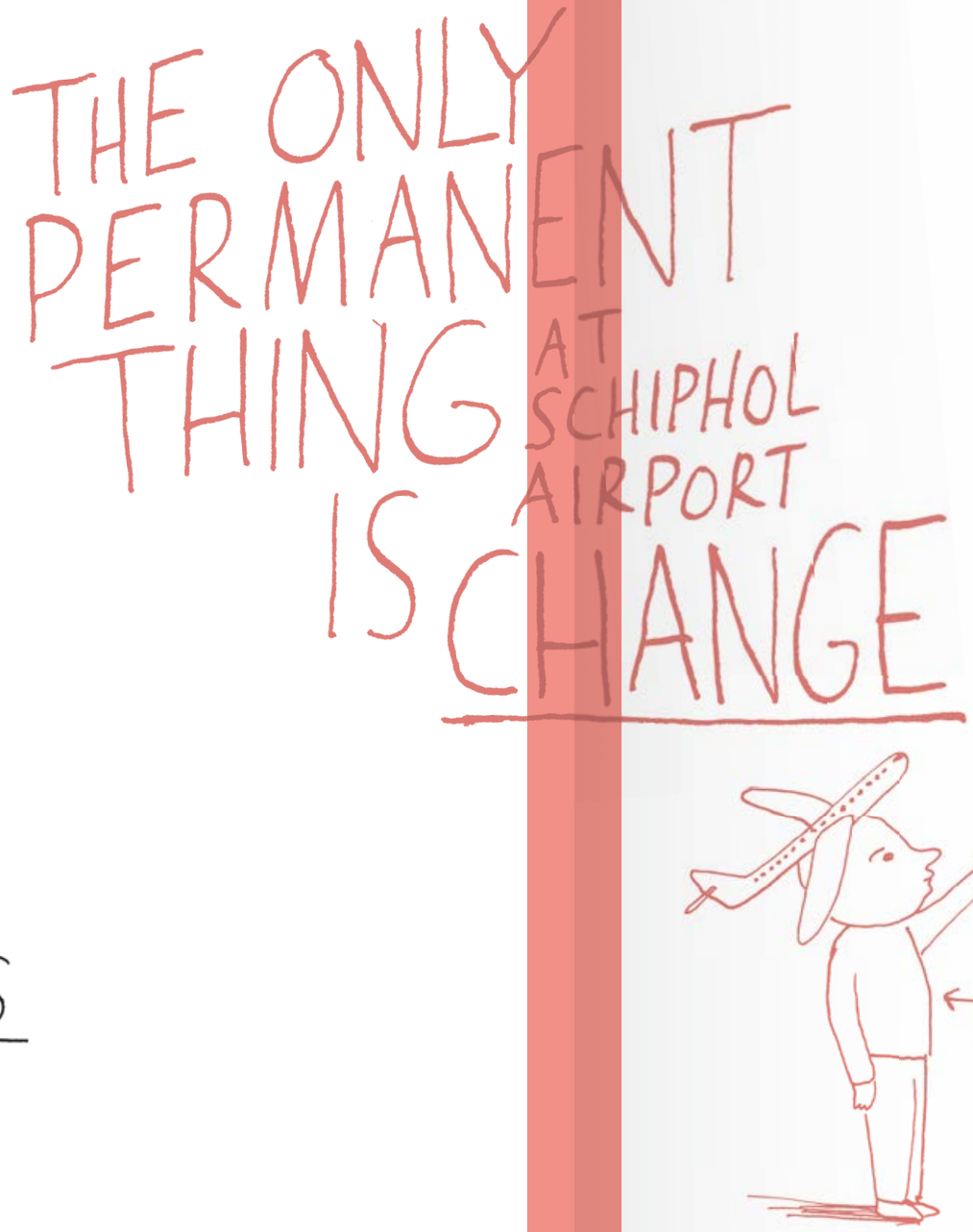
OBSERVATIONS

RUNNING AROUND LIKE CHINESE JUGGLERS

As you set out to develop a PSS, the first thing you realise is that many PSS elements have to be designed/developed in parallel; the designer soon begins to resemble a Chinese juggler, having way too many plates spinning on his sticks, running around in a desperate attempt to not have them all come crashing down. This is where the classic design methods, that divide the design project into a succession of steps and simplify the design problem by cutting it up into manageable subproblems, just get completely overwhelmed by the complexity of it all. These conventional methods no longer lead to good results.

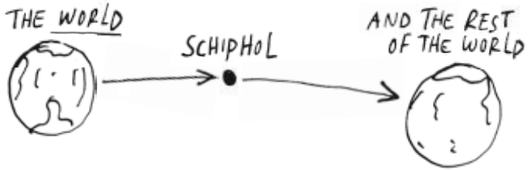
So, what, besides panic, is the designer to do?

Well, the good news is that in the very complexity of PSS development lies the solution to this quandary; if you can let go of the need to be in control all the time, and come to the challenge with an open mind, the complexity will show itself not as a problem but as a richness from which new patterns of meaning and value emerge, in due course. You design by exploring and developing these patterns.



Speaking of patterns, sewn into the fabric of Smart Textile Services (STS) projects is the combination of high and low tech, of electronics and craft, brought together to create meaningful concepts. Consider as an example Textales, a jacquard-woven fabric produced by Johan van den Acker Textielfabrieken, which becomes dynamic through a screen-based augmented-reality application developed by Unit040. They created an experimental high-tech bedspread on which apps can bring characters to life as if they were present on the textile itself. Children can move the characters by manipulating the textile to create their own bedtime stories. The qualities of the textile thus offer us fascinating new ways of interacting with the digital world.

But complexity issues are not limited to technology. The issues often arise on the human side, as a PSS sparks behaviour that completely change the impact a PSS can have. This fascinating dynamic is something to be mindful of — things could go wrong. Some PSSs seek to help vulnerable groups in society, like people suffering from dementia. This requires a keen sensibility for the possible impact of the PSS and a lot of experimentation to map the possible side effects. Designing PSSs for these groups is important, but it is also a morally laden balancing act. The social robot Polygon, for instance, is designed to have conversations with patients. It is currently being field tested with patients who are diagnosed with acquired brain injury (ABI) to possibly counteract loneliness and provide them with social support. Affection and empathy between entities: both product and person are the drivers for its success.



DESIGNING EXPECTATIONS

"In creating Polygon," says Robert Paauwe of the SELEMCA project, "Wang Long Li, Desmond Germans and I learned that it is not only about designing a product, but also about thinking about how Polygon could form relationships with its users over time (an aspect more elaborately discussed in the 'designing relationships' theme). We designed the embodiment of Polygon so that it does not give the impression that the 'robot' could do everything. The different expectations people have in combination with many factors related to social interactions make designing this simple social robot complex. As this makes it very difficult to study robots from a purely academic perspective, we founded Tinybots. With this company, we hope to transition social robots from academia to real-world applications."

TRUST THE WISDOM IN THE NETWORK

Although a focus on users can help guide PSS development, this does not mean the other stakeholders should be left out. STBY, a design research company, was asked to help the Province of North-Brabant to develop a new policy and implementation plan for water management. They used the "Value Pursuit" tool developed in PSS101, discussed in CRISP magazine #2, p40, to uncover the needs, struggles, and contributions of key stakeholders, such as the water management companies, water committees, conservationists, city councils, farmers, and industry. This helped them when discussing who could have what role in implementing the policy. Thus PSS design was used to develop and maintain a very complex network of stakeholders. According to Marie de Vos, who works at STBY: "When you look at an issue in its broader context and learn to embrace that complexity, it becomes easier to come up with the right question to tackle the right problem. Designers' strength lies in their practical, hands-on attitude towards complexity, and having the tools necessary to deal with it." ↗

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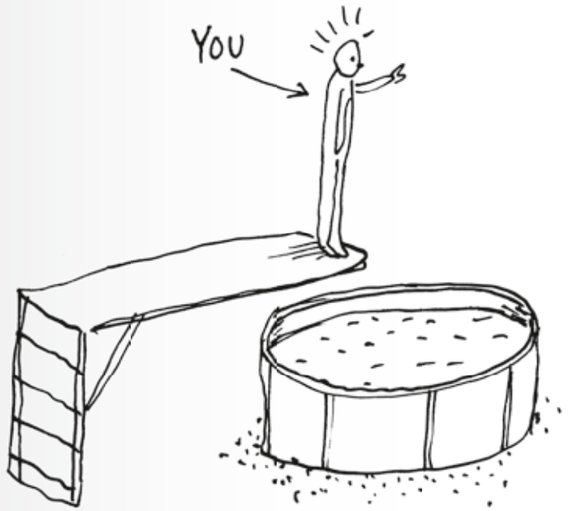
HIGHLIGHTS
SOCIAL ROBOTS

Social Robots describes how the Selemca project dealt with designing in a social and complex context.

CONQUERING COMPLEXITY



JUST DIVE AND SWIM

A first step to get a grip on a complex situation can be to soak it all up, like a sponge, to thoroughly get to know all aspects of a complex issue. But sometimes, this is just impossible. Karianne Rygh, a Research Associate at the Design Academy, joined the PSS101 project about a year after CRISP began. Because all the other project members already knew each other, she first tried to get a grip on the whole project, to get an idea of what she could and should do. She spoke with all team members about the project and what they were trying to achieve. She quickly learned that everybody had their own perspective on the project, and very different expectations. Each of the team members used very different words to simplify the project as they explained to her what was going on. On the way home after a CRISP meeting, she shared her frustrations with Bas Raijmakers, who heads the Research Associates team at the Design Academy. After listening to her, he said: "You seem to think there's a grand master plan, but there isn't: that's what we are trying to make."

WHEN IT GETS TOO MUCH MAKE IT PERSONAL

Just like Karianne, Michelle Baggerman joined a CRISP project, STS, a year after most of the other project members. She too felt that most of them were up to speed and that she had to catch up quickly, get a grip on what was going on and come up with a plan of action for her own contribution. It was tempting to go into all the details, but she sensed there was just not enough time to do that. Instead, she needed to get a sense of what was going on and, based on her intuition, decide where she could contribute. Although she was familiar with textiles, embedding technology in fabric was new to her. As she struggled to get to know the technology and its potential, she decided to try it out for herself. By prototyping for her own purposes early on, Michelle developed the means to help others to have a similar learning experience. ➜

BALANCING BETWEEN CHAOS AND STUCKNESS

According to Berry Eggen, Professor of User Centered Engineering at Eindhoven University of Technology and member of the I-PE project, many of the issues in PSS design resonate with the field of complex system design from the engineering disciplines. “When it comes to self-organising complex systems, chaos theory identifies three types of systems: systems that, after incubation, die or get frozen, systems that end in random behaviour, and the so-called complex systems that constantly change and show emergent structures that adapt to the environment. When we embrace complexity, we want to design PSSs that belong to this third category. But engineering science tells us that this is not a trivial challenge. Whether a system, once it comes to life, develops into a truly complex system, depends on the initial conditions and the local behaviour and intelligence of individual ‘agents’ that make up the system. The slightest mistake in the conditions, or inappropriate communication between agents and their environment, and we end up with a fixed or random system.” This is not the first time that the connection between chaos in dynamic systems and PSS development emerges. In the very first CRISP magazine, artist duo Driessens & Verstappen, also part of the I-PE project, shared what they learned on the subject of complex dynamic systems with their super organism simulation (p16-17).

SPEAK YOUR LANGUAGES

To make that implementation easier, it is important to know the languages of the stakeholders because you then need to translate the service from something that is valuable to the users to something that is valuable for the organisations. Before you present it to the board, ‘reframe’ the prototype into the “language of the organisation.” Behzad Rezaei, founder of Connect to Innovate and member of the PSS101 project, “I always start with creating data sets concerning targets, added value, cost structures, etc. that my clients are familiar with. Since most board members are (unconsciously) risk averse, seeing measures they already know helps in creating a common ground. Than, I transform the same data set to show the perspective of the customers. In this way decision makers become involve in discussing everyday context of their customers, beyond numbers!” ↗

ORGANISING: FLEXIBILITY

When it comes to implementation, the nature of product service systems necessitates that the organisations that deliver these PSSs are incredibly flexible. They should be ready at any time to tweak and change the PSSs — or even radically overhaul their very structure, and create additional services. →

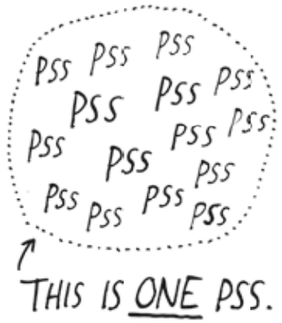
PREPARING FOR THE FLIGHT

GETTING REAL

Robert Ehrencron (KLM) discussed with Marina Toeters (Saxion Hogeschool) what they learned during CRISP of the challenges of implementing a PSS mindset in an organisation. Robert Ehrencron: “As long as it is still on paper, or just a prototype, people are open to the new idea. But, we see that once the step has to be made from plan to actual practice, the complexity to make it real grows substantially.” “When innovation requires changes to an existing process, it will initially be seen as an ‘operational disturbance’ of a highly optimised process and, as a result, won’t be implemented overnight. You can’t just stop a well-oiled process to plug in a new one; the risks are much too great.” “Innovations that follow an incremental approach, an almost unnoticed transition from old to new, have a better chance of survival. It is easier to improve the service by changing an existing product with a better one than, for instance, to organise a completely new way to motivate cabin staff before a flight.”

MANY SMALL PSSs MAKE A BIG ONE

From Rick Schotman (Grey but Mobile project): At one moment, the care provider Skewiel was taken over by the larger care provider, Tellens. Now the service had not only to be successful at one location, it had to be scalable, standardised and more efficient. Rick noted, “The numbers have to win it.” This poses new challenges; the business model should be reviewed and other locations should be able to organise the service without loss of quality. For the business model, the functionality of the service isn’t the most interesting aspect. If you look at Skewiel mobiel as only a “mobility service” it is expensive; you have to be able to show the benefit in a broader sense. This is quite difficult: how do you make a multifaceted service fit in existing business structures?” →



When we began with our theme, we had a general idea of the types of complexity we would encounter in the various CRISP projects.

In November 2014, at the Design Review Sessions, we organised a round-table discussion for those interested in sharing their experience, and together decided on the key aspects in embracing complexity. Participants from all eight projects were present and highly engaged in the discussion. We used the outcomes as the basis for this article.

Another problem is the scalability of the service. People who haven't participated in the development of the service see it as yet another service they have to deliver. They will probably not deliver it to the same standards as the initial service. Most important here is to be able to communicate very clearly what the aim of Skewiel Mobiel is. This can be difficult as it is quite abstract, but you still should be able to translate that into common language. For Skewiel Mobiel, this meant it had to be made clear the service isn't simply a mobility service, but a service that enables people to continue doing their activities.

The good news is that in the very complexity of PSS development, also lies the solution: if you can let go of the need to be in control all the time, and come to the challenge with an open mind, the complexity will show itself, not as a problem, but as a richness from which new patterns of meaning emerge.

As a PSS designer, you have to approach the total context as broadly as possible, right from the start. Continue iterating, as if it is an open-ended process from which more and more depth and richness emerges. Communicate this richness of the process as openly as possible, so that all stakeholders can take whatever they need from it, when they need it. You design by exploring and developing these patterns of meaning.

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