Hidden Restrictions to Information Access:
On the Reproduction of Societal Gender Relations in Technological Artefacts

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Abstract

Economic evolution relates to the development of technologies as well as to changes of social settings. Besides the macro-economic perspective on the mutual dependency of social change and technologies (see e.g. Kontradieff 1926) also the micro- and meso-level play an interesting role. The discussion on the interdependence of social settings and technological artefacts emerged during the eighties (see e.g. McKenzie et al. 1999), when more and more computer systems were introduced in organizations and started to change working conditions as well as work content. Additionally McKenzie and Wajcman (1999) and feminist researchers of science and technology like Haraway (1995) and Cockburn (1997) describe developing technologies as a highly gendered process – but not in an essentialist way (i.e. not focusing on the sexes of developers but on the interdependency of technological development processes and collective constructions of gendered social reality.) They show, for example how basic paradigms of computer science inscribe themselves in the software through processes of classification, normalization and standardization and therefore create socially and economically relevant structures. This gender-relevance is manifested in the fact that societal gender-specific division of labour is represented in technological systems and vice versa reproduces these dynamics. The paper is discussing these aspects in more details based on the results of a cas-study of an Austrian computer games developing company.

Introduction:

New information and communication systems have become an integral part of our daily life as well as of working settings. Even though the development mainly took part in few decades only, the discussion of the influence and impact of technologies on psychological, social, organizational settings immediately started from the very beginning.
In particular the discussion on the interdependence of social settings and technological artifacts has emerged during the eighties (see e.g. McKenzie and Wajcman 1999), when more and more computer systems have been introduced in organizations and started to change working conditions as well as work content.
From the perspective of system development a clear shift from an “engineering” viewpoint to a social-oriented perspective took place and the consideration of users and organizational dynamics has become important. The original “engineering” approach was heavily questioned since the results (the technological systems) were not user-friendly and thus not used adequately. Hanappi-Egger (2000) shows an analogy of the general technological development with new information and communication technologies: Similar to the development of organizational concepts of work – ranging from Taylorism to socio-technical approaches – according discourses with respect to information and communication technologies have taken place. Summarized it can be stated that in the last decades the view on system

development changed a lot. Users were more and more incorporated - ranging from pure observation at the beginning of structured system design to contemporary user-centered design methods (see also Kuala 2003). In particular the view that computer system design is organizational design implies many decision making competencies of the users. Thus it could be stated that there is a new understanding of constructing technological artifacts leaving the path of "objective" modeling following the view of "negotiated constructions". Consequently the process of system design is put into situational contexts in which the actors as well as the organizational settings play crucial roles.

Parallel to these discourses the feminist critique on science and technology emerged with a strong focus on the male-dominance in the design and development of technological artifacts. Even though there are interesting contributions concerning the gender issues in using new information and communication technologies, the topic which role gender as integral part of social settings plays in the design and development of technological artifacts stays open. Consequently the paper tries to close this gap: the question will be dealt with, how gender influences the design and development of information and communication systems. This will be exemplified by a case-study of a Computer Game Company conducted in Austria.

The Role of Gender in the Social Shaping of Technologies:

Hanappi-Egger (2003a) points out that there are several levels of gender-bias in new technologies: Gender-specific behavior has been intensively studied concerning the use of information and communication technologies as well as the educational choices leading to the fact that fewer women consider the technical field as interesting work opportunity.
Furthermore investigations of e.g. the Web show that there is a strong orientation towards male surfers and studies of the organizational cultures of the high tech industries emphasize hidden access barriers for women.
The recent feminist debate on technology could be seen on a broad spectrum of dealing with "gender": The "ecofeminist" position claims that technology is the result of male-based value systems such as rationality, efficiency and exploitation. "Liberal" feminism focuses on how to increase the number of women in the technical field in order to allow for equal chances without questioning technology itself.
Besides these two groups there are several more gender-related approaches based on post-structuralism, postmodernism or socialism as theoretical frames. In each group of contributions different gender issues are emphasized. But they all have in common that there is no doubt that gender plays a critical role in social settings: There are specific gender patterns and gender relations structuring organizations and consequently the social interactions. In terms of "doing gender" (West et al. 1998) gendered processes take place in organizations producing and reproducing gender relations (see also Hanappi-Egger 2003b). Consequently gender serves as analytical frame and as sense-making feature for social processes. Harding (1991) identifies three gender dimensions:

- Structural dimension: Gender as social category structures economic power relations consequently subordinating female activities in the paid economy as well as in the unpaid economy.
- Symbolic dimension: Gender-hierarchies are maintained by stereotyping masculinity and femininity.
- Individual dimension: Socially constructed gender stereotyping determines individual gender role identification and is reproduced by individuals.

Consequently it can be assumed that gender has to play a role in the design and development of technological artifacts (for a general discussion see Hanappi-Egger 2003a). In order to develop the

following argument, an analogy to the built environment can be drawn:
From a design perspective Kennedy (1981: 76) exemplifies gender-specifics in architectural practice: The female principles consists of more user-oriented, more ergonomic, more functional, more flexible, more organically ordered, more holistic/complex, more social, more slowly growing. The male principles are designer oriented, large scale/monumental, formal, fixed, abstractly systemized, specialized/one-dimensional, profit-oriented, and quickly constructed.
Wajcman (2001) doubts this approach since there are many intra-gender differences and several 'male' characteristics are caused by commercial imperatives. Nevertheless she establishes the connection between the built environment and patriarchy and shows that cultural assumptions such as gender-specific division of labor shape the development.

A similar reflection will be made in the following for computer-systems:

One main critique on the development of technological artifacts is the male dominance. Merely men are designing and developing systems. Consequently it is assumed that a very specific – namely male – perspective is implemented. The stronger involvement of female engineers should lead to more diversified perspectives and consequently to "better" solutions.

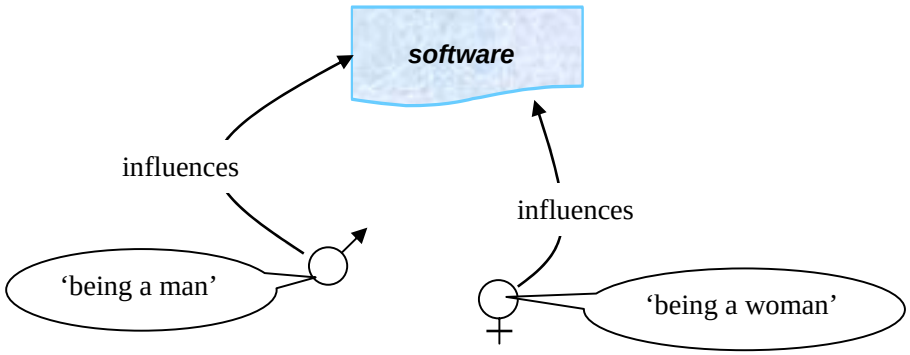

Figure 1: Gendered Design Based on Biological Gender

Evidently this approach is based on a rather biological understanding of gender. Men as such and women as such do have different perspectives useful for the design of technologies. This essential view neglects the role of professional socialization: As several scholars (e.g. Rommes, Oost, and Oudshoorn 1998) mention there is no empirical evidence that women design systems differently. Hanappi-Egger (2003a) stresses the importance of hegemonic ways of perceiving problems in computer science educations and thus leading on one side to rather homogenous self-understanding of both male and female computer scientists. On the other side it has to be noted that women often leave the technical field due to their unwillingness to adapt to this heavily male coded professional culture. Thus the main stream in engineering is male stream. The effort of increasing the number of females in computer science can be positioned into the liberal feminist perspectives, since basically the organizational settings and systems are not questioned. Women have to adapt to the given circumstances. Consequently this view often is called the deficit-oriented approach identifying women's deficits as the crucial reason for the under-representation of women.

The importance of efforts bringing more women into the field of technology shall not be de-valuated. In particular since several empirical studies show that e.g. the design of web-based systems often is oriented

along men's interests while the information needs of women are forgotten (see also Winker 2001). Nevertheless one has to keep in mind that implicitly the "gender" issue is strongly connected with being a woman in a male-dominated field. Only little attention is paid to the fact that gender issues concern men, too, in terms of hegemonic gender patterns. Consequently men often fight against a specific "hacker" image or other metaphors shifting them into an anti-social corner.

As soon as this essential approach is questioned, one has to face that it is not so much the biological determinism of gender playing a crucial role in the design of systems, but it is the socially constructed way of perceiving gender and gendered processes. Studies of the development of information technologies, for example, indicate that design practices are dominated by the so-called 'I-methodology' in which innovators consider their own preferences and skills to be representative of those of the future user (Akrich 1995).
The deconstruction of technological artifacts shows a gender-bias in the design of technologies: e.g. work-flow management systems incorporate a specific view of division of labor in which "female" tasks are heavily forgotten or taken as irrelevant.

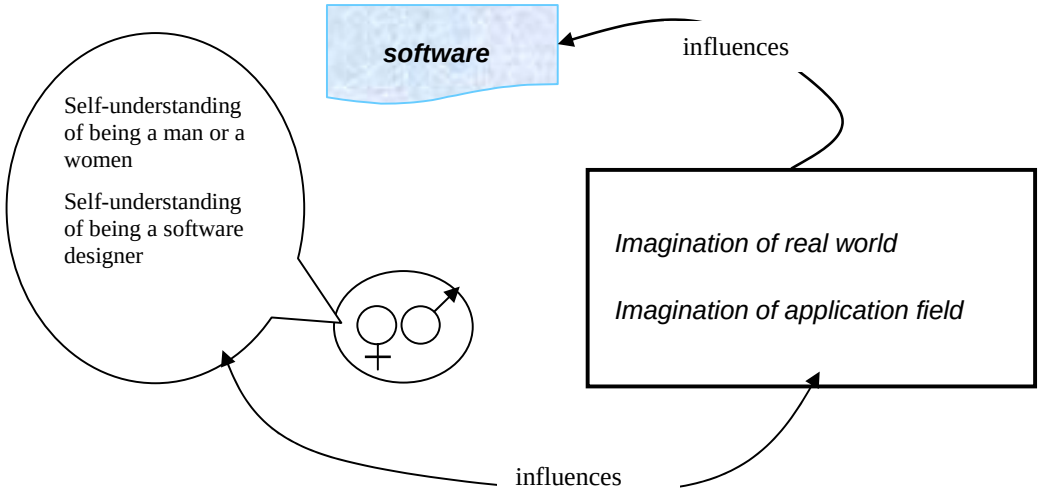

Figure 2: Gender Scripts-Based Design

As Akrich (1995) has suggested, 'innovators are from the very start constantly interested in their future users. They construct many different representations of these users, and objectify these representations in technological choices' (Akrich 1995:168). As a result, technologies contain scripts: These scripts function as orientation and determine the way future users are seen, which rights, competences and skill are assumed and consequently realized. Since these scripts reveal a gendered pattern, it can be assumed that gender scripts are incorporated into the technological artifacts. Since scripts are references, people use them for guiding themselves in situations. They are mostly unconscious and thus unquestioned. Concerning gender issues these scripts are often stereotypes assigning codes of femininity to women and masculinity to men. With respect to technology these scripts lead to the a priori equivalence of "masculinity" and "technology" and consequently exclude women as being the others or as being "the problem".
Even though this perspective stresses the importance of gender scripts as part of social settings, it still sticks to a view that gender is an attribute. Something people "are" and what influences them in their social interactions.

Recent gender studies focus less on the bodily difference, but more on the ways of ascribing gendered images to them. Consequently the focus of interest is on "doing gender". With respect to this gender is a dynamic producing and reproducing a gendered understanding in social interactions. It is an essential part in social settings and cannot be avoided, but the way of constructing gendered meaning can be reflected on. This leads to the necessity of questioning gender scripts and their incorporation in the design and development of artifacts. Hanappi-Egger (2004) calls this "triple loop learning". In other words, system development has to be put in the social setting and vice versa and requires a gender diversity-related approach: Gender diversity refers to multiple identification aspects and tries to overcome gender-dualism as well as exclusion mechanisms based on social categories such as gender, sexual orientation, age, ethnicity and the like. Instead contextual dynamics are seen as driving force in system design and development.

From the perspective of the social shaping of technology we have to add a crucial learning loop in the design and development process: In terms of software engineering this means that besides developing the system, a meta-level has to be established allowing participants to reflect on mental models, on assumptions and in particular on gender scripts influencing the way of specifying the system. In terms of system design methodologies the three learning steps are:

- Single-Loop Learning: questioning the functionality (doing things right)
- Double-Loop Learning: questioning the specification (doing the right things)
- Triple-Loop Learning: questioning the mental models and gender scripts

This clearly requires a new self-understanding which might cause difficulties for people not willing or not familiar with this kind of discourses.
But in order to develop diversified products this is an essential step. Therefore an experiment of this triple-loop learning approach was started and a case-study in an Austrian computer game developing company was conducted.

Case-Study: A Game Development Company in Austria

Research Design

Framework of the case study

The presented case-study is part of an ongoing research project financed by the Austrian Ministry of Education, Science and Culture within the funding program of fFORTE (women in research, technology and engineering) 'GenderIT'. The main research focus of the case-study in a computer game development company was on the question of which hidden and unconscious mental models are accessed when making design decisions. It was also studied how diversity of the team influences the development process and which role management plays with respect to this. Therefore semi-structured interviews with the project members as well as with involved project managers were performed* and an innovative research method, namely mind-scripting was applied (see also Allhutter and Hanappi-Egger 2005). The interviews mainly served to identify important topics and gain comprehension of the framing of the

* The article refers to the interviewees using the following abbreviations: managing director (MD), technical director (TD), project manager (PM), game designer (GM), lead artist (LA), programmer (P), graphic designer (GD), graphic artist (GA), animator (A), sound designer (SD); Two interviews were conducted in English, the rest in German. Quotations from German interviews were translated by the authors.

subject of software quality in the specific development context. The fact that the team aimed to improve quality significantly within its current project helped to promote discussions of their concepts of quality. Furthermore an adequate topic for mind-scripting could be defined which allows going deeper into the ideas behind concepts of quality. During the process of mind-scripting (i.e. deconstructing mind-scripts) participants discussed implicit quality standards to identify a collectively shared understanding of quality as well as joint beliefs and assumptions about users.

Mind-scripting

Mind-Scripting is a method of analyzing implicit assumptions in technological processes such as software engineering (see also Hanappi-Egger 2004). It allows making the hidden social dimensions of technological artefacts visible and gives insight into specific mental models and social or gender scripts which system designers have appropriated through their socialization in the technological field and everyday experiences. The method of mind-scripting is based on memory work, which was developed by the German social scientist Frigga Haug (1999) and until now has mainly been used in the field of social sciences but never in the technological field. Memory work is a discourse-analytical and linguistic method of deconstruction, which enables the participating group to reflect on how subjects appropriate and reproduce social constructions (for further detail see Allhutter and Hanappi-Egger 2005).

Selected Results:

Quality Standards and Professional Self-Understanding

Talking about quality in developing computer games, interviewees referred to two different levels of how to make the quality of a game good: The first level concentrates on what is technologically feasible in terms of graphics and animation and on reviewing program codes according to a coding style guideline as well as testing for functionality, structure and extensibility. Technological feasibility is compared with the state-of-the-art in game development and is understood to depend on technical equipment and time restrictions and thus related to the budget. The second level refers to content and aesthetics of computer games. Quality criteria regarding game design, entertainment value and audiovisual design are articulated rather vaguely and come down to being a matter of taste and subjective preferences. A means to keep quality standards high in this context is '*giving qualitative feedback' [PM]* on '*when a product is qualitatively good and finished' [PM]*. In general due to commercial pressure what can be and will be done is a matter of '*urgency*' *[P]* or a '*compromise between quality and getting it done' [A]*.
Regarding game design, the idea prevails that proper quality criteria do not exist but nevertheless you can come up with a well-engineered game design by investing more time in the preproduction of a game. During the interviews we generally found a lack of problem awareness concerning processes of quality assurance. Only one of the interviewees was aware of a certain lack of theoretical background on process design and criticized that there are no clear responsibilities and competences for these tasks.
Moreover the interviews showed that the question of specifying a target group generally was not seen as being connected to quality standards. When asked to define the target group of the game being developed it became clear that '*it is merely specified on an intuitive basis' [PM]*. Interviewees share the opinion that the game is designed for a fan group of typical adventure game players that it seen as being mainly male. In particular the chosen war scenario is assumed to be of no interest to women or girls. Apart from assumptions on the gender of users there is no consensus as to whom the game is being designed for. Regarding age, opinions vary widely. The target group is located at 14 or 16 years or older, between 20 and 35, or even from 12 to 80. Regarding the accessibility, reference was made to users' skills and interests, to required equipment and to financial aspects. Even if '*the target group is nailed down in the*

game concept' [GA], there are said to be no explicit requirements from the publishers with regard to it nor does it have much influence on the design. Game design and aesthetics are usually not addressed to a target group. The case study showed indeed that game developers rather explicitly stick to their own preferences due to assumed higher quality standards and aims of self-fulfilment or incorporate vague assumptions about users, very often considering their own preferences to be representative of those of future users.

Professional Self-Understanding and Self-Fulfilment

Whilst investigating professional self-understanding we found three different approaches that are derived from the categories of educational background, professional function and the main motivation for doing the job. The first group's dominant self-construction emphasizes a technical approach to the job. Characteristics of this group are academic education in varying technical fields and functions like managing director, technical director, programmer and graphics. Professional self-understanding and motivation are articulated in terms of 'finding creative (technical) solutions' and conceiving a product as expression of one's own technical qualifications. The second cluster promotes an image that puts artistic talent and creativity at the centre. The educational backgrounds are diverse and include academic education in arts, humanities and social sciences. Functions are game design, graphics, animation and sound. This group shows itself as intuitive, creative, unorganised by nature and very self-confident in aesthetic taste. Several times members of this cluster voiced the motivation of wanting to exhaust their potential and aiming at developing their capabilities. Finally there is a third cluster of team members who see themselves as being 'capable' of completing management tasks which is often articulated as being a matter of natural aptitude or bent.
They all share the enthusiasm for playing computer games themselves and due to their technical or artistic ambitions they express a claim of *self-fulfilment* or *authorship* of the games they develop. Problems arise when it comes to who has the authority to decide if a graphic, the sound or game design is *'good'* because *'everybody wants to implement his own ideas' [GD]*. A certain lack of interest in target groups can be derived from the developers own aesthetic demands that are very often voiced as being crucial as they are higher than the assumed demands of mainstream-users.

Assumptions on Future Users

In addition to a rather unconscious ignorance of target groups, interviewees also mentioned a number of assumptions concerning users in general and future users of the game in question. These assumptions either referred to an image of the 'average' user or of particular user groups specified by age, gender and nationality.
The image of the 'average' user is one of having rather mainstream entertainment preferences and implicitly he is seen as being male and heterosexual. The 'average' user is said to be familiar with classical film patterns wanting to retrieve a similar logic in computer games: *'There has to be a love-interest and the spectator has to know from the beginning 'ah this is a nice, pretty woman, he will fall in love with her, and he will kiss her' [GM]*. In order to enhance the identification with the main character he has to be an average type of guy: *'Users don't want to play with a super hero with muscles who is really overly smart and handsome' [GM]*.
As obvious from above *age* specific assumptions have proved to be very important from the developers' perspective. Apparently only the age group from 14 up to a maximum of 35 seems to be relevant, whereas no references to gaming preferences of over 35 year olds were uttered. Also a slight reference to aspects of *nationality* could be found. Regarding *gender* specific assumptions on future users a lot of quite obsolete stereotypes were articulated. Firstly, the average user is assumed to be male. For the most part the company specializes in game genres that are explicitly developed for male users *('Racing games*

don't appeal to women, because they are for people who like motor bikes' [PM]; 'Do women like war games like this? … I don't see girls wanting to play it.' [GA]). Secondly, when it comes to women, assumptions concerning women's preferences *('Women play different … emotions are crucial for them' [MD]),* their competences *('Games for the typical 25 year old secretary, the kind of 'I-play-5-minutes-during-my-break-because-I-am-able-to-handle-a-mouse-game.' [GM])* as well as their interest were stated *('The game doesn't have a girly theme … There are no horses, there's not any kitsch girly theme them to it.' [GA]).*
From this it becomes clear that even if the developers don't pay much attention to defining target groups and to designing a game accordingly, there are quite a lot of hidden assumptions about users that are incorporated in game specifications.

According to Akrich (1995) a further attempt by developers to approach user-preferences is to consider their own choice to be representative of those of future users. An example of this 'I-methodology' could be found with regard to different standards of graphical realism for male and female game characters. As described above the male characters primarily have to be *'normal guys'*. The reference material for male characters was photos of actors and the developers aimed to model them anatomically correctly. In contrast the reference material for the only female character in the game was a 3D character. The claim was to model the female character to be pretty and sexy; therefore to some extent she must not be anatomically correct. Nearly all of the interviewees gave great importance to the looks of the female character. Discussions on personal preferences concerning her hair colour, legs, the colour and shape of her eyes, the size of her nose and her clothing were described as having been very intensive: '*We had some struggles over how she should look. She wasn't pretty enough … Then we found a CG character that looked tremendously good, much better than the photo. The photo was realistic, so you've got droopy legs and all that ugly stuff that's realistic … it's always the same when we do female characters we have to be attracted to her and that's what we're fighting over.' [GA]*

Hidden Assumptions and Construction Mechanisms of Implicit Quality Standards

As analysed in the previous section, apart from technologically centred quality standards we found strong references to assumed standards and requirements of future users, arguing from the perspective of future users and putting own quality standards as developers before that of the prospective target group. The interviews gave us insight into explicit concepts of quality in game development and assumptions of how to reach adequate quality standards. Furthermore the relation of on the one hand leaving aside a professional approach which would deal with defined target groups and on the other hand implicitly incorporating generalized assumptions on users became clearer. In order to get a better understanding of the team's underlying concepts of quality we then used mind-scripting as a means to investigate the central construction mechanisms of these concepts which combine various hidden assumptions to a collective process of sense making. Considering the great influence of user-representations, the process of mind-scripting or deconstructing the mind-scripts aimed to shift to a user-perspective and reflect on quality standards from this point of view. Therefore mind-scripts with the subject of 'The last time he/she tried out a computer game or a video game' were requested.

Concepts of Quality in the Mind-Scripts

Whilst deconstructing the development team's mind-scripts varying topics turned out to be important: In general the mind-scripts deal with anticipation and disappointment as central themes of trying out games. Anticipation and disappointment are linked to quality claims to the game. In this context various quality criteria are mentioned which are expressed as objective statements about quality and as subjective

impressions of how playing the game affects the writer. Very often the quality of the game is measured against comparable state-of-the-art games or against a former version of the same game.
The strongly objectified tone that specifies quality criteria like a checklist refers to how the technical execution of the game manifests in functionality, aesthetics and interaction with the game. Criteria mentioned are:

- *functionality and handling:* loading time, response time, required computer performance (e.g. graphic settings), easy and realistic control (e.g. like a real racing car, sight like in real racing situation, complicated button-combination, overly sensitive control)
- *aesthetics:* overall impression and appearance, graphics (e.g. detailed landscapes, beautiful graphics, slick use of lighting, characters look good), sound effects and music (e.g. nice and atmospheric), storytelling (as opposed to the story itself, e.g. good staged action sequences)
- *interaction:* game play (e.g. simple, fantastic), playing modus (e.g. multiplayer, singleplayer, cooperation modus), allowing for a learning curve, fairness (e.g. same parameters for player and computer rivals)

In their mind-scripts writers differentiate these stated criteria from what really makes a game worth playing, namely a challenge, a captivating atmosphere and the chance to immerse themselves in a parallel world or to flee reality. Therefore an essential part of what definitely makes the quality of a computer game for the writers is only linked rather implicitly to concrete quality criteria. An assessment of these crucial criteria is done by very subjective approaches in terms of the wide range of emotions that playing computer games sets free and in terms of which of the senses it affects. Thus the question is 'How does it feel to play the game?' and 'What makes playing it feel good?'. Writers very often stress that a game needs a 'hook factor' or 'addiction factor' that fascinates them and makes a game immersive. This addiction factor can be reached by appealing to atmospheric sensations of the story, graphics, sound, restaging, game depth or identification with the characters or their actions. A second way of catching the writers is involving them through positive emotions (e.g. warm feelings, having fun, having a good time experimenting) and by provoking passion (e.g. fury, anger, feeling challenged). A lot of attention is also paid to the feeling that playing a game gives (e.g. hectic, not feeling deterred by failure). Even though these criteria are expressed in a very subjective way, writers place a great deal of importance on them. They implicitly indicate that in fact these are also to be seen as objective criteria which make sure a game has the quality of motivating users to play it for a longer time period.

Hidden Causalities and Contradictions

The discursive analysis of the mind-scripts highlights which causalities are implicitly or explicitly constructed and where contradictions and ambiguities emerge. Taking a closer look at the concepts of quality in the mind-scripts, the participants found that construction mechanisms of 'objective' quality standards and subjective preferences differ in writing style as well as in terms of how they are framed.
Referring to the above stated first group of 'objectified' criteria we see a rather distant writing style where the authors fade from the spotlight and very often passive wording is used. Mostly material aspects of the game were described such as the interface and what is technically under the surface (i.e. how it was technically done in terms of e.g. parameters, artificial intelligence). Quality in this context is thematically linked to a comparative technological state of the art, to the production value of the game and to very interesting ideas about time. In many texts the time spent playing computer games is constructed as an investment which refers to the professional context in various ways: Free time is described as scarce because the work load is high. Therefore time invested must relate either to the degree of recreation, fun or the addiction factor or to the benefit the writer gets from analyzing and understanding the functional logic of the game. It was also stated that the assessment of graphics seemed obligatory in many texts because it then often was described as being a criterion that they condone. Therefore the participants

found that it is rather a cliché that graphics has to be criticized while a game cannot really be sold on this basis. Good graphics only serves as a first impression of the game which leads 'average' users to buy it. In this point writers created an opposing construction of their professional assessment and 'average' users who allow themselves to be tricked by the game's appearance even if the game itself is poor quality. All in all this perspective on quality was perceived as a professional approach. When writing about the second group of quality standards which is understood as subjective criteria they rather appear as active subjects in the mind-scripts and describe quality through the act of playing and in terms of emotions and feelings when interacting with the game. It is about diving into the game world as opposed to describing material aspects of a game. During the process of mind-scripting this perspective was also connected to the price of a game and the anticipation that a new game stands out against games played before. Therefore this approach to quality was seen as a user perspective.
In order to integrate both approaches to quality in their mind-scripts writers permanently switched between a professional perspective and a user's point of view. In the professional assessment - by ways of checking objectified criteria - games are criticized more heavily while when described as qualitatively good this is mainly done from a user-perspective. By contrast the professional view is repressed and described as being less important if the game succeeds on an affective user level. Furthermore it is especially interesting to see how concepts of quality are constructed as objective standards on the one hand, even if the criteria for these standards can't be measured objectively and on the other hand as subjective preferences while at the same time these are seen as objectively contributing to the quality of a game. Switching between the two perspectives also reveals a contradiction regarding assumptions about other users. While from a professional perspective a preference for games that are not mainstream in terms of aesthetics and content was articulated, writers believe that average users only buy games that are mainstream in this respect.

Conclusion: Creating Hidden Access Barriers

As shown the self-understanding of system developers is strongly connected with specific value-systems and societal constructions. Due to gender issues this means that technology is male-coded and therefore reproduces gender hierarchies. Since system developers are trained to approach real world settings in very specific ways they also apply (unconscious) knowledge on gendered division of labour and on social relations. The so-called "I-methodology" implies that the own perspective on the social situation to be modelled and the own opinion about future users are taken as granted. Consequently technological products represent the system developers' perceptions which are not necessarily identical with the users' needs and requirements.
As the case-study shows system designers try to anticipate the context of the application of the technological product (such as a computer game), but they do not question these assumptions. Furthermore they believe strongly in their competences as being representatives for users. By doing so the create (hidden) access barriers based on competences, stereotypes and gender relations, because real needs of users are not evaluated.
To overcome this limitation clearly participation of concerned users is necessary. Furthermore the hidden bias have to be made visible, as it was done in the case-study.
The empirical studies show that system designers are in a post-modern sense not coherent identities. Concerning their handling of quality and quality standards this means that they continuously switch between a professional perspective and a user's perspective. In order to catch both perspectives, the hidden biases in the used concepts of quality and the 'mainstream' solutions *mind-scripting* can be applied which is an innovative and promising enhancement of traditional software engineering methods. Making these hidden mental models visible will help to tap the full potential of creativity and innovation

within the system designers. This will lead to a higher quality of the product in terms of a less biased and more inclusive product.
The case-study showed that the system designers were rather surprised when they were confronted with the results of their mind-scripting. They found it interesting to have access to their hidden mental models since they never would have thought to base their discussions on such strong stereotypes (e.g. concerning the gender of the game's users). Additionally they recognized that they would need a learning loop allowing for making these scripts visible and to question them in order to come up with a more inclusive specification. Clearly this should take place at the beginning of the design process.
Summarized the case-study supports the assumption that a new understanding of developing technological artefacts is needed in order to prevent the reproduction of access limitations by applying unconsciously given (gendered) societal relations. But clearly there is additional research needed.

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