Global STS Design Network Meeting: "Technology @ Work in the 21st Century", Leiden, September 5th-7th 2018

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Introduction

If organizational designers want to stay effective and viable, it is necessary to adapt to new requirements and technological developments in the society. Therefore, for the GSN meeting of 2018 the overarching topic of the conference was new (digital) technologies and the impact of such developments on the organizational design process. These new technologies, like Blockchain and Artificial Intelligence, are very popular and omnipresent in the media. More importantly, for Socio-technical systems (STS) designers, the reciprocal influence of technological system on the social system is of course very relevant.

The goal of the conference was to elaborate on the possibilities and pitfalls/limitations of these new technologies, learn about their impact on organization design and the design process, in addition to offer an opportunity to apply these learnings. This approach built on the GSNM of 2017, which included an ecosystem perspective on the application of technology.

The main question that informed the meeting over the three days was: *What are the possibilities and constraints of new (digital) technologies and how do they affect the (process of) organization and ecosystem design?*

GSNM 2018 was organized as a three days meeting in addition to a pre-conference.

Pre-conference

The Global STS Design Network meeting 2018 started with a twofold pre-conference on September 4th. The first part of the pre-conference was a workshop with Chris Sels and Carolyn Ordowich on the topic, *deliberation on the principles in the 21st Century*. The second part was a workshop with Jan Achterbergh on the topic, *deep-dive into Systems Theory and Viable Networks*.

Deliberation on the principles in the 21st Century

Sels and Ordowich presented their perspectives on STS-approaches as these principles are understood and used in the Lowlands and North America (NA) nowadays.

Photo 1: Chris Sels (BE) and Carolyn Ordowich (US)

Chris Sels, who represented the Lowlands' perspective on STS, emphasized that Lowlands STS is a predictive theory developed by primarily de Sitter and colleagues. Lowlands STS originated from the Tavistock-tradition, and is very much rooted in the social systems theory of particularly Niklas Luhmann. Lowlands STS is not

only a theoretical model, but also a strong design model that offers clear principles on developing an efficient organization in line with quality of working life. The NA-approach to STS emphasize stronger participative perspectives on STS, and has largely developed STS into a viable change model. Carolyn Ordowich, who represented the NA's perspective on STS, emphasized that organizational change impacts the whole system in the organization, and that STS-practitioners strive for maximal engagement of the employees in the change process, from the very start. Usually, management has the responsibility to define the mission, vision and strategy of the organization and to design a clear set of goals and performance criteria. However, in NA STS, the strategic process itself is carried out as participatively as possible. Instead of creating a "big bang" change, STS-practitioners work along the principles of design thinking. The organization learns and evolves by conducting experiments and using iterative projects. This is often called the action-learning approach.

Despite somewhat different approach, Lowlands- and NA-STS share the same theoretical framework, presented in this useful and thorough figure:

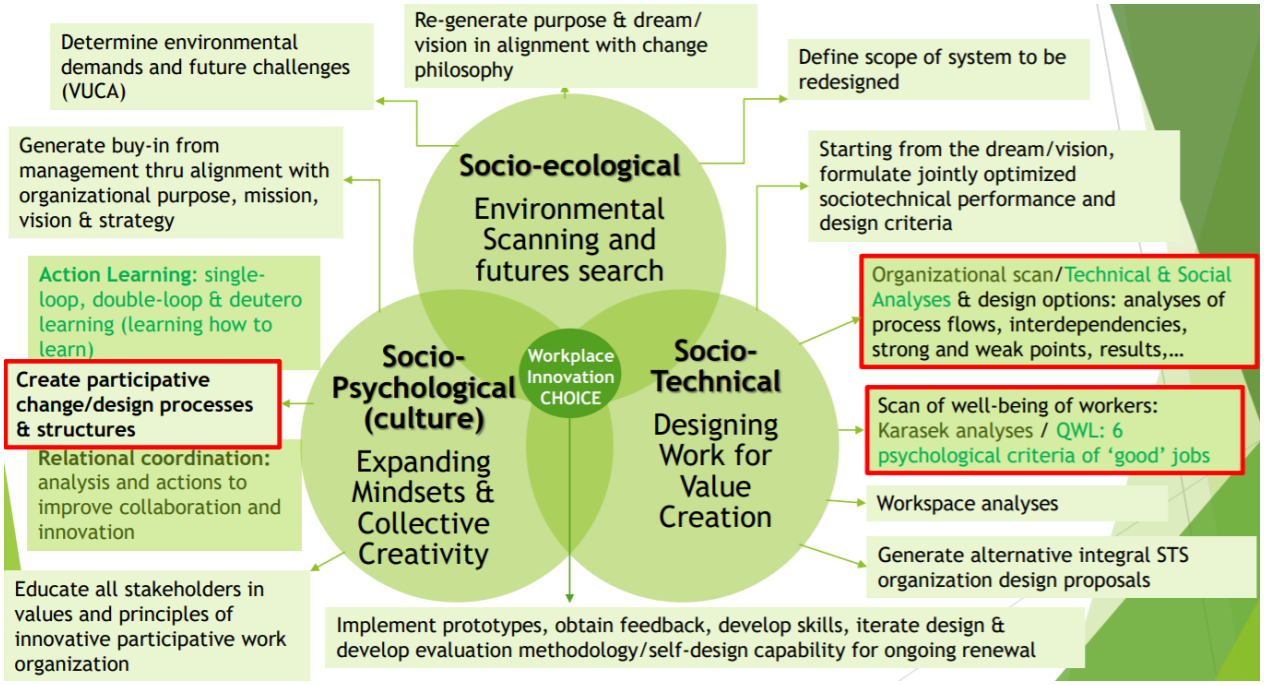


Figure 1: STS approach in both Lowlands and NA, presented by Ordowich and Sels at Global STS Roundtable in Leiden, 2018.

The workshop also consisted of a number of group discussions in order for the participants to contribute to new understandings of STS nowadays. One of the exercises that was really useful, was group discussions on the new principles based on the original STS-theoreticians like Cherns (1976) and updated by Doug Austrom (USA), Mark Govers (NL), Carolyn Ordowich (USA), Bert Painter (C), Christiane Sels (BE), Pierre van Amelsvoort (NL), and Geert van Hootegem (BE). The task was to discuss in small groups what the participants have learned about STS principles from the handouts and to prepare clarifying questions or amendments to the principles in the plenary, and later to discuss which STS practices that are most helpful in design. The principles and outcomes are presented in the following figure:

Figure 2: Originators are Doug Austrom, USA; Mark Govers, The Netherlands; Carolyn Ordowich, USA; Bert Painter, Canada; Christiane Sels, Belgium, Pierre van Amelsvoort, The Netherlands, Geert van Hootegem, Belgium.

The presentations and the group tasks led to engaging and energizing discussions. In this report, we are unfortunately only able to "scrape on the surface" of the rich presentations and discussions during the workshop. Ordowich and Sels gave the participants both a good overview and some detailed understanding of both the differences and the common grounds between Lowlands- and NA STS.

Photo 2: Group discussion at the pre-conference

Deep-dive into Systems Theory and Viable Networks

After lunch the pre-conference continued. This time with Jan Acherbergh from RU Nijmegen/Management Science in the Netherlands, who gave the participants a deep-dive into Systems Theory and Viable Networks.

The goal of the contribution was to provide a (cybernetic) reflection on conditions for the meaningful survival of networks.

To this purpose:

- First, the notion 'meaningful survival' and its different modes ('rich' and 'poor' meaningful survival) were introduced (A);
- Second, meaningful survival was linked to the five functions of Beer's Viable System Model (B);
- Third, a model was introduced that applies Beer's functions in order to diagnose a network's potential for (rich) meaningful survival (C).

Ad A: Meaningful survival and its rich and poor mode

In this context it was argued that:

- viability means something like 'being able to survive';
- survival as such cannot be the general goal of organizing (e.g. an organization that wants to eradicate malaria, wants to abolish itself as quickly as possible);
- meaningful survival, however, can be accepted as a general goal of organizing;
  - 'Meaning', here, refers to goals that for some reason or other are considered worthwhile.
  - 'Survival' refers to the continued existence of organizing as a social activity directed at the production (= adaptation and realization) of meaning.

Between 'meaning' and 'survival' there is a reciprocal relation: meaning provide the rationale for survival, survival provides the conditions for the production of meaning.

Moreover, it was argued that meaningful survival has two ideal typical extreme modes:

- rich meaningful survival: the organization's meaning contributes to the conditions for people affected by the organization's to live a fulfilled human life because this is the right thing to do;
- poor meaningful survival: the organization's meaning realizes whatever contingent goal for whatever contingent reason; e.g. producing and selling oil in order to make money for shareholders

It was argued that rich meaningful survival does not necessarily precludes making money for shareholders.

Ad B: Meaningful survival and the functions of the VSM

In this context it was argued that:

- meaningful survival means 'producing' meaning;
- producing meaning means realizing and adapting meaning;
- the realization and adaptation of meaning can be coupled to Beer's Viable System Model
  - realizing meaning is related to Beer's functions: primary operations, coordination, and control;
  - adapting meaning is related to Beer's functions: intelligence, control, and policy

Ad C: Application of A+B to networks

To apply both the notion of (rich) meaningful survival and the functions related to the production of meaning to networks, a diagnostic instrument was discussed that consists of three 'modules' devoted to: (1) values and activities (normative), (2) activities and their distribution (descriptive), (3) analysis of omissions, doubles, fragmentation, and complexity (analytic).

1: Value / activity module (MEANING and IDENTITY)

- Values (meaning)
- Goals related to values (meaning)
- Activities related to realizing and adapting goals

2: Activities and their distribution over actors (DESCRIPTION)

- Participating actors
- Distribution of primary activities over actors
- Distribution of coordination activities over actors
- Distribution of control activities over actors
- Distribution of intelligence activities over actors
- Distribution of policy activities over actors

3: Analysis (OMISSIONS, DOUBLES, FRAGMENTATION AND COMPLEXITY)

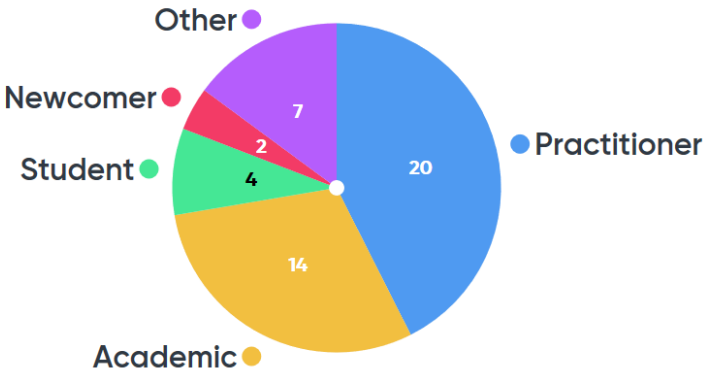
- Omissions: what activities related to the production of meaning are missing
- Doubles: similar activities performed by multiple actors
- Fragmentation and complexity: how fragmented and complex is the production of meaning in the eyes of:
    - customers/clients, citizens
    - actors in the network

Photo 3: Jan Acherbergh (NL)

Day one of the conference

The first day of the conference opened with Jesper Hanssen (NL) and Ray Dyck (C) who took the participants through the program and arranged for a fun mentimeter session, which gave the participants a quick view on who is attending the conference. In addition to being a fun and informal ice-breaker, the result from the mentimeter session contributed with some interesting numbers. For example, of the 42 participants who answered the mentimeter, one lived in Canada, eighteen lived in The Netherlands, ten lived in the USA, four participants lived in Belgium, eight lived in Norway and one participant lived "somewhere else". What we learn from this is primarily that for the first time in STS Roundtable's history, there were quite a number of participants from Scandinavia present.

The STS-community seemed to be quite new to each other. Only 11 out of 44 participants had seen 50-75% of the participants before. 7 participants had seen 25-50% before, and as many as 26 participants had only seen 0-25 % of the other participants. This might indicate that the STS-community attracts new STS-friends.



In addition, half of the participants would label them self as academics or students and half of the participants would label them self as practitioners to organization design. It varied how experienced the participants were in organization design. 12 participants said they had been involved in organization design for less than 5 years, 16 participants said they had been involved in organization design between 5 and 15 years, 11 participants said they had been involved in organization design between 15 and 25 years, and as many as 10 participants said they had been involved in organization design for over 25 years.

Finally, the 48 participants who at the end of the mentimenter were asked to explain their motivation for participating at the Global STS Roundtable, made the following tag cloud:

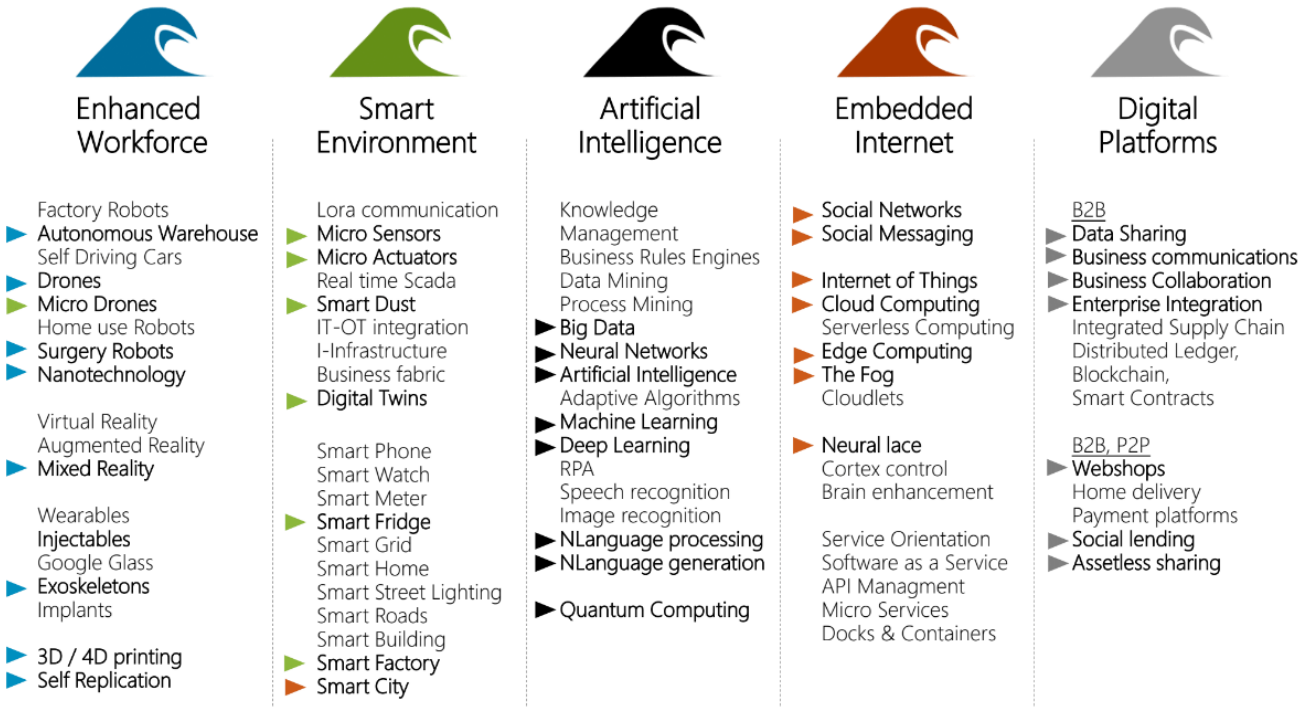
Figure 3: Motivation for participating at the Global STS Roundtable, presented as tag cloud

In short, the members of our STS-community are not only attending the roundtable to learn and gain new knowledge, but also to expand their network and connect with people in order to reflect and be inspired on issues like technology, better jobs, theory, cybernetics and labor market.

After the welcoming speech and introduction of the participants, the main conference started with an enlightening keynote by Martijn van Glabbeek (NL) from the Dutch energy company, Alliander, on the impact of digital technology on work life and life in general. Van Glabbeek is a Senior Business Information Architect at Alliander and specializes in Business Information Architecture, Customer Experience, Customer Transformation, Market Revolution and Business and Service Innovation. van Glabbeek argued that the society is now in an enormous technological area with huge changes in a variety of organizational contexts such as the development of technology such as enhanced workforce, smart environments, embedded Internet, artificial intelligence (AI) and digital platforms. Together the sum of all these new waves of different technologies at work make what van Glabbeek calls “a perfect storm”. By introducing and going through a large number of relevant technology at work on different levels such as 3D-printing, smart glasses, Internet of Things, AI, and platform economy, van Glabbeek demonstrated that these are not only potential technologies for the future, but definitely up and running even today. In addition, it is important to understand that these technologies are not operating and functioning individually, but that many of them will be informing how we work simultaneously. It is this merge with all kinds of new technological solutions and development that is hitting our organizations as “the perfect storm”.

Although this new technology improves many of the work processes, there are also some problematic issues that have to be dealt with. Van Glabbeek mentioned in particular Internet companies’ surveillance of people’s lives and how these companies can foresee certain developments before the person him/herself is able to. He ended the presentation with advice to the participants of the Global STS Roundtable, which is to be clear on what kind of technology we are dealing with, and in what sense that can contribute to a better society. We just need to figure out how to make it right, and; there is no such thing as bad technology – only bad application of it!

Table 1: Martijn van Glabbeek's overview of relevant technologies at work



Van Glabbeek's presentation of technology at work gave a wonderful overview of what kind of technologies that organizational designers have to take into account when working with companies in the future, and it made a good base for further discussion throughout the RoundTable. Basically, it is important to stay viable as organizations and as STS- designers in the era of digital technology. We need to understand the possibilities and pitfalls of these technologies in organization (design), and need to be able to adapt these technologies in organizational design.

The presentation was followed by an open forum where the participants were divided in teams. The team members then discussed what surprised them in addition to identifying burning questions related to the presentation. A discussion that came up quite frequently in the plenary presentations was the technological relationship with democracy and power: How can we as organization designers put control in the hands of users and workers, and not providers and managers?

Photo 4: From the open forum

After a break, Bert Painter (C), Pierre van Amelsvoort (NL), Mark Govers (NL), and Matthijs Moorkamp (NL) presented a common theoretical foundation and language that would help us structure our learning journey towards answering the main question of the meeting: *What are the possibilities and limitations of new digital technologies, and how might these be most effectively incorporated in the (process of) organization and ecosystem design?*

They argued that the topic of work and technology is not new to sociotechnical thinking. In the 1950's the Durham studies revealed that introduction of technology severely impacted ways of working (team structures) and resulted in psychological consequences for workers. A central concept that emerged out of these studies was the concept of organizational choice; the notion that work and division of labor were not (or should not be) determined by characteristics of the technical system.

Insights from these studies can still be helpful in thinking about the relation between technology, design of work and agency of workers. However, introduction of concepts after the classic longwall studies may shed new light on the (very relevant) concept of organizational choice. The presentation did so by briefly discussing three perspectives that all reject the notion that the social and the technical should be seen as independent subsystems and acknowledge the dynamic and intertwined relationship between human agency, technology and structural characteristics.

1) Organizational choice presented by Pierre van Amelsvoort

Van Amelsvoort argued that we in the 21st Century are inserting a new "wave" of Digital Technologies. The reality is that these new technologies are disruptive – for person-machine relations, and for person-person relations. However, we have seen an earlier version of this "move" before—with a first wave of mechanization of work. Are we here witnessing some Déjà vu?

2) Duality of Technology presented by Matthijs Moorkamp

In thinking about technology and work (design), duality of technology points us to the notion that technology and human action often are addressed as separate subsystems. However, they are intertwined and should not be taken apart and studied in isolation. What can we see, when we look at the use of technology in this way? And what can it give us in relation to work design? What's in it for us, as sociotechnical designers?

- Technology and work are not static.
- How can we create workplaces in which there is room for discovery and innovation by using technology?
- Facilitate the process of enactment through work design.

3) Action Potential & Limitations of Technology (based on Technology Affordances and Constraints Theory) presented by Bert Painter

Uses and outcomes of technology are best understood in terms of dynamic *relationships* between individuals or organizations and technology features. This means that each technology with particular capabilities – in conjunction with people/organizations having specific purposes in a particular use setting – may present real and significant *action potential*. Although an understanding of the particular features and functionalities of a given technology can help one hypothesize about action potentials, an action potential is not a property of either the technology or the organization. In the Durham case, with the same technology and the same corporation – but in a different division with different people with different goals and maintenance strategy, this action potential of predictive maintenance did not exist and was never realized. They were so focused on perfecting their preventative maintenance routines that they did not have time nor interest nor inclination to trust and use this new digital technology.

Furthermore, to realize a specific action potential often requires contextual changes in the use setting (e.g. new methodologies or new organizational roles)—and again, these contextual changes are not programmed by the technology, only facilitated. Finally, Painter warned that when using any particular technology, there are also limitations (or constraints) that can hold back people and the organization. For example, with the earlier example of the AMS in manufacturing, there is a significant "limitation" of cyber security vulnerability. This is, potentially, a negative action potential. In Summary, Painter argued that these concepts (action potential and limitations) can help us all achieve more successful use of technology. Awareness of these concepts can guide us how to assess user needs, modify technology features, change work practices, and provide proper support structures—it makes for better system thinkers and a best fit of people and technology.

Govers, van Amelsvoort, Moorkamp, and Painter suggest that these perspectives may help bring the concept of organizational choice into the 21st century. These perspectives are visualized in the following figure.

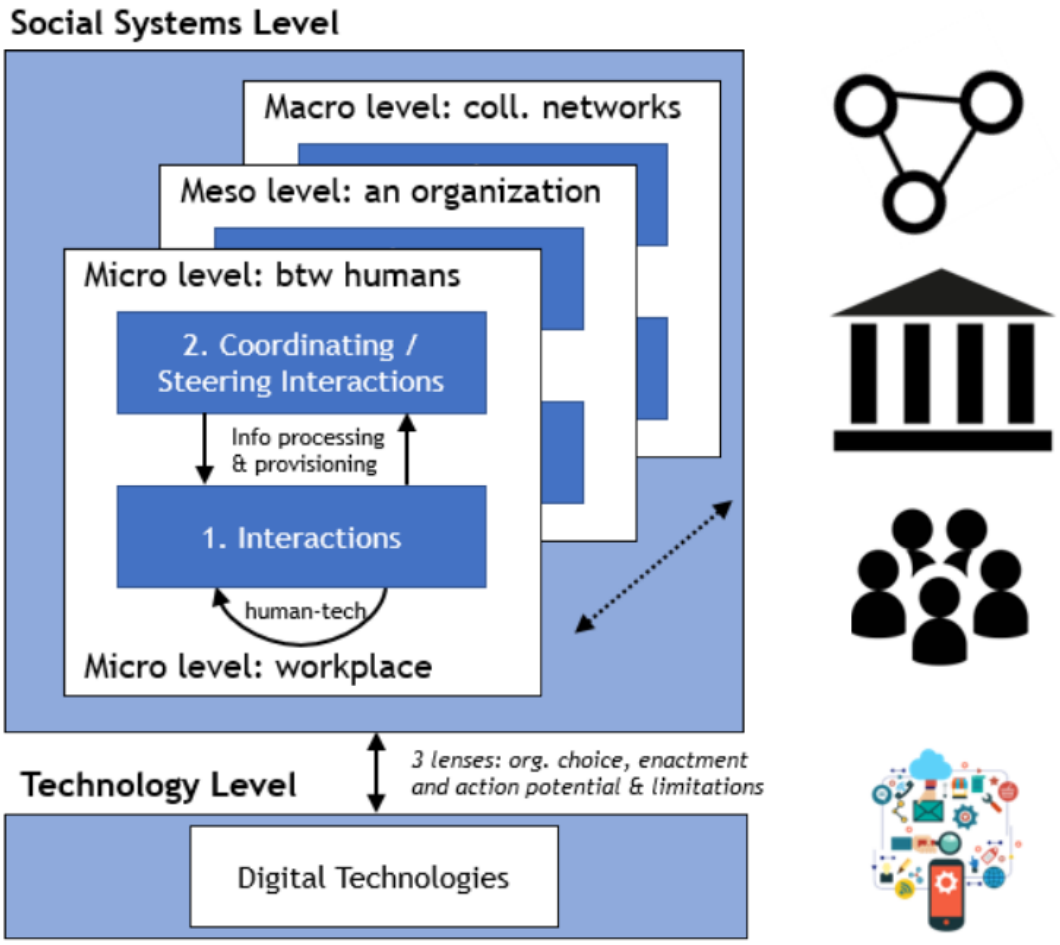


Figure 4: Theoretical foundation for the GSTS Design Meeting 2018

After discussing these perspectives, the overarching message that seems to surface accentuates that, use of new (digital) technologies in organizations underlines the importance of thinking about the concept of organizational choice in the sense that:

- Technologies do not necessarily determine ways of working (of which sociotechnical structure design is a part).

- Getting insight into the dynamic interplay between agency, technology and structure may teach us a lot about potential possibilities and limitations of 21st century technology

- Which may accentuate the need for novel organizational forms to facilitate the process of enactment and reap the benefits of 21st century technological potential.

After a presentation of the theoretical foundation of the STS Roundtable 2018, the participants were introduced to a "technology carrousel". The goal of the carrousel was to get insight in what new possibilities and limitations technologies bring to the organizations and eco-systems design table. This technology carrousel was arranged as a deep dive into six technologies, namely

1. Wearables
2. Cobots

3. Collaborating Autonomous Vehicles
4. Blockchain
5. Rich Data Analytics
6. Machine Learning and AI

These technologies represent different levels related to micro, meso, and macro level in organizations. The Wearables and the Cobot technology represented technology@work on a micro level, Collaborating Autonomous Vehicles and Blockchain represented technology@work on a meso level, and Rich Data Analytics and Machine Learning /AI represented technology@work on macro level. Each of them were presented at different stands where a researcher or somebody working or developing this kind of technology presented the specific technology. However, the experience was that it was difficult to discuss these technologies on specific levels, since some of them are relevant on more than one level and some of the limitations or possibilities related to the different technologies are relevant for all levels.

The participants were divided into teams which visited the different stands in turn. The participants then wrote down what new possibilities and limitations these digital technologies bring to the organization and ecosystems (design) table.

Photo 5: Group discussions during the technology carrousel

Photo 6: Two of the stands at the technology carrousel

After the technology carrousel, it was time for a collective learning process. Team members shared their learnings and deliberated on new possibilities and limitations within their team. These deliberations were consolidated at each level of interaction such as micro, meso and macro level. The key findings were then reported out to plenary.

Photo 7: Jules (NL) shares his ideas with the rest of the group

Key findings on micro level

The different topics related to technology on micro level were grouped into categories. This resulted in categories that varied in size depending on the amount of topics that were merged into this group. In the categorization below, the number reflects the size of the category (1: the largest). The Wearables and

the Cobot technology represented technology@work on a micro level, and make most of the empirical basis for the discussion and findings. On the micro-level we see the following opportunities of new technologies, if the technology is implemented in a social technical way:

1. New technologies can lead to job enrichment: more task variety, new tasks and learning opportunities by working with the new technology

2. Use of new technologies increases knowledge for workers

3. New technologies can lead to higher safety levels and less errors

4. New technologies can help workers/teams making better decisions due to transparency of information and knowledge

5. New technologies can lead to decentralized power due to transparency of information and knowledge

On the micro-level we see the following limitations of new technologies, if the technology is not implemented in a social technical way:

1. New technologies can lead to loss of human interaction

2. Using new technologies requires new knowledge, and may result in increased complexity and information overload.

3. New technologies can limit autonomy if the technology determines the course of action, new technologies can hence lead to less rich jobs/loss of whole tasks if the technology takes over parts of the job and the worker is left with single simple tasks (Taylorism). There is also a danger for increased control due to data gathering.

4. New technologies can lead to vulnerability of groups on the labor market (people who lose their job due to technology taking over their tasks and/or people who are left with non-challenging jobs and/or people who cannot work with the new technology because it requires specific knowledge).

All these categories are interesting hypotheses based on both experience and theoretical discussions within the STS-community. They make a wonderful basis for further research.

Key findings on meso level

Collaborating Autonomous Vehicles and Blockchain represented technology@work on a meso level, and make most of the empirical basis for the discussion and findings. The discussion on meso level is presented in the following bullet points:

- Questions can be raised regarding the usability and the validity of the data that are used by the technologies. Which and who's values do the data reflect? How must the data (as input or output) be

interpreted? Are there cultural bias? Are human elements replaced by data? This is related to decisions and effectivity.

- Learning capacity of AI. Who controls the learning process? There is a danger of false authority.

- Disruption of existing procedures (related to hospitals in particular).

- Ownership of technologies. This had to do with the interest of the suppliers of digital technology. They have their own (and often commercial) interests in the products, and these interests are not always the same interests as the interests of the organization. Who is benefitting? Whose interests prevail? What about internal control by the people themselves?

- Finally; what if the systems fails?

All these points are interesting hypotheses or arguments based on both experience and theoretical discussions within the STS-community. They make a wonderful basis for further research.

Photo 8: Jules organizes deliberations on technology on meso level.

Key findings on macro level

Rich Data Analytics and Machine Learning /AI represented Technology@Work on macro level, and make most of the empirical basis for the discussion and findings. Six categories were captured within which numerous possibilities were discussed:

1. Fading of Boundaries.

2. Speed.

3. More influence in decision-making/participation.

4. Less work to do = More time to focus on other pursuits.

5. Equality/Transparency

6) Health & Safety.

Limitations created by these new technologies. Six broad categories were identified:

1. Ownership/who is in control? The main issue was who owned the data and the algorithms behind these new technologies, and how this was regulated. A related limitation was how these algorithms were designed - whose interests were being served? With these limitations, building trust within a 'community' can be a big challenge.

2. Human Issues. With technologies such as wearables, AI machine learning and cobots. There are limitations related to possible planned obsolescence of job roles, losing skills over time as technology advances, displacement of work and loss of employability. At a societal level, these technologies can increase wealth disparity and lead to a loss of rich connection. Questions were also raised around how ethical decisions are made and who makes them.

3. Knowledge. With the proliferation of data and tools/algorithms, there are limitations related to how quickly people can understand these tools/algorithms and learn how to use this data. Blockchain may not be as accessible since not everyone understands it. A further limitation may involve the competition between AI and human knowledge.

4. Monopoly. A 'winner-take-all' approach in digital platforms may dramatically reduce competition.

5. Black Box/Transparency. Lack of transparency around what happens in the 'black box' is a limitation. How are algorithms developed and by whom? Machine learning is based upon assessments - they could be wrong. AI is based upon what has happened, not what should happen. There is a need for choice.

6. Large scale communication/networking questions.

All these categories are interesting hypothesis based on both experience and theoretical discussions within the STS-community. They make a wonderful basis for further research.

Photo 9: Ray (C) sums up the deliberations on technology on macro level and its impact on organizations

Day two of the conference

After a theoretical discussion on the Technology@Work and the possibilities and limitations related to the different levels in the eco system, it was about time to test some of our assumptions and curiosity on a company case. Day two of the conference was spent at the Europe Container Terminal (ECT) outside Rotterdam. Here we had the possibility of checking out how STS and Technology@Work is relevant for such a company.

Field trip to the Europe Container Terminal (ECT)

We started with a guided bus tour at the ECT centre. Henk-Jan Bax, at the Strategic Management Technological Maintenance Department at Hutchison Ports ECT Rotterdam, joined us on the bus and gave us a guided tour on our way to the meeting center for a presentation of ETC. ECT in is one of the leading and most advanced container terminal operators in Europe. The company handles a majority of the containers at the port of Rotterdam ECT operates the ECT Delta terminal and the ECT Euromax terminal. Both situated at the Maasvlakte, directly on the North Sea. For ECT, it has been important to be a pioneer in the field of automation. Already in 1993 ECT opened the first automated container terminal in the world, which was only imitated in the 21st century. The participants were quite impressed by both the size, the logistics and not least, the use of new technology in order to enhance efficiency and safety.

Photo 10: All the participants at STS Roundtable 2018 at the site visit

Photo 11: Hank-Jan Bax presents Technology@Work in a STS perspective at ETC

Bax presented which technologies are applied within ETC, why ETC has invested in these technologies, how they have integrated humans in the technological design, in addition to his views on what is going well and what needs improvement, and which limitations they are facing related to digital technologies.

It is clear that ECT operates in an environment highly exposed to electronic crime such as hacking. ECT is one of the larger companies that need to take increased use of digitalization into account in order to stay viable. However, increased digitalization will make ECT more vulnerable to hacking from actors who

want to harm freight traffic. As one of the largest ports in Europe, the ECT is unfortunately an attractive target for terrorists and others who want to control important infrastructure.

On a micro- and meso level, Bax emphasized the need for a skilled workforce, and how necessary skills have changed over the years. Thanks to technological development, there is a need for fewer employees, and the expertise of employees is largely about managing and controlling technology and less manual work. A powerful example was the handling of cranes. Earlier there was one crane operator per crane, while it is now possible for one crane operator to operate several cranes at the same time in addition to more use of remote operated cranes. The result is improved safety, lower costs, and improved efficiency.

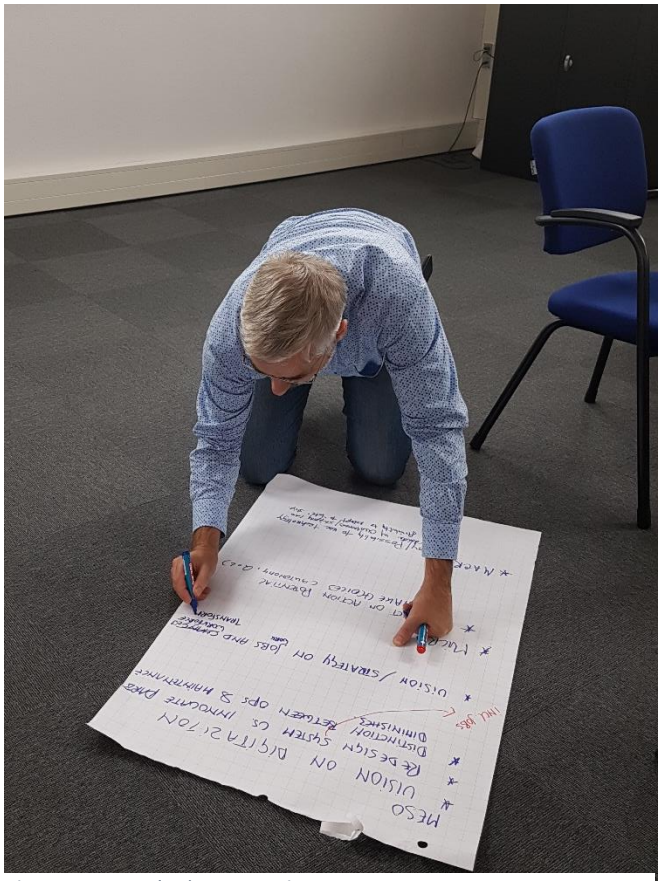


Photo 12: Friso (NL) in action!

After the presentation, Bax took us on a longer bus tour where the participants could see the technologies at work and get a better understanding of the organizational opportunities and limitations these technologies bring.

The field trip ended with a deliberation session and open forum. The goal was to get insight in what new possibilities and limitations digital technologies bring to the organizations design table, in this brownfield context. The participants worked in teams in order to formulate questions for Henk-Jan Bax that would help us answer the conference question; *what are the possibilities and constraints of new (digital) technologies and how do they affect the (process of) organization and ecosystem design?*

These group discussion were motivated by some issues and challenges emphasized by Henk-Jan Bax:

- Process-optimization. How can we optimize our processes to get the maximum out of our resources? (balance ownership/flexibility, knowledge management)?
- Product-optimization. How do we keep our knowledge on the right level with aging assets and new technology? How can we use new and existing technology to achieve process optimization (design for maintenance)?
- Sense making of work changes. How do we control the impact on appreciation of an individual or a team, when a person is partially or entirely replaced by technology?
- Technology and human interaction do not always integrate as expected. How do we measure and optimize the integration of technology and human interaction in our processes?
- We preach and practice “evolution not revolution”. Is that a sustainable approach in our change management process?

- The impact of technology grows beyond human capacity in our processes. How do we adapt out organization to changing roles where technology is no longer supporting but getting in the lead?
- The position and dependency of suppliers is increasing. How do we manage the role of suppliers in our organization and stay in control?

The groups worked on this, and it was connected to the three levels, micro, meso and macro when this was useful. On a macro level, the majority of the groups emphasized that new technology increases efficiency and that it in some cases also drive quality of life in a positive direction since work is presented and understood as "high road skills". One group suggested that increased digitalization and the introduction of new technology may challenge established power structure. Less physical and manual tasks may improve the position of women and thus introduce new and interesting jobs for younger employees and/or women. However, some participants also emphasized that skills might be reduced since some skills that have to do with tacit knowledge or physical/bodily knowledge disappear. In addition, technology might be the leading variable, not people. The challenge is that organizations like ECT manage their change management in accordance with solely technological possibilities, and not human possibilities or requirements. Also, some groups emphasized the ability to use technology to coordinate with customers/shipping e.g. flexibility to adapt to "late" ships. Some emphasized the reconfiguration of the economy and how the introduction of digitalization and new technology may lead to new business and opportunities in addition to social shifts.

On a meso level, some of the groups emphasize how important it is to have a vision or strategy as a company on job and workforce related to the use of new technology, the development of enactments, in addition to a strategy on how to integrate "silos" within the company (building and make use of multidisciplinary teams).

On a micro level, some of the groups emphasized that the introduction of new technology also leads to skill development among the employees – here exemplified by the crane operators. However, it is a danger that "charming/cool" and engaging new technology may lead to a situation where necessary skills are ignored basically because new skills are understood or presented as more important or even "everything". Some participants also emphasized that digitalization and new technology may lead to alienation, lack of ownership, and reducing jobs to involve the most boring tasks.

Photo 13: From the group discussions at ETC

Photo 14: Henk-Jan Bax presenting the site

Conference dinner

The second day of the conference ended with a joint conference dinner in collaboration with the research conference, International Workshop on Teamworking (IWOT). Like the Global STS Design Network Meeting, IWOT was partly organized by TNO. IWOT has established itself as a multi-disciplinary arena for researchers of teamworking. The attendees are a mix of senior academics and junior researchers, but also of practitioners. We decided to arrange for a joint dinner since there are many overlapping areas of interest between the two networks. For instance, IWOT's main theme in Leiden 2018 was Technology@Work.

Photo 15: Meeting among STS- and IWOT friends. In the left corner you see the president of USI and member of the 2018 Design team, Jesper Hanssen, fighting nature like a real Dutch

Day three of the conference

The last day of the conference started with a debrief of the site visit the previous day. Then the discussion turned to an awareness on the ethical dilemmas that come with these new technologies. This was carried out as a workshop led by Carolyn Ordowich and Douglas Austrom. The purpose of this workshop was threefold:

- To raise awareness of, and explore, ethical considerations (challenges, opportunities - both intended and unintended) that arise in the development and application of digital technologies.
- To explore principles already in existence to counteract techno-determinism.
- To examine our own awareness of these ethical issues and how to address as a designer.

By using the Haigh Moor Colliery and Eric Trist's perspective on choice and the Techno-Bureaucratic Imperative as a starting point, Ordowich and Austrom argued that Digital Technology will either be constraining or liberating.

Digital Technology may be constraining because:

- It is perceived as diminishing life and human dignity
- Digital Taylorism and an insidious extension of bureaucratic design principles … pervasive use of cameras, facial recognition, wearables/ implantable … "Big Brother" monitoring of all our movements
- Reinforce C&C v1 for how we coordinate human endeavors…

Basically, Digital Technology leads to *command and control.* But Digital Technology may also be liberating because it:

- Give people and life the potential to flourish as never before.
- Positively augment and extend human capabilities … facilitating horizontal coordination while reducing transaction costs to virtually zero.
- Enable C&C v2 for how we coordinate human endeavors …

Basically, Digital Technology makes the opportunity to connect and collaborate.

The constraining and liberating characteristics of digital technology was discussed through a number of different cases, particularly the development in China.

Ordowich and Austrom then proposed a model they called the STS First Principles:

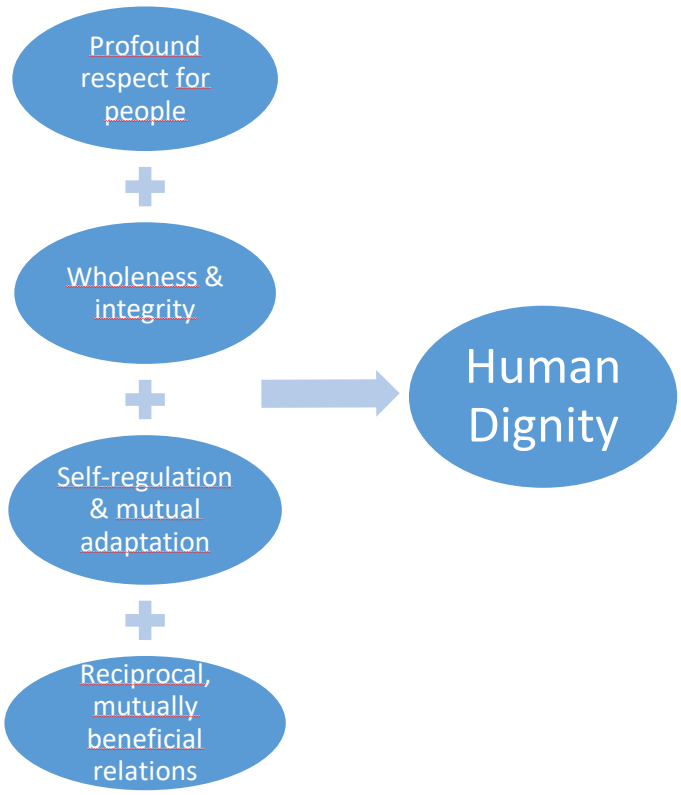


Figure 5: STS First Principles by Ordowich and Austrom.

After the presentation, the participants organized in groups and discussed: "What are the ethical principles that you believe we as organization designers need to incorporate in our work in order to challenge techno-determinism and the Digital Coalface?"

In the Future ….

*Will we will look back at today as a turning point towards **humane design** … when we moved away from technology that extracts attention and erodes society, towards technology that protects our minds and replenishes society?*

Photo 16: Taken from Ordowich and Austrom's presentation

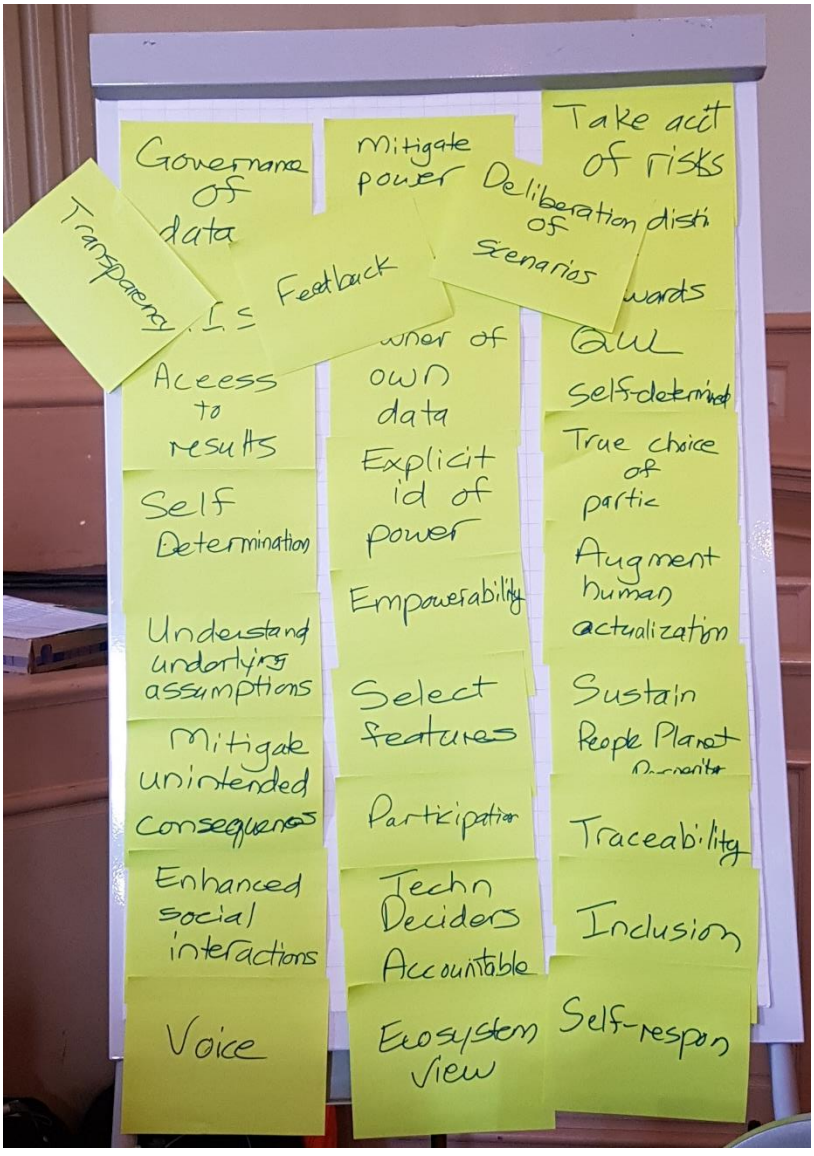


Photo 17: The summary if the group discussions on the ethical principles that organization designers need to incorporate in their work in order to challenge techno-determinism and the Digital Coalface.

After lunch, the participants were invited to take an individual journey among all the flip charts, drawings and models that were produced during the conference, in order to develop an understanding of the most important opportunities and limitations that these new digital technologies bring to the organization (design) table. The participants were then asked to write down the most important opportunities and limitations and point out whether these opportunities or limitations affects the Quality of Organization, Quality of Worklife, or Quality of (external) relationship, and then discuss them in the groups.

A selection of points from the flip-charts:

Opportunities	**Limitations**
New job opportunity	Technology deskills
Connectedness New, disruptive products/services/business models	No regulatory power towards the big platforms (by law and politics)
Learn how to use technology in organization design processes	Hidden interdependences in ecosystems
Explore + and – of technology to make conscious and informed choices, knowing implication of decisions	Boundaries of human capability
Ask what type of organization we are/want to be to match choices (technological)	Potential loss of craftmanship
Co-design technology and workplace simultaneously	Loss of control
Digital Technology can help synthesize ideas	Ethical boundaries
Decentralized trust	Less inclusion
Flatter and more effective organizations	People habituate to being externally monitored
Better/faster decision making	People have to work harder
Decreased complexity	Need better education for remaining workers (upskilling)
There will always be a role for humans	More unemployment (esp. for semi-skilled)
Bringing IT knowledge into organization design	Risks associated with increased dependencies on technology
Coordination and cooperation	Possibility of more stress
Speeding up and increase quality of decision making processes	Fewer jobs
Knowledge sharing and learning	
Enable decentralization and enhance autonomy	
Wisdom of crowd	
Reduced downtime	
Knowledge from many sources	
Higher level of skill	
Less bureaucratic	
Better problem solving	
Potential for healthier people	
More efficient base of access to maintenance info	
Opportunities for woman and youth	
Creating integrated ecosystem/suppliers etc.	

Photo 18: Journey among the flip charts

Finally, at the end of the meeting, the participants sat down to deliberate on what we had learned over the days, and to suggest and discuss principles, rules, methods, and possible research topics: How do our experiences, insights affect our profession? What research questions emerge from here?

Photo 19: Deliberation process led by Bert, Betsy and Doug.

For the GSNM meeting of 2018 the overarching topic of the conference was new (digital) technologies and the impact of such developments on the organizational design process. For Socio-technical systems (STS) designers, the reciprocal influence of technological system on the social system is of course very relevant. The goal of the conference was to elaborate on the possibilities and pitfalls of these new technologies, learn about their impact on organization design and the design process, in addition to offer an opportunity to apply these learnings. This approach built on the meeting of 2017, which included an ecosystem perspective on the application of technology. The meeting of 2018 took technology and the

impact of new technology to a new level, and included all aspects of technology in the different levels of the ecosystem perspective; micro, meso and macro. Opportunities and limitations of the different technologies were discussed and deliberated both as theoretical concepts, through empirical case studies (ETC) and analyzed through a variety of lenses summarized in the concept model presented by Govers, van Amelsvoort, Moorkamp and Painter, all in all presented through the slogan Technology@Work!

However, both the ecosystem perspective of work and all the perspectives of technology, are huge topics that probably deserve much more attention and deliberations within the future STS-community. This has been a start – a scraping of the surface.

Photo 20: Part of the design team of Global STS Design Network Meeting 2018

The design team of the Global STS Design Network Meeting 2018 would like to thank the community for giving us this opportunity. We are very grateful for all input, ideas, suggestions, topics, contributions and energy from the participants before, during and after the meeting. We are looking forward to the continuation!