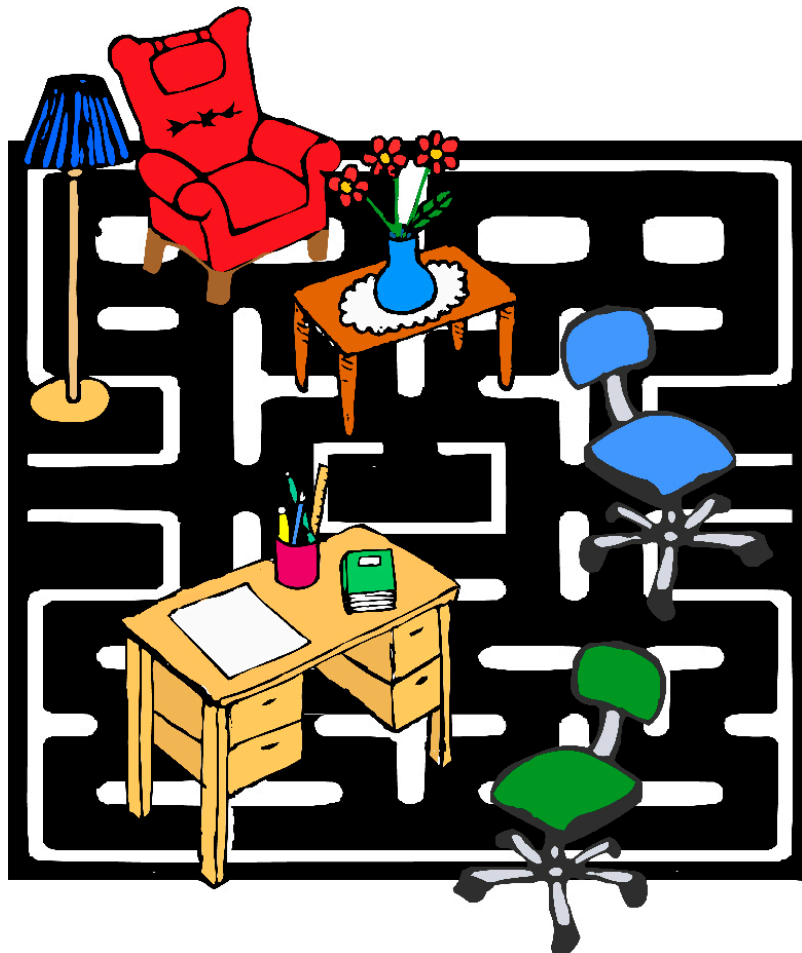


Computer's Workspace

– users' views on working in graphical interfaces

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Introduction

We are spending more and more time working in graphical user interfaces. Many people work daily in a computer environment, and many spend more time in this digital activity room than with their colleges. Working with a computer can be expressed simply as handling specific software with its icons, menus and tool pallets. A more compound and, to my way of thinking, more precise picture, is that the work is taking place in graphical planes or rooms imagined by the individual and featured in the graphical user interface. These computer environments co-operate or work with other software and interfaces, and with the physical room. In this article the topic is how computer software is experienced as a workplace. The content is based on a master study in Educational Science at The University of Stockholm, Sweden. This study is about what the user regards as specific for working within a graphical interface.

- How does the interface appear to the user?
- In what way does the computer environment co-operate with the physical surroundings?

The purpose of this article is, on the basis of some persons' statements and experiences, to elucidate some aspects of how people use and shape their computer work environment and how this environment co-operates with their physical offices. How people acts in these digital landscapes and which consequences the computer work can have for the experience of work quality and comfort.

THE GRAPHICAL USER INTERFACE – THE FUNCTION OF THE FORM

This article focuses on what some computer users meet in their daily work: the presentation of the computer programs' functions and possibilities in a graphical interface.

A SOCIAL CONSTRUCTIONIST VIEW

The study is based on a constructivist view on the user in relation to her tools and her culture. The user creates her own knowledge in dialogue and interaction with a cultural and social context (Berger&Luckmann, 1966; Waldenström, 2001).

Theoretical background

INTERACTIVITY

In established jargon the word interaction is used when a computer program permits the user to choose within a set of given possibilities. Software can offer the user tools to create for example pictures or sounds in an infinite number of possibilities. This allows a high degree of intentionality and user control, a high dynamic level, but who are interacting? Who do you meet in a graphical interface? The perspective means that people are seen to be in dialogue with a responsive computer in order to carry out various tasks. The user can carry out a lot of complicated things beyond the program designer's control, but without real interaction. The user does not interact with a closed computer system in a unit, but with the complex worlds that are represented in the computer. The user is acting in a created context.

CONVERGENCE

Manuel Castells (2001) represents those who describe how the use of home computers not only erases the borders between time and room, but also dissolves the borders between work and spare time. Convergence can occur in many different situations and meanings. In a constructionist per-

spective the user creates her own convergence in the active gathering of the possibilities she wants to use in the computer's digital environment. She selects and deselects tools. She constructs combinations of tools and communication possibilities after her own intentions.

INTERFACE DESIGN AND DIGITAL USER ENVIRONMENT AS A CULTURE OR A GENRE

Spinuzzi, Bakhtin and genre theory

Clay Spinuzzi (2003) uses genre tracing, where the users work structure in their work environment is in focus. Genres can here be seen as traditions in order to produce, to use and to interpret artefacts. In a genre, people create effective, everyday procedures for how concrete materials and abstract attitudes are used and produced. As a consequence of this Spinuzzi supports a contextual design where it is important for the designer to realise that her research has implications for how the user works. The designer's alterations can result in a system that supports, changes or entirely destroys the users work routines. Here, the official practice, the designer and the product, meet the unofficial, which are the user's own solutions in the management of a system.

Mikhail Bakhtin, forefront figure within genre theory, argues that two competing impulses shape our communication: the *centripetal* and the *centrifugal* (1983, orig. ed. 1934). The centripetal impulse is towards formalisation, normalisation, regularity and convention. Work systems become centralised and official. The centrifugal impulse is towards resistance, idiosyncrasy, ad hoc innovation and chaos. Decentralised systems with unofficial work standards are developed.

GENRES AND CLICHÉS

A semiotic *genre* is a code for which signs that can be combined, that belong together, and the genre has resemblances with the *paradigm*. Clichés and genres within interface structure can for example be purely graphical, as symbols for *save* and *cut* that are similar in most computer programs, or the way to link to help files etc.

EDUCOLOGICAL ETHNOGRAPHY

In the collecting of data and their implementation, and the analyses of these, I strove to work according to the *educological ethnography* developed by Birgitta Qvarsell (1996). The ethnographic endeavours to capture the complexity of a situation, and the educological interest is focused on learning and development, on individually considered possibilities in a surrounding world. Theory and experience are used in order to make discoveries throughout the study, and the researcher tries to find the most reasonable interpretations by means of the logic of abduction.

Affordance is a concept with great impact on interface design theory. Referring to the actionable properties between the world and an actor (a person or animal) the term was originated by perception psychologist James J. Gibson (1979). An affordance stands for what the environment offers, provides and invites to, in a both positive and negative sense. Affordances can only be seen ecologically, i.e. in symbiosis between organism and environment.

According to Gibson (1979) our tools and our artefacts increase the affordance possibilities. The difference between affordances and tools is that a tool has a generic function and design, affordances exist, as mentioned above, always relative to individual action possibilities. An affordance can also be a compound of several actions, nested, which in themselves can hold affordances. In order to, for example, picture editing in a computer to exist as a possibility, we must imbue and carry out a number of action steps. Worth stressing is that according to his model Gibson does not treat degree differences in an affordance, if for example an affordance exists but is very difficult to use.

Donald Norman (1988) uses the term affordance within the design field when, for instance, the

shape of a handle signals the function, the proper way of using it. The actionable property is the ability to press the handle down for opening a door. Affordance is in this sense reduced to generic means, in design for a generalised user. The concept of affordance has sometimes also been further reduced to name an inviting design of graphical buttons in interface design. A button demands to be pressed, invites to action. Norman means that the term *perceived affordance* would be more correct in these cases. An affordance dance exists independently of what is visible on a display, but the interface can demonstrate the action possibility.

Preece et al (2002) make an interesting reflection with reference to the latter way the concept is used. They discuss perceived affordances represented on a screen as clues to functions. A too naturalistic depiction of, for instance, a sound mixer can make the interface overloaded with all shadows and light directions that will simulate a three-dimensional effect.

OFFERED MEANINGS – AFFORDANCES ACCORDING TO QVARSELL

The participant observations this article builds on are analysed by means of theoretical concepts that focus on what the individual herself sees as meaningful possibilities and challenges. Birgitta Qvarsell (1989) has used the concept *offered meanings* (writer's translation), referring to important educological conditions in the individual's own perspective. They are environmental cultural aspects which afford meaning and invite (to) actions. Offered meanings are constructed by the individual and can be used as tools in order to solve identified tasks. The concept can be seen as a development of Gibson's (1979) environment-related affordance adapted to a socio-cultural context. In this study's participant observations the concept is used as a theoretical base tool. It will clarify and focus on possibilities in the individual's own perspectives. The interface can be seen as containing indexes of functions that contain possibilities or invitations to act.

DEVELOPMENTAL TASKS

The cultural and educological concept *developmental task* refers to challenges that the individual meets during different life phases and in different cultural contexts. They are not psychological phenomena, they are perceived in the space between the individual and the surrounding world, as concrete challenges. The tasks are defined by the individual alone, which identifies and endeavours to solve them (Qvarsell, 2003).

In the computer's workplace - manoeuvring the interface

The interfaces are important for several informants in the study, in the same sense that our physical environment is. The primary task is to find adequate tools in the digital workplaces, but it can also be of importance how the rooms are coloured and arranged, both the physical and the digital rooms. Not everybody in this study has reflected on the software environments' aesthetics. A pair of the users do not consider this to be an important question, or haven't reflected on it to any great extent. But at the same time they have created their own picture of how the whole computer environment is put together, with different program rooms and paths and shortcuts between these. The user visualises the digital work environment in own models. Here are some examples:

IN LAYERED SIDE-SCENES

Jenny, 25 years, web designer:

"It feels like a world, with a table and I am partly in it...It is not just a table because I am in it as well. I think you sometimes perceive it more three-dimensional than it is, that you create such an image especially when you are working a lot with layers. In those moments I think I could see the layers if I stood beside the computer."

Jenny's reflections on working in a digital environment are clear-sighted and express feelings of participation and belonging since she claims to be partly in the user interface. She creates a three-dimensional image of the computer room, but like flat layers stacked upon each other, more like side-scenes than rooms. She thinks that she shapes this model herself, it doesn't look the way she is visualising it. She creates an own image of the rooms in the interface that functions with her actions and navigation. It could be seen as a highly functional and intentional appropriation of the digital workplace.

LITTLE BOXES

Filippa, 30 years, art educator at a museum:

"I see it like little boxes, just when it was so hard to reach your documents, I thought: 'OK, through that wall and the next and there are my little boxes.' And it was very difficult to remember, 'what do I do? Am I supposed to go through that wall?' I look on it as going inwards."

Filippa sees the computer's roominess as little boxes, to reach different files she has to get through the boxes' walls. The movement is inwards the computer. She makes a three-dimensional image, spatial shapes of the computer interface. She finds it hard to remember the way back when she navigates far in. Making desktop short cuts could be her red thread in the labyrinth, finding the path to the right room. No, teleportation is a more correct metaphor here. You don't know the actual path, you are just being moved to the correct place.

THE VIRTUAL ROOM?

The digital workplaces appear different from informant to informant. The room metaphor works, but in various ways. Some see rooms as cartons, for others the rooms consist of layers on layers in a side scene world or as contour models in a pasteboard. The movement is experienced as inwards from the monitor's surface and further inwards the computer and its applications. The movement inwards is seen as increasing in deep and detail, the movement outward increases the overview and gives a structural perspective. The images we create of the digital context both work as a mind map for our navigation in the interface and as our own designed and furnished workplace.

METAPHORS FOR ACTION, OBJECTS MOTIONS AND ORIENTATION

Our concepts structure what we perceive in the world, and according to Lakoff & Johnson (1980) our conceptual system is largely metaphorical. Metaphors in that sense become crucial to how we define our everyday reality. *Metaphorical concepts* structure our thought system, are used to describe the movements we make in the GUI. The interfaces are often designed with different metaphors (implicit comparisons) of the physical world, such as *desktop, toolbox and scene*, and the user moves in parallels to physical rooms and motions: "how do I get out of here?" "where is the spell check placed? ", "now I'm moving backwards!". Within computer use there exist some metaphors so well established that they become so called *dead metaphors* (Lakoff & Johnson, 1980). They have been in use so long that we do not regard them as metaphors. For example *mouse, surf*, the overall *home* metaphor for the computer or a website's starting point, and the tool metaphors in computer programs in this study. The context here will govern the direction of the connotations, if a mouse is a rodent or an input device. With reference to Charles S. Peirce (Bertilsson & Voetmann, 1990) it can be expressed like this: the interpretant is culturally determined.

From the data covered in this study I could find some general orientational or directional metaphors:

- *In* – deeper and deeper into detail, input from the physical world.
- *Out* – overall view of entries; print out to the physical world
- *Down* – files are on the ground, the letter *z* is down
- *Up* – folders and catalogues are directorial signs, the letter *a* is up
Up and down in menus where *up* supposedly should be the most used tools.
- *Centre – periphery* usually people have their workspace in the middle and the tools organised around
- *Front – back* as for instance Jenny’s side-scenes

PLANE OR DEPTH

The program interfaces are two-dimensional planes that the user navigates in. In certain software, the user can create projected three-dimensional rooms where she can determine viewpoints and movements in room coordinates. According to Gibson (1979) three-dimensional seeing is a direct perception of the item’s movements vis-à-vis the movable beholder. It does not consist of contours that get volume through light and shadow. A true stereoscopy does not occur in graphical interface. The user shapes her own image of a room representation, with materials from different programs interfaces and by constructing her own images of how the undefined interspaces look like.

Virtual remains – virtual archaeology

One issue of great importance for some of the users in the study is how to organise the digital archives, like servers, in an understandable and readable way. In some case we don’t have the opportunity to build our digital models from the ground, we inherit a computer workspace.

Anna, 34 years, web editor:

“I actually think that it’s a thing to work on, to do a real analysis of the database the way it looks today and of what it’s supposed to be able to do in the future, because there is still only paper here. That the papers are registered somewhere.”

The filing system needs to be organised in a better way at Anna’s work place. It is a great part of the work tasks, to file and organise, but the technical solutions are not equal to Anna’s intentions. Besides, the earlier filing organisation is probably a collage of different people’s ideas. The software is circumstantial and demands a great amount of own work, which ought to be handled by functions in the application. Double work and the handling of written notes are demanded to be able to get some kind of control over what the digital catalogue looks like.

Anna took over a computer desktop environment from a former employee. Anna’s inherited desktop (“second-hand”) environment in the computer, and the website without a map of the file structure make it hard to find files and know their meaning. Do the files contain important information? Are they essential for coding and graphical design? Finding structure and content in these virtual remains are hard challenges. It is far from obvious what is to be trashed and who is going to execute what.

There are two kinds of problems here: the first one concerns a collective result, a server system arbitrarily built up by just adding files and folders, with no general organisation. The second concerns a file structure that only the former user knows how it is built up. Only the former user has an inner model of the file organisation. It is difficult to see an organised structure and find files and their relevance, because you have to find out the former user’s idea of cataloguing, and you have no own structure to support your way in the “virtual archaeology”.

WHO IS CLEANING THE SERVER?

On servers there could exist a lot of old material that is difficult to weed out. The server contains folders and loose files that no one takes responsibility for. As a consequence of this, Filippa the art educator, has sometimes lacked backup since she does not want to store something in the server disorder. For Filippa, working at a museum, a functional archive system is very important. She wants radical improvements.

ORGANISATION, STRUCTURE AND ARCHIVE

In arranging and structuring there exist central offers and challenges in the computer work for several informants. The computer is considered good for structuring and as a memory aid. The digital archive offers many possibilities to organise access to materials and back up of documents. Location of materials and documents are particularly important for Anna and Filippa which both have a large archive activity. At the same time there are difficulties with digital archives, difficult to see what things are, where they are and who has created files or modified them. The digital archives are not present all the time, the user must connect to a server in order to see files and to check.

Anna has a lot of digital material and wants still more pictures and document procedures to be digitised. It would make pictures and information more easily accessible for her, and she will get rid of the double work the mixture of physical and digital picture result in.

THE COMPUTER ARCHIVE AND THE PHYSICAL OBJECTS

Filippa also works a lot with physical objects in her workplace. The digital archive can offer search functions, indexing for each of the physical objects and their properties. This is a difficult task, to build up a database with a functional index. In her own workroom, the physical files of the digital are complementary, double archiving offers no advantages to Filippa.

A sterile environment

Joakim, 40 years, graphical designer:

“There’s something so incredibly clinical about this environment, you can get an incredible craving to just get down and get dirty when you’re sitting here, you’re like a surgeon in some way. I want this computer environment to be here, but at the same time, I can get disgusted by it.”

Joakim misses tactile response in digital work. He considers some programs and tools to be good, and finds it possible to make fine products, but he also finds that the digital working environment has inherent shortcomings for him. He finds it too sterile, too synthetic and divorced from physical reality. He also expresses scepticism of naturalistic graphical interfaces, since they never become real for him. They do not offer him an environment that increases comfort and recognition.

“Photoshop is more like Pollock... Illustrator is more like Hergé”

Joakim makes parallels to the art world when describing what this two Adobe programs means to him. Photoshop represents a spontaneous expression possibility to play and discover. Illustrator offers a more carefully planned, meticulous line drawing.

Joakim can hardly stand the sterile and clinical world that he thinks the interfaces constitutes. He is very aware of design and thinks that although the digital environment can be “aesthetically correct” it’s nevertheless clean and lifeless.

The diminishing movement of the body

STUCK BY THE SCREEN

Joakim also has things to say about the physical consequences of computer work:

“You can certainly raise or lower the work table or perhaps hang from the ceiling to work, but you are still stuck at the computer ten hours a day. You just feel like an American sitting in a car all day with no chance of movement, in a totally fixed position, I think it’s terrible. The brain needs movement, it just does. For most of us anyway, when it comes to creativity.”

RAISED TEMPO AND ACCESS TO WORK AT HOME

Gunilla, information assistant, 53 years, has been around to watch and take part in a digital revolution in office work:

“First you typed on stencils, then you put on a white coat and went to the printing room to manually print them out. That was around 1971. Then the electric typewriter became common, after that you got an electric typewriter with a correction button. That was no good at all. With that, you to fit the paper with the text to be corrected exactly in the machine and then press backwards and try to remove the mistypes. You could sit there almost hacking holes in the paper before you got rid of the incorrect text. You could not change large quantities as you do now, only a few words. Of course it influenced your way of writing.”

After several years of daily computer work, now extended with Internet connection:

“I did nothing but sit by the computer, for hours on end. Sometimes I thought of course that it was such fun, though I knew how hysterically stressful the image processing could be. Then it began. I felt such a pressure on myself to arrange things. I got the background facts and the day after I had to have a presentation all finished, it was so stressful. Sometime they wanted it finished in a few hours, a huge presentation running to twenty pages, sometime also translated into English, although they were only diagram headings. It was horrible.”

Afterwards Gunilla went home and continued working in the evenings. She had access to the software at home and she could reach all work files from there. It was far too much work. Partly because of her interest, because she found it such fun. Gunilla started to develop different stress-related diseases. It began with frozen shoulder, adhesive capsulitis, which is easy to develop when you are sitting in the same position every day, she says. Gunilla then developed fibromyalgia, which is a chronic disease having pain and fatigue as its main symptoms. She herself calls it a work-related injury, because it occurred after five years of stress at the computer.

Gunilla’s enthusiasm and desire for computer work and the accelerated pace of work have meant her developing a variety of stress-related diseases during the years. Another reason can be that the existence of rest possibilities in work, natural pauses in the creative torrent, has decreased since the computer came on the scene. There also existed more practically aimed tasks that included physical actions and movement. She could for instance go to another room in order to stencil manually, or spend half a workday by the fax machine. Some more monotonous tasks, retyping documents from templates etc., also offered pauses from being maximally creative. Now, work rhythms and practices are more infinite and diffuse. It is more difficult having a break when there is no natural reason. One way for Gunilla is to print out what she wants to read, and then change workstations.

WHO'S IN CHARGE?

Giovanni, 54, video film teacher for young people:

“Sometime it feels like I’m governed by the computer instead of vice versa. It does not need to be a situation when something goes wrong, but you are not aware of time, it flies quickly concurrently as you isolate yourself from the environment, and become less receptive the more tired you get. You are not aware of that, your spine hurts more and more and then you look at the clock and a long time has passed.”

Time disappears for Giovanni during computer work. He says that he is located in another dimension, isolated in both time and space from physical reality. He speaks with playful seriousness about software that will force him to do pauses; he does not know how to cope with that himself. Those pauses he nevertheless takes, are strategically planned to moments when the computer must process files, or render.

FROM PHYSICAL ENVIRONMENT TO COMPUTER ENVIRONMENT

The creative process does not always take place directly by the computer. In front of the screen, it can be difficult to be creative and innovative. Another place can be necessary for creative work. Personal procedures and places to use for innovation can contribute to a more harmonious atmosphere, offer concentration as well as contact with physical tools as pencils, colour crayons and paper. They are places that the user chooses as a basis for creative processes, they are initiating places. There is also a need to move around while thinking, or during the actual work. The computer can be used for input of already completed materials, or to complete a more or less developed idea.

Theoretical implications

WAYS OF CONSTRUCTING DIGITAL WORKPLACES

The informants choose the tools and communication possibilities that will converge in the computer in the office workplace and the home workplace. In the interface rooms, different media and different technical functions converge (device convergence). In particular, work production and communication. The software you use is only a part of how you organise your computer world. The way you use the applications, where they are placed, how you modify and build paths between the tools, are also constituents in creating a digital workplace of your own.

“Photoshop is more like Pollock... Illustrator is more like Hergé”. The user creates her own metaphors and paradigms from the programs and their products. She creates a personal work landscape that makes it easier to structure the interfaces and functions and to relate these to other physical and digital worlds. The interpretant that constitutes the relation between the sign (interface icons, text) and the referent (tools and products) get the meaning the user applies to it, with reference to Peirce (Bertilsson & Voetmann, 1990). This meaning is shaped by the user in a workplace context, how and what she does with the application and how she looks upon that tool. Functions in the programs imply different offers for different individuals, in different stages of the work.

As I mentioned before, the user does not act against a closed computer system in a single unit, but with the complex worlds that are represented in the computer. The user interacts with a context she herself has taken part in creating. To inherit a digital work environment can therefore mean several challenges. Files and functions will be found in a system created after another user's intentions and situation. In order to entirely become the new users work environment, the former foldering, symbols and shortcuts must first be understood and then reconstructed.

The informants shape their physical work environment as much as possible after her own ideas about design and function. Physical input devices as footswitches and digital pens, can offer a tactile experience and control that feels more apparent than ordinary keyboards and mice. A convergence between the computers and the physical rooms is created. Physical instruments and tools such as electric guitars and digicams can be connected directly to the computer, thereby creating extensions of the tools to the computer room.

The user's modifying of the program possibilities can also take place through installing help applications and complementary plug-ins. In this study it is quite common for the user to complement the software in a way that better fits her own work approach. Another way is to use software for something other than the manufacturer's intention. This is done in order to reach functions or to achieve expressions that are impossible in the normal way of using the software.

The convergence between home and workplace is also prominent. To separate work and spare time is difficult when the physical room isn't important for accessing the projects you work with.

NESTED AFFORDANCES

An offered meaning for the individual can be considered as being made up of several aspects, and then becomes stretched over time. A long action chain can be required to realise a computer user's intentions, and this is something that is difficult to show directly in a GUI. Software can have potential offers for the user who is not aware of how she could find them. Complementary help programs or manuals are required in order to locate the possibilities. When new functions are developed basic questions arise: how will the user be aware of this new possibility? Will the user use the new function? Is it a good tool?

Gibson (1979) used the term *nested affordance*. Briefly, each partial moment is then an affordance in itself, but it can also lead to further additional affordances. In this study, it is possible to question the user and the producer's views on the actual work: is only the goal prioritised or is the whole work process included, to the final product? Making, for example, a video film can be seen as a long row of action possibilities. It is obvious that the virtual cutting board with its time line offers a high-quality possibility for cutting a film, but can rendering of work files be an offer or is it only a boring format handling?

THE INTENDED USER – THE INTERFACE AND THE INDIVIDUAL

The naturalistic interface in Cubase for example addresses the experienced musician, but for those who don't have previous experience of musical production, it becomes a new complex symbol world to appropriate. There is no natural transfer from the physical to the digital world. A new culture or genre must be taken possession of, by stages which are not always logical but developed from a tradition of hardware for musical production with its own codes. A feeling of being excluded can exist for a new beginner not having the experience of a culture or genre that many others seem familiar with. Shneiderman (1998) speaks about novices and first-time users. The novice has no knowledge of information or software, while the first-time user has knowledge from the physical task but must learn how it will be carried out in the program interface. There is of course a difference between software that is a transfer from the physical world to the digital, such as Cubase, and programs that only exist in an own digital world, as Flash, where all users are novices in the beginning.

The picture editing application Photoshop has certain tools that analogue photographers recognise, but the interface has never imitated a photo laboratory, it is based on its own system of icons and menus. The program is intended for, and is used by, a broad category of people who need to process digital pictures. Experienced photographers however, have good use of their knowledge when exploring the program. Work experience, education and photographer identity can be confirmed.

Ethos, the program's way of presenting itself, should be suitable for the content and for the target group. Some applications could be seen confirming a certain state of profession. To work with InDesign for example, could signal having control over the final design of the product and not only delivering raw text.

The multimedia application Director places itself within a film paradigm and contains among other things scripts, scenes and cast members that are related to a score with a timeline. These are not direct analogies and they can be confusing for a novice. For example, a cast member can be both an animated character and a stage set, and can principally govern the course of events in a film in spite of the overall film script. Problems arise when the metaphors do not correspond to the physical world, prompting one to ask what purpose the genre or the paradigm in those cases serves. A calculation program like Excel dresses itself in a strict suit, making somewhat dry, but businesslike and reliable expression without any visual metaphors in the actual calculation tables. These could basically be described as storage shelves, a pantry or suchlike, but this would entail a risk of being considered childish and unprofessional according to prevailing genre thinking. An aesthetic well thought-out and developed interface (ethos) can decrease the trust to the application's function (logos).

Social status and competence can also be shown for example in the use of many keyboard shortcuts. Apart from the good of using these, especially ergonomically, it's sometimes also a workplace culture where the user shows her competence and dexterity with keyboard shortcuts.

A genre entirely without graphical interfaces, as for example direct UNIX commands typed in text code, offers direct control for an advanced computer user, and can also strengthen the feeling of the user's own competence. Unfortunately the feeling of exclusivity can increase when the ordinary user doesn't comprehend what the expert is up to and it could result in a technical "nerd mentality". This also has certain couplings to the technical service personnel that do not see to the user's needs in this study. There is sometimes a lack of real interest in making things understandable for a normal user.

AFFORDANCES IN THE USER INTERFACE, OR TROMPE L'ŒIL?

The naturalistic interface strives towards a total mapping, and tries to imitate physical tools and their user culture. There is a risk attached to promising functions that do not function as in physical reality. The interface is hereby reduced to a trompe l'œil without function, or a false index (Bertilsson&Voetmann, 1990). Also, as pointed out earlier (Preece et al, 2002), it can be found messy and disturbing, with all the shadows and light directions intended to simulate a three-dimensional effect. The naturalistic interface must correspond with physical reality in order not to make the offered meanings, or the perceived affordances, false.

The lack of tactile control can be a problem, the fact that the interface most often only consists of pictures and sounds. A virtual potentiometer is not twistable as a true one. The pictured thumbwheel is governed by the mouse and gives only a visual feedback. The visible system state, as Nielsen (2001) stresses, functions, but there exist no tactile response.

OFFICIAL AND UNOFFICIAL SOLUTIONS

The official and unofficial solutions can be seen as expressions of Bakhtin's (1983, orig. 1934) competing impulses: the centripetal and the centrifugal. The centripetal strives towards formalisation and normalisation. User practices become centralised and official. Manufacturers of software want to implement and "refine" the users' modifications and add-ons of the software in order to include these in their own product (Spinuzzi, 2003). Solutions will be packed and distributed in the software and thereby end up outside the context that the solutions were developed in. The cen-

trifugal impulse is toward resistance and ad hoc-solutions (not general solutions). Decentralised systems with unofficial work practices are created. The user creates her own solutions and work procedures that function in the situation. The original creativity can be expressed as a centrifugal impulse or force. Solutions in centripetal direction gradually lose the unique qualities of the user's own modification (Spinuzzi, 2003).

Analogies between interfaces and the physical world are not always interesting, and not always possible. Interfaces are considered worlds of their own and separate consistent genres, with more or less connection to the physical reality. If the GUI's use metaphors they must, as mentioned above, compare to their physical equivalences in order not to seem confusing.

The production genre is primarily aimed at effectiveness. They are task and goal orientated aspects in designing applications (Preece et al, 2002). Clarity in a cognitive perspective, readability expressed in general models for human information capacity. It is however only the user that meets the whole context where the program products will function. The cognitive model is a general idea without a specific context. A contextual design model could be a solution in order to come closer to the work genre in designing the software. At the same time, everything could not be implemented in a graphical interface, as Spinuzzi (2003) points out. The physical work experience and its convergence with the digital work place are far more complex than a separate computer program, and ad hoc innovation can sometimes be the most appropriate.

LUST OR PRODUCTION?

The user's experience of work joy is sometime considered by the manufacturer to be in conflict with the goals that are supposed to be achieved (Preece et al, 2002). A conflict relation is created between the logos, ethos and pathos, in rhetorical terms. A great part of the conflict perspective in this discussion can have its origin in our general view on work and its goals. A belief that a too strong desire experience (pathos) decreases focus on the outcome, that the member gets caught in the work process. In the goal-related view there sometimes exists a fear that too comfortable a program environment distracts the user. In this study there is no indication that a high comfort in the program environment will negatively affect the products' quality.

ADVANCED TOOL OR SOMETHING MORE?

To consider the computer as a device like any other is relieving and defusing. When the user sometimes treats it as a living creature, the stress increases when she does not find functions or problem solutions and when technical disturbances occur.

According to Bruner (1996) the complex interaction between the worlds we can appropriate is in itself a culture. The user's acting with these worlds represented in the computer can according to this be seen as a complex culture of its own, where old and new attitudes meet in production and communication. Here the rational and the irrational live side by side. Those who have least knowledge about how the computer functions technically have the greatest tendency to mythologise the computer as a defiant creature.

Among the more technically skilled there can exist another type of submission to the computer, an experience of losing control over time and work and a feeling of needing help to be able to leave the computer and its program products.

Discussion

KNOWLEDGE ARCHIVE, STRUCTURE AND MIGRATION

Digital archives are increasingly replacing physical rooms for text, picture and sound storage. It's interesting to see how a relatively permissive system can generate a number of different ways of structuring and organising various information. To archive on a server without a system means that order suffers and the archive becomes an unsorted chaos. Archiving in shared digital rooms and being able to feel control and safety, is very important in order to facilitate work. Apart from all users needing to find the appropriate files in the server's folders, work is sometimes carried out directly in a shared work file, and clarity becomes crucial. Who did what and when?

The digital archives are also complements to the physical objects with picture and text descriptions. Objects are catalogued and indexed to be found, to be referred to, to be studied and to be used. Our cultural heritage and indexes on where artefacts are placed are gradually being digitised from physical card indexes and archives. We risk losing parts of this heritage unless work routines are improved. The problem is not new, nor is the migration. Many information vehicles have come and gone in the course of human history, from rock paintings to DVDs. Archiving and storage has always been a question of how, what and by which means.

There are positive offers to find in digital archiving for different users. For example, global access to the material could be arranged, as well as different authorisations on the same physical storing place. Indexing and digital files as text and pictures are easily copied and backed up. It is a question of finding the appropriate degree of decentralised organisation. How does the system look that governs organising but does not force the member into static procedures? Can we directly transfer functioning physical archive models to appropriate digital systems? Can we directly transfer our mental archive models, our internal images, to appropriate, intuitive digital systems?

NEW TAYLORISM?

At the beginning of the 20th century Frederick Taylor launched a production design, the assembly line, with extreme task specialisation for the individual worker, rigidly specialised and statically positioned with a monotonous duty (cf. Charlie Chaplin's film *Modern Times*, 1936). His model was the machine with its cheap, interchangeable parts, each of which has one specific function. This concept still survives in traditional production, where the employees are tied to monotonous and strenuous work duties by machines or rule books.

The informants in this study often experience work as being intellectually satisfying and containing a certain amount of creativity. The mental scope is great, but the bodily work scope is restricted. The functions in big devices have been transferred to software products and these have in turn converged in the previously mentioned device convergence. As a consequence of this, for instance, repro work, layout, printing and typing work have turned from bigger worktables and natural body movements in the room to computer work on a metre-square surface with a lot of restricted movements. The device convergence can have negative consequences for physical wellbeing and for creativity and learning. Is there an ongoing degeneration of the work environment, a kind of new Taylorism? It will, if that is the case, imply a return to the assembly line's monotonous movements and locked body position, but with more intellectually sophisticated duties.

The decreased possibility of bodily mobility during work is a problem that is important to solve. How do the devices and interfaces function that make us feel good physically and thereby mentally in our computer work? How do you design a work environment that is experienced as rational and intentional without the body becoming statically positioned? How do you achieve that in a way that is not experienced as artificial and manipulative?

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