Socio-technical systems as "machines for learning"

Kaspar, Heidi and Claudia Müller

Careum University Health, Switzerland; IT for the Ageing Society, University of Siegen, Germany

heidi.kaspar@bfh.ch

Abstract. In this position paper, we take a concept – or parts of it – and run away with it (Mol 2002) to explore its potential to better understand the non/appropriation of technologies by people in later life. We introduce the concept of the city as a machine for learning developed by Colin McFarlane (2011) in the field of urban studies. We identify elements we consider inspiring for the study of socio-technical systems, translate them to smaller entities of human-technology interactions and test their usability to analyze how older people in later life integrate digital technologies in their everyday lives. We do so from two distinct vantage points, i.e. empirical contexts: A participatory design project of a neighborhood platform and related privacy issues from the perspective of older tenants, and the introduction of a new automated emergency call system in seniors' apartments in a serviced senior living facility. We conclude with the suggestion to understand the concept "machine for learning" as a normative notion and a claim to accept the challenge it implies.

1 Introduction

In the field of technological innovations to improve quality of life in later life, learning seems to fail both on the side of the developers and the end-users of technologies. Science and Technology Studies demonstrating engineers' misconceptions of end-users – sometimes despite user inclusion (see e.g.
Neven 2010) – are abundant. So are developers' laments about older people's unwillingness or inability to see the benefits technology could bring to their lives. If we understand learning as a process of producing new knowledges through the transfer and translation of knowledge between different or even disparate contexts, rather than an isolated and individual cognitive act of processing information, this double failure collapses into one malfunction: the unsuccessful, sometimes even untried translation of knowledge.

Translation is a key aspect of Colin McFarlane's (2011) conception of learning, together with coordination and dwelling. McFarlane (2011) developed his conception of learning for the field of urban living and planning. He argues that cities are key sites to study learning for life because the city constitutes a context that constantly prompts – actually demands – learning, because cities are

> *"spaces of encounter and rapid change, of concentrations of political, economic and cultural resources, and of often perplexing unknowability – [they] are constantly sought to be learnt and relearnt by different people and for often very different reasons, from coping mechanisms and personal advancement to questions of contestation and justice" (McFarlane 2011: 362).*

We translate the conception from the city to socio-technical arrangements for people in later life, because we think that many of the mentioned characteristics apply to socio-technical systems, too, though differently. Translation, hence, requires analytical care. We elaborate why we think translation is worth the effort and suggest that understanding socio-technical arrangements as 'machines for learning' bears the potential to fundamentally and sustainably overcome some of the key hurdles in the development and appropriation of technologies for people in later life.

2 Machines for learning

We run away with McFarlane's (2011) conception of the "city as a learning machine" and state that any entity or environment that spurs and requires learning on a constant and everyday basis can be viewed as a machine for learning. A machine is an apparatus that does a particular type of work (Cambridge Dictionary, Dictionary.com). Usually that work involves transforming things such as cleaning dirty clothes or cutting a loaf of bread into slices. A machine for learning does the work of prompting learning, in other words: providing or creating environments and situations as opportunities for learning.

Cities can be viewed as socio-materio-technical systems, but our focus here scales down to a city quarter and to households and people with some sort of functional limitations, often due to old age. Hence, we are dealing with

environments that are not as complex, diverse, contested, opaque and fast-paced as cities, but they are multifaceted, polyvalent and changing, particularly in later life when physical and cognitive functions start dwindling and therefore the home in- and outdoor environment is experienced differently.

In the field of knowledge management and economics, learning had been given a focus in regard to cooperation structures in IT industries, e.g. with concepts such as "learning regions", "regional innovation", or the shift from the so-called first wave of knowledge management (i.e. storage of knowledge in IT systems) to the second wave of knowledge management acknowledging the socio- cultural embedding of knowledge production, transfer and learning with concepts such as "communities of practice" (Wenger 1998) or "networks of practice" (Brown & Duguid 2001). So far, these perspectives have hardly been elaborated for the area of IT-supported living in higher age; the focus has mostly been on the area of work and organizational learning from an economic perspective.

Living labs as environments of co-production and co-design among various stakeholders also include perspectives on joint learning, and recently, a focus on sustainability in IT design emphasizes a joint perspective on technology design and appropriation within local communities (Meurer et al. 2018). However, we still are lacking concepts which take the more subtle and mundane learning processes of all stakeholder groups into focus, and especially of those of the very end-user group, older adults.

3 Translation, coordination and dwelling as three interrelated processes of learning (in) socio- technical arrangements

In McFarlane's (2011) conception, learning consists of three interrelated processes: translation, coordination and dwelling. **Translation** describes the process when knowledge moves between different contexts. Knowledge is contextual, i.e. embedded in socio-material contexts, that is spaces, of which it is productive and a product. Translation is the work performed when knowledges move, that is get de- contextualized at one site and re-contextualized at another site. "[T]ranslation emphasises the spatialities through which knowledge moves and seeks to unpack how they make a difference, whether through hindering,

facilitating, amplifying, distorting, contesting or radically repackaging knowledge" (ibid: 363).

When engineers read about age-related visual impairments in Geriatric journals and accordingly adapt the design of interfaces, knowledge moves from medicine to engineering. On the way, it gets transformed and it transforms engineering.

Translation engages various sites, actors and action and hence requires **coordination**. Coordination is the effort taken to enable learning by "linking different forms of knowledge" (ibid: 373). A conference is a classic example of coordination, so is the field test of a prototype.

While learning can be structured through coordination, learning also works through aesthetics, i.e. sensing and inhabiting the world. McFarlane calls this process of learning **dwelling**. Knowledge shapes how we perceive and sense our environments; learning entails "the educating of attention" (ibid: 373) and shifts in ways of seeing.

A key strength of McFarlane's conception of learning is his understanding of translation, coordination and dwelling as constituted through and constitutive of **everyday practices** and **materialities**. Another strength is the attention to **power relations**, inequalities and exclusions inherent in learning. This sensitivity to power allows seeing negative aspects and detrimental effects within the predominantly positive notion:

- People might call it learning, but the covert motivation is to confirm – and legitimate – what is already known (McFarlane 2011: 362).

- «learning may be reduced to a direct or indirect process of imposition or instruction rather than dialogue and reflection" (ibid: 363).

4 Empirical examples

Co-design of a city quarter portal: privacy issues

We conducted a long-term participatory design (PD) project with tenants of a city quarter in a German mid-sized city. The project aimed at establishing socio-technical measures to support mutual help and social inclusion. One of the measures included the development of a web-based neighbourhood portal. We developed the portal in a participatory design process together with interested, voluntary tenants as our co-designers. All of the interested tenants

were between 60 and 86 years of age and had no prior knowledge in the area of new media and ICT.

For over 36 months, we conducted regular workshops with interested elderly tenants (and younger ones in a much smaller number) on the one hand to investigate the approaching and handling of tablet PCs and online services and thus, to enable the establishment of a shared common thinking space for the later usage of the portal. On the other hand, our measures aimed at preparing all participants for taking an active role in the participatory design process (Hornung et al. 2017).

In the course of the appropriation of the tablet PCs which were handed out to the participants, in personal chats with the participants and during the PD workshops and common prototyping endeavours, topics repeatedly emerged, which can be allocated to the current privacy discourse. On the one hand, this happened due to our efforts to prepare the participants for potentially arising threats in the use of ICT. On the other hand, the participants uttered security concerns by themselves. We conducted several interviews to firmly understand the individual behaviour, attitudes and concerns regarding the information flow of the participants.

During this study, we were able to learn about the participants' privacy and safety concerns and their related measures they apply in their every-day life to keep their environment safe. In mutual discussions and observations (the older participants observed how we, the researchers, behaved in our own manipulation of internet tools and we observed the local actions of the participants) activities of translation, coordination, and dwelling took place.

Translation: Introducing mobile devices and internet tools, such as social media and the platform to older adults, who were not familial with those applications, first of all made us aware of our responsibility. We not only needed to hand over the devices and possible usage concepts, we also felt the need to help the participants to navigate the new "online world" in a safe way. One issue was with passwords: We introduced several strategies which may help in dealing with passwords, e.g. mnemonic tricks. We also handed over a notebook and a folder for sheets to help keeping their passwords in one place. Here again, we had to decide for a working strategy: usually one would not recommend to write up a password.

However, due to their problems with reminiscence we did so in this case.

Coordination: To set up a continuous learning and also support space between the bi-weekly meetings, among others, we introduced the instant messenger app

"telegram" and showed the participants how to make screen shots and how to send them to us. By this, we were able to help with problems with the tablets from remote. It turned out that telegram was being used in manifold ways by the participants and that they started to communicate with each other via the tool, e.g. sending birthday wishes, wishes for a nice week-end or sending a "hello" when being in the hospital. The messenger served as a linking tool between participants and researchers and was being used intensively, as problems with the tablets occurred in manifold ways. The tool served as a digital learning and communication space and enabled learning processes as "mimicry" in the beginning of the process, i.e. participants saw how the researchers communicated digitally and they partly copied this when formulating their messages.

Dwelling: In regard to the question of "how will I be seen by other tenants in the online portal", it turned out that the participants applied a lot of "analogue" privacy-preserving measures which they then transferred to their possible usage of the portal. "My home is my safe space", "When I close the door, then I am safe", or practices to cut out the address part from paper envelopes before putting them into the publicly accessible wastepaper box were such mundane activities. Interestingly, there was a difference in thinking about and feeling affected by adverts in the participants' email inboxes: Here, their general method of handling unknown correspondence was to mostly ignore and immediately delete it. Usually participants did not think further about these emails and did not question them as much as the physical letters. This may hint at a difference between the negotiation of privacy boundaries in their personal *physical territory* which was of high importance and was considered potentially harmful, and their *digital territory* which they just recently started to explore and construct and where such potential threads were not perceived.

The examples show socio-technical approaches to privacy and security issues in the elderly by taking in the perspective on privacy as socially negotiated boundary management and disclosure in a social system as well as demonstrating ways of conceptualizing the challenges in building systems for the elderly.
Mutual learning processes were possible between researchers and participants in the bi-weekly workshops and via the instant messenger. Privacy and security issues were transferred from the ways people were navigating their "analogue" relationships and activities in their local environment and gave much food for thought for reflecting and testing out digital tools for the

neighbourhood. Further, the researchers themselves and their digital practices were learning sources for the participants. A lot of micro-learning activities happened which – too often – happen to be neglected in AAL approaches.

5 Introducing a new automated emergency call system to residents in a serviced senior living facility

The setting is an institution running a nursing home and an adjacent unit with serviced apartments for seniors. The institution promotes independent living and warrants security. Contracts with residents include a 24h-emergency call service. In autumn 2019, the current system was replaced by a new automated system: Motion detectors note motions within the apartment, door sensors note absences, a mobile device allows actively calling for help and an interphone allows talking to nurses answering emergency calls. The introduction had been planned considerately, with learning being a key element, though limited to certain occasions and directions of knowledge transfer.

Coordination: Four occasions for learning have been set up:

- A person from a facility that has adopted the same technology recently has been consulted to learn from their experiences in implementing the new system.

- An accompanying study has been commissioned to evaluate the implementation processes to learn from the experience for the implementation in other facilities.

- An event to inform residents has been organized.

- Individual teaching took place at the same day of the installation.

Translation and dwelling: The former two occasions constitute coordinated occasions of translation: Consulting and evaluation study facilitate the movement of knowledge between care institutions. The latter two occasions were designed to inform and teach seniors about the new emergency call system. The 'look-and-feel' of the new system was given priority. At the information event, the system's components were passed around while explaining how it works and how it differed from the current system. After installation, a social worker visited each apartment, explaining again the components and testing system it to reassure

residents they know how to handle it and *that* it works at all. Through collective information and individual teaching/testing the institutions made sure that residents were in a position to intellectually understand and practically know how the system works. However, the potential of these occasions for the institution to learn about residents' needs was missed, as these occasions had been designed as one-way learning occasions, only. After the explanations from a representative of an institution that had already implemented the system, there was room for questions. Several residents articulated various concerns with respect to data protection and privacy as well as the mandatory use of the system. These concerns were impatiently and flippantly shrugged away, rather than answered. This is not just unsatisfactory for residents, but a missed opportunity to learn about concerns and needs. The articulated fear of being watched and surveilled in the apartment can be understood as a desire of untouched privacy and the question regarding the modalities to opt-out as a manifestation of autonomy. For an institution promoting independent living for people in later life, these are essential moments to learn about residents' contextualized priorities. Essential questions such as: Under which circumstances is somebody ok with giving away some of her/his privacy? Can be discussed, negotiated and deployed to foster autonomy as a lived quality, rather than an element in a contract determining people's living and working conditions.

With a more holistic and practice-oriented understanding of learning as suggested by McFarlane (2011), the learning potential could have been exploited more fully. Furthermore, the introduction of the new technology could have been used to empower seniors rather than patronizing them.

6 What we learn from the empirical cases – what are socio-technical arrangements as machines for learning?

McFarlane (2011: 361f.) suggests that his conception of learning can be taken elsewhere and applied to what he calls non-urban contexts. But what do we gain with this novel conceptual approach for the better understanding of the non/appropriation of technology in later life? The notion of "machine for learning" is not a particularly accurate definition or description of socio-technical systems. We suggest it as a notion with a normative implication: Socio-technical systems should be designed, developed, distributed, implemented and

appropriated as machines for learning. This seconds McFarlane's (2011: 373) statement:

> *"But the critical purchase of the concept of urban learning is not simply in a call to know more of cities, but to unpack and debate the politics of knowing cities by placing learning more centrally on the urban agenda".*

The concept of "machine for learning" opens up a corridor for coupling design activities and learning activities. In socio-technical design approaches, the concept of appropriation already includes a focus on learning. However, micro processes and mutual learning perspectives are not spelled out in detail so far. What is especially lacking is an engagement with mutual learning processes with older and not technology affine persons in a long-term, sustainable design-oriented perspective. It is all the more important when thinking about regional or city quarter-oriented approaches, and we think that the concept provides new viewpoints for fruitful discussions.

However, we also see limitations: technologies as machines for learning require a certain level of abilities to learn and interest in engaging with the digital sphere. When we think about persons with limited cognitive abilities, then the concept itself will have limitations. The suggestion of a new conception of digital media as machines for learning can thus not be transferred to all kinds of AAL technologies.

7 References

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