Supporting Configuring as Appropriation Work

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1 Background

Based on two different but complementary cases – the *'mixed media case'* (architectural design work) and the *'wireless call system case'* (hospital work) – we argue that taking advantage of the potential that configurable systems offer may require attention to several 'qualities of use'. Here we provide further elaboration of the concept of configurability, which we have suggested elsewhere (Balka et.al., 2005).

1.1 Configurability of space and technology relations

Different tasks may require different spatial set-ups – people may need to be able to configure their workspace and the equipment they need with ease (this has implications for the design of the space and the artefacts that populate it). Different tasks may require different configurations of hardware and software, input and output devices, etc. The wireless call system is made up of a combination of telephone console, coloured lights, wireless phones, and 'alarms' that can be triggered in different places (patient bed, bathroom, and so forth), or can be connected to different devices, such as beds or intravenous pumps. It is

also hoped that the wireless handsets will help quiet the ward, by replacing alarms audible to all with alarm calls heard only by staff. The system (on principle) supports varying physical landscapes of alarms and displays, which, if connected with the mobile phone system, can be accessed from any place.

1.2 *Configurability of connectivity* (of people, places, materials)

Configurability also has to do with the possibility for people to arrange and re-arrange their connections to other people and to particular places, taking account of e.g. a varying spatial organization of activities or of changing patterns of availability. The wireless call system was intended to reduce time and space constraints associated with care delivery in a complex team environment, and in doing so, to improve connectivity—of patients to staff, and staff in varied locations to one another. Configurability also may refer to a capacity for assembling and re-assembling materials (design representations, patient information) so as to shift perspective, gain a particular point of view, support specific activities, and so forth.

1.3 Configuring as direct engagement – transparency and accountability

Designing environments so that users can develop an understanding of their choices, receive feedback about the implications of their interactions with the system, and that their actions are available and understandable to others, is a huge task. In the 'mixed media case', architectural students' direct, bodily engagement with artefacts makes configuring a (publicly) visible, hence accountable activity. Students experimented with changing the properties of a model, by applying colour, inserting movement and context, and varying its dimension in relation to other objects in the physical space. Using barcodes as a single interaction mechanism proved to be a good decision. The barcode technology was easy to understand and transparent. Barcodes were e.g. integrated into CAD drawings, cut out, glued onto posters or models, annotated (students e.g. created their own manuals), distributed in space, used for configuring input (images) – output (projection surfaces) associations and for setting keywords (in a tangible way).
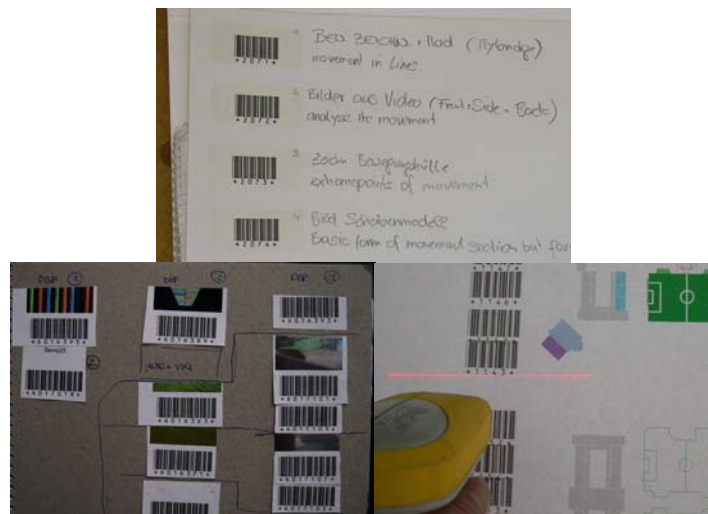
We also could see that the potential of physical interfaces (in this case barcodes on posters, models, and other parts of the physical environment) reaches beyond 'mere embodiment'. They provide people with the means for producing configurations that change spatiality, interactivity, and physical landscape in ways that help experience, explore, present, and perform.

1.4 Configuring as part of technology use

Providing organizational resources for configuring as part of everyday work practice is another challenge. Connected with this are issues like how much work has to be done to configure and re-configure; can it be done by end-users or is this a work of specialized personnel and are these people available, and so forth? In the 'mixed media case', configuring was part of the pedagogy. Students were asked to continuously transform and 're-program' familiar settings. *Configuring* was encouraged, and was hardly distinguishable from proper *use*. Students' configuring their workspace, configuring and selecting textures to be 'painted' onto their models, configuring input and output devices, and so forth happened as part of the design process.

2 Configurability

We see configurability as being intricately linked to the fact that in an evolving environment the boundaries of activities are continuously moving. The introduction of new technologies necessarily involves reconfiguring—often the decision to use new technologies in a particular work setting is undertaken specifically to serve as a catalyst for altering or re-configuring work practices. While this fact may be purposely built into learning situations (such as in our design students case), it may be ignored, hence poorly supported, in other cases (such as the wireless call system case). Here, possibilities for configuration of the

system were shrouded in a lack of transparency about the range of configurable features. Local adaptation and configuration (e.g. that the alarm that signalled when a bed was being unplugged from the wall could be turned off) were at odds with core organizational requirements. Hierarchical organizational relations and the multiplicity of stakeholders deterred configurability. Our conclusion from this is that *configuring organizational relations* is an important resource in supporting highly configurable technologies.

Another conclusion from our study is the need to take a step further and unravel different meanings of configuration and of the contexts in which configuration takes place. In doing this, we are aware that we use different terms without being able to make a clear distinction between them:

- We use the term *configuring* for all activities that allow users to assemble available resources to handle their tasks. Rodden *et al* (2004) discuss configurability in relation to two organizational features of interaction: placement – how to take account of the local spatial organization of activities; and assembly – how to facilitate the configuration and reconfiguration of artefacts and media. Newman et al. (2002) introduce the term *'recombinant computing'*, which builds on tools (protocols and techniques) and interfaces for making components interoperable.

- *Customizing* denotes activities that are necessary to make a device or system function in a particular environment, down to very small details that matter to users. Many systems are designed for a certain degree of customization, offering specific features (Andriessen et al. 2003).

- We talk of *tailoring* in the case that *software* is customized to the needs of users. This often is to do with defining, sharing, and distributing 'standards' (forms, macros) within the organization. It may involve building/modifying buttons, to writing macros, and programming on the PC, manipulating otherwise 'invisible' codes (Trigg and Bødker 1994).

- These activities may involve *appropriation work* – users fitting a (set of) devices, a piece of software to their needs. Bossen and Dalsgaard (2005) distinguish between weak appropriation (flexible appropriation at the level of the artefact) and strong appropriation (changing the technology in ways that go beyond the intention of the designers).

Obviously the architectural students' configuring options differ from those open to the hospital staff. This is partly to do with the nature of design work that makes particular configuring options relevant and attractive, partly with the technologies that were made available to students (at a working prototype level), partly with the fact that their work environment is small, open and experimental.

Configuring the wireless call systems happens within a complex organization and it involves different internal and external (vendor) stakeholders. It may involve different levels – technical (system, component, device) and organizational (ward, IT department and so forth) - and happen at different stages

of the system development and implementation process. Each type of configuring requires a specific set of skills, depending on the activity, and attention to different resources necessary to successfully carry out configuration in relation to each particular type of configuration.

3 Placement - taking account of the local spatial organization of activities

For example, we observed how being able to configure the work environment for a diversity of uses, from solitary work to group discussions, performing, presenting, and building models, is an important aspect of design work. While some spatial set-ups lend themselves to students' quick and easy reconfiguring, others may require high degrees of precision, hence time (such as, for example, fixing the position of beamers and projection surfaces in relation to an artefact). Space on a hospital unit needs to be reconfigured in order to support the use of the wireless call system. A place for storing the devices needed to be created, as well as a place for charging handset batteries, which required the cooperation of building maintenance staff.

4 Assembly – configuring artefacts and media

Students configured input and output devices in support of their design activities and combined technical and spatial components to explore new ways of browsing and searching multimedia database. This is an activity that takes place as part of ongoing work but requires some preparation. At the beginning of each work shift each staff member had to configure the handset they would use for the day. This entailed linking the rooms/ beds they had been assigned to the handset they would carry for the day, and determining which staff member would serve as their backup for calls that went unanswered during breaks and busy times.

5 Customization – appropriation in the use context

Customizing the length of time the wireless handset rings before going to the backup nurse is an example of a restricted set of features to be adjusted by end users; another one would be varying the colour of different types of alarms (associated with the patient bed, the patient's body, the bathroom and so forth). This may happen from time to time to adjust for changes of work practice, staffing level and so forth. In the hierarchical environment of the hospital unit, engagement in this level of customisation was restricted to management staff, who

sought input from representative users. Enacting this particular feature required that a vendor representative alter software logs, and, although this work could have theoretically been undertaken by hospital staff, in the case we observed, it was reserved for the vendor.

6 Customization – fitting the application to a particular setting

Customizing the sign-on and sign-off process to different devices (the unit's computer, its wireless phone system console). This is an activity that takes place at implementation, involving the vendor, technical staff and users. It usually requires some programming (tailoring). In an environment where each implementation integrates a slightly different constellation of devices together with the specifics of what is actually possible in a given setting determined by a myriad of factors, little or no documentation may exist about the exact scope of customization that is possible.

7 Getting an integrated system to work

An example would be getting the wireless network on the ward to interface with the wired phone system. This happens at the pre-pilot or pre-implementation level, with technicians, IT staff and gatekeepers for component systems solving the complexity or messiness of particular implementations.

8 Getting a component system to work as part of an integrated system

Setting up the phone consoles at the unit desks and setting up the wireless LAN. This is part of the initial equipment set up or modification required as multiple components are integrated. Most of this work would be carried out by technicians. Decisions made during component set up may need to be altered when individual components are brought into an integrated network.

9 Elaborating design patterns

In the design setting, users combined technical and spatial components to explore new ways of browsing and searching. Here we talk of creating a *design pattern* - a particular combination of devices and services which may serve as a relevant exemplar from which mixed media environments for other tasks and in other

settings can evolve (Ehn et al. 2004). A design pattern may illustrate what is possible conceptually, however, achieving a specific design pattern in a new setting may rest on resolving configuration issues identified above in new ways. Different configuration activities may be required from one setting to the next in order to achieve the same—or a similar—result.

10 Creating a sustainable structure for implementation, use and configurability

Integrating technological components in new ways can pose challenges to existing roles, and can both alter and introduce new means of responsibility and accountability. In the wireless call system case this would include clarifying who will follow up with problems related to batteries; or defining responsibilities as well as options for staff in case of problems and breakdowns. One example is drawn from a phenomenon we came to refer to as 'phantom calls' that were not taken very seriously by the vendor representative who said they would probably disappear again. But eventually he was forced to check the system's software logs. He found an error in the configuration, which made the system attempt to call the phones up to one hundred times if they had been receiving calls while they were switched off (as happened frequently when staff took breaks). Creating such a sustainable structure primarily involves management.

Configuring systems so that they work together and offer users a seamless use experience requires that configuration occur on numerous levels, which we have attempted to outline above. Each type of configuration involves different constellations of actors, who come together in different groupings, governed perhaps by different interactional norms or relations, which also must be addressed or accounted for in efforts to sustain highly configurable systems.

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