

Towards Heterogeneous Sanitary Engineering:

A Study of Sanitation Specialists' Perceptions of Users

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Abstract: *When ecological sanitation alternatives are introduced in urban areas, the technological changes have consequences for the users of these technologies. This is a change compared to the past decades where the focus has been on sewage treatment plant processes to reduce environmental effects of sanitation systems. It is therefore of interest to study how sanitation specialists perceive the users and the relationship between users and specialists. In this paper, I present an interview with a group of sanitation specialists regarding their perceptions of the users. A main conclusion is that specialists tend to continue to regard the development and use of the systems as distinct activities. Although there were some differences between the interview participants, the majority seemed to regard themselves as problem solvers, responsible for the development of technologies that are easy to use in the "correct" way.*

Key words: Ecological sanitation, user participation, heterogeneous engineering, specialists' perceptions

1. Introduction

'Sustainable development' also entails an increased emphasis on the users of sanitation systems. The division between the constructors of the systems and the users is a distinction that is generated by the structure of the conventional system and that influences the visions of future sanitation systems too. The sanitation sector has requested research concerning acceptance, which indicates that the public primarily represents a problem of acceptance. [...] The public could be involved for a number of reasons, of which acceptance could be one, while another could be to listen sincerely to what the public thinks, and the difference between these two perspectives in attitude towards the public is great (Söderberg 1999, p. 22f; my translation from Swedish).

In connection with a study into user perspectives on ecological sanitation systems in urban Sweden, it was the attitudes of the specialists towards the residents who use the systems that intrigued me in particular. Implicit in the reports and discussions about residents as users of sanitation technologies that I came across were perceptions of the users that I believe to be of great importance to the way in which technology is developed.

Against this background, I decided to undertake a study in collaboration with sanitation specialists to increase my understanding of their underlying presumptions and perceptions in relation to the users of the technical systems that we develop. The connections between environmental issues and democratic issues, and the relations between the different social actors and knowledges all call for a more heterogeneous engineering practice.

2. Background

With the shift away from an industrial society towards a risk society (Beck 1994), the distribution of negative consequences of new technologies rather than of benefits has become a major issue. This shift requires the democratization of science and technology, and a modification of the specialist's position in this society, as we can no longer expect new technologies to increase wellbeing without harmful side effects (*ibid.*). The principle of symmetry between engineers, users and other actors (Law 1987) indicates a shift away from the hegemony of specialists and towards a heterogeneous engineering process where all the participants negotiate on the same premises.

The sewage system is a good example of the shift to a risk society. A century ago, the arguments for the introduction of the piped sewage system were increased hygiene standards and living conditions in urban households (Drangert 2002). Today, the debate around sewage concerns the loss of nutrients from the human sphere to the recipient and the ensuing eutrophication of natural waters, that is, negative side effects of an initially (supposedly) positive technical innovation. Consequently, an activity that for almost a century was confined to engineering departments has returned to the political and media agenda (Hallström 2001). There are debates in the newspapers about the risks entailed by the use of sewage sludge as a fertilizer, and politicians have introduced a new set of requirements for the treatment of wastewater in order to reduce nitrogen run-off to the recipients and to increase the recycling of phosphorus. In the repoliticization process, the number and diversity of actors with an interest and/or relevant knowledge has increased, making it necessary for engineers to adjust to the new heterogeneity (Law 1987).

3. Why worry?

My interest in the engineers and their/our perceptions of users derives from problems in their relationship with residents experienced on both sides. While residents feel overlooked, engineers are upset about misuse of the sewage system. Some recent research has surveyed the relations between people's environmental knowledge, attitudes towards environmental problems and their solutions, and environment-related behaviour (see for example Åberg 2000; Lundgren 1999; McKenzie-Mohr 2000; Dahlstrand and Biel 1997). A major conclusion is that these relations are extremely complex. Increased environmental knowledge does not lead to changes in behaviour or attitudes, and changes in attitudes do not necessarily influence behaviour.

The aim of this article is to turn the focus from the users to the sanitation specialists. Given the complexity in users' motivations and practices and the problematic gap between users and developers of technology, there is a need for the specialists to reflect back on their own role as producers of reality and contributors to the direction of development. Beder (1998) quotes a number of studies where engineering students and engineers in the US and the UK were found to be "disinterested in people" (p. 14), but she claims that the engineering profession is changing towards a more socially and environmentally responsible manner.

In action research and in reflective practice, we are given tools to engage the specialists and their/our way of carrying out the profession (for example Schön 1995; Reason and Bradbury 2001; and the journal *Reflective Practice*). Reflective practice is suggested as a means to implode research and practice. Rather than pursuing social science studies into how users behave (and why), as is the case in the works mentioned earlier, the sanitation specialist is encouraged to reflect on his/her own frames within which s/he identifies and solves problems (Schön 1995). This can be done both individually (more or less consciously) or in a group of colleagues who have together identified a need to reflect on their practice. Being an environmental engineer myself, involved in a research group of sanitation specialists, I had an opportunity to engage as an insider with my colleagues in a discussion about our perceptions of users. In some of my discussion here, therefore, I include myself in the analysis.

Schön also encourages the specialists to engage in conversation with his/her “clients”. Through dialogues with the “clients”, their priorities and expectations as well as their relevant knowledge are made visible and can be incorporated into technological development. In development projects in the so-called “Third World”, user participation in technology development and project planning has been recognized as a way, both to improve the projects through inclusion of diverse perspectives and capabilities, and to empower the participants (for example Chambers 1997). Deister and Tice (1993) provide a radical example of such a dialogue in the USA. In their case, a wide range of stakeholders and actors were invited to participate in a series of debates to find a solution to the water shortage problem in a river catchment area in Western USA. The participants disagreed widely, but the sincere commitment to the participatory process finally provided the area with a solution that the regional planners had not foreseen in the beginning and which all of the actors had been able to discuss freely and finally accept. Disagreement is, according to Deister and Tice, not an argument for ending the debate, but an argument for inviting even more parties to participate with new inputs.

As a practitioner-researcher in urban planning in Sweden, Malbert (1998) found that citizen participation can be introduced and create expectations that the people in charge (politicians and/or municipal planners) are not prepared to handle. The problems shown in his examples were both that the people in charge dominated the situation, and that the participating NGO representatives and private persons acted as defenders of their own interests rather than knowledge providers. He suggests that the participatory planning process therefore needs to be well planned and guided by a well-prepared facilitator who is not immediately connected with the decision-making institutions.

While Malbert’s study of participatory planning processes provide insight into successful as well as problematic experiences of the community involvement, explicit studies of the specialists’ perceptions of the users and of public participation have not been found.

4. Engineers talk

As Söderberg (1999; see the quotation above) argues, concepts like “acceptance” indicate that engineers tend to regard the residents as a rather passive “component” in the context of sanitation. The engineer designs a system that the residents may or may not accept. I want to argue that this is a problematic view, regardless of how much the engineer exerts her/himself to design a system that is both robust and user-friendly. Unfortunately, there are few cases where residents have been invited to participate in the design of the sanitation system, with the exception of the ecovillages where the residents were the initiators of the entire construction project.

A common division occurs between the objective – what can be measured with natural science methods and the subjective – what users experience (for example Palm 2000). Although the authors emphasize that both aspects are equally important, I want to problematize the division in its own right. The “objective” measures are defined by humans, with a situated understanding that differs between countries and interest groups (for example farmers, the dairy industry and the environmental engineers concerning the quality of the sewage sludge to be used as fertilizer) and cannot be regarded as objective in the real sense. Moreover, the distinction between objective (measurable) and subjective criteria for the evaluation of technologies conceals the fact that users contribute substantial information about technical performance as well as about their own attitudes towards the basic principles or the design. As soon as non-professional human beings provide information, this is considered subjective and is labelled as data on attitudes or behaviour, but rarely do the authors define these concepts or differentiate between them or recognize when users provide other kinds of information.

In the report *Sewage for Recycling. A Behavioural Perspective on Inception, Maintenance and Use of Urine Diverting Systems* (Widahl 1999; my translation from Swedish of the report title), this became particularly evident. While the title introduces the reader to a “Behavioural study”, the report contains headings suggesting that attitudes as well as behaviours are reported. When I read the report, I was able to identify user information not only concerning their attitudes and behaviour, their opinions and knowledge about ecological sanitation, but also substantial information about the functionality of the technology. From interviews with four households in four different areas in Sweden, 177 remarks were reported (some of the 177 comments are duplicates, as they belonged to more than one category). Of these, 27 were general comments about or demands for information, 39 concerned reported behaviour (for example what chemical products are used for cleaning, how visitors are instructed, whether men sit when urinating), 54 concerned perceptions about the sanitation system (for example too expensive, not willing to take part in maintenance, pride, okay to sit when urinating), and 57 concerned the technical functionality (for example same comfort, too high, difficult to install, easier to clean, difficult to keep clean).

In Malbert’s (1998) study, it was found that the public participants took the role of debaters rather than knowledge carriers (p. 95f). This suggests that in urban planning in Sweden, specialists’ and users’/non-specialists’ perceptions of the users/non-specialists as (weak) knowledge carriers correspond. An alternative perception could be obtained from the emphasis on “local knowledge” as it is expressed in projects in “Third World” contexts (Chambers 1997).

5. Method

After reading a number of reports and listening to conference presentations and conversations where the user/resident was treated as an entirely different kind of human being to the engineer, I decided to interview a group of sanitation specialists who work with ecological sanitation alternatives about the way we perceive the users.

Against the background of the most recent, heterogeneous demands on engineers, I was also inspired by what Heath (1997) calls *modest interventions*. In her study of practices in a molecular biology laboratory, she invited the head of a research project into protein mutations that cause Marfan syndrome to attend a seminar with clinicians and patients that deal with the syndrome on a daily basis. In the discussion afterwards, the researcher emphasized strongly that she was doing basic research and that her work should not be dictated by applied concerns or patients’ demands. Finally, she admitted, “I am [mad at the Marfan patients].

They've made a difference in how I think about my work" (Heath 1997). Heath's modest invitation to a meeting between actors that relate to Marfan syndrome thus had lasting effects for at least one of the actors and her practice.

My own modest intervention was to introduce a few of my colleagues in sanitary engineering to the idea that their views of the users matter. I am an environmental engineer and I consider myself on the same critical plane (Smith 1987) as my colleagues when we discuss users. In my research project, I invited the project group to which I belong, which consists of four male and two female sanitation specialists, all of whom are Swedish, to a two-hour focus group interview (Wibeck 2000 and Wilkinson 1998). Not all the participants are engineers, but they all work with the development of ecological sanitation technologies in some capacity. Before the interview, the quotation by Söderberg cited above was distributed to the group, along with a number of questions about their views of the residents:

- Who is a resident to you?
- How do the residents influence our work and our ideas about feasible technological alternatives?
- Is your view of the resident different or similar in conventional and ecological sanitation?
- Describe the ideal resident.
- Do lab tests and interviews influence decision-making in different ways?
- Who are you to the residents?
- How does your work affect the life of the residents?
- How is your own work affected by your view of the residents?

The questions proved difficult to discuss openly in the group. Although we discussed how we as engineers create systems and how the residents use them, our view of the users was never actually discussed explicitly. My perception was that, during the interview, the general view of the residents shifted, which might indicate that the participants were trying out their arguments – perhaps because none of them had a clear idea of what we need in order to achieve ecologically sustainable sanitation solutions.

6. Representing the interview

As in all research, my representation of the interview and of the participants' argumentation is partial in the sense that I have selected and reorganized the material according to my own needs and interpretation. The themes represented below were identified during the analysis of the interview and are thus my way of organizing what was said at different occasions during the interview.

The problem of representing fellow human beings in research reports is always present (Wolf 1996), but became especially obvious to me as I interviewed colleagues that I interact with regularly. The participants may argue that I have misinterpreted them or that I have not presented the full picture, but that was never my ambition. Instead, my analysis is meant to arrange the different arguments into topics that are relevant to my discussion about heterogeneous engineering and the inclusion of diverse actors in the process of technology development.

6.1 Our view of the residents

Nick (all names have been changed) admitted that he (as a user) would prefer it if he could simply pour chemicals down the drain and that the technical system would take care of it from there on. He expected the transition towards increased resident involvement to take a long time. Since the problem of the present sanitation system is invisible to the residents, there is little motivation for them to change their behaviour.

Well-informed consumption and source separation of waste as standard practices require that people spend more time on everyday chores, according to John, and the residents need to know *why* they should switch from a convenient system to one that is less convenient. The sanitation system is something most people do not want to have to deal with any more than is necessary. Since the environmental consequences are not immediately apparent to the residents, they need to be communicated to the residents (John). Ann added that the design of the present system “invites you to behave as you like”.

Ann argued that ecological sanitation systems require more effort from the residents, since they do not function in exactly the same way as conventional systems and since they do not always work as we are used to. “It is not just paraffin oil that we pour into the drains, but many other things that we really need to maintain some kind of quality [of life]; Western life that is, but nevertheless... These things do not change that easily” (Ann). Even with some awareness about the problems, Ann felt that it is hard to actually make the radical changes that might be needed.

Peter’s experience from contact with residents is that they are “quite curious, quite interested, but rather uninformed”. The wastewater disappears and that is all they know. Peter compared residents in ecological areas with residents in areas with conventional systems and felt that despite the greater involvement in the ecological areas, both groups have similar needs. “After the first intensive surge of involvement dies off, nobody is interested any more and we are back at convenience, that it should work properly, as the first priority. So, perhaps there isn’t such a great difference between different user groups in the end.”

This might be related to the widespread stress in society. Technology “has to work to support us, so that we do not need to spend any time on it. There is hardly time enough to cook” (Ann). Peter agreed that the time aspect is important in ecological areas too.

6.2. Technology as the solution

If we perceive the resident as rather indolent and uninterested or uninformed, then the technology is ascribed the all-important role of directing behaviours and correcting what goes wrong during use. Mark opened the interview with a discussion about the residents’ acceptance, arguing that this depends on the design and robustness of the system. The technology should, according to Mark, be simple and intuitive. “It should be self-evident. When you enter [the bathroom], you should understand how to use it. You should not need any instruction before sitting down”. The system should also be “forgiving”, i.e. endure mistakes, according to Mark. With such a system, acceptance among residents for ecological sanitation systems is possible. In other words, the idea is not problematic in itself, but the design is immature. Mark expected an ecological sanitation system to demand the same input from the residents as the current system. The method of use of low-flush toilets, for example, does not differ for the user, and organic kitchen waste disposers are convenient and easy to use when placed in the sink. Still, Nick, John and Ann claimed that new demands would nevertheless be made on the residents, including source separation, knowledge about different materials, adaptation to new routines etc.

Peter added that critique is common when a project is focused on technology, and *not* on behavioural changes or information campaigns.

6.3. Possible instruments of control

Even when technological solutions are regarded as the main theme in ecological sanitation, additional requirements are often placed on the users. According to Peter, we do in fact expect changes in the users' behaviour in connection with both conventional and ecological systems, since we are calling for a reduction in undesirable substances and objects disposed of in either kind of system.

Mark expressed a strong belief in information, but was dissatisfied with the way the sanitation sector had worked with information. Information must be produced and distributed more systematically and professionally. Peter added that we must not forget the need for repetition in information campaigns. Nick was more sceptical – he believed that in general people are rather hard to influence, unless there is some imminent catastrophe scenario to refer to. Therefore, statutes are necessary, especially, as Mia commented, since “the effects of a changed sanitation system are located so far away from me as a user”.

Mark compared the required changes in the sanitation sector to the introduction of catalytic converters in the Swedish car fleet. Economic subsidies were combined with new legislation, and today, most cars are equipped with a catalytic converter, even though every car owner had to pay for it. Mark believed in pricing as a regulatory tool in connection with sanitation as well. For example, the connection fee could be set higher for conventional than ecological sanitation. Mark commented himself, though, that differentiation or large increases in sanitation tariffs are politically sensitive, with which Peter agreed. Despite the low per-household cost of sanitation, cost sensitivity is high, according to Mark. Peter claimed that this factor is in fact positive, “since it could be exploited”. High cost sensitivity creates possibilities to redirect behaviours, even with rather moderate tariff changes. Nick emphasised that the change in tariffs should correspond to environmental benefits, and not only be used as educational instruments.

After a long discussion about the political difficulties of pricing water, sanitation and waste handling, Ann reconsidered our role: “Is it our duty to try to infuse courage into our politicians so that they dare make these decisions, excuse my question, or is it the users'? They might not be aware of the problems, and so we must first influence the users who should then influence the politicians, who are also users. It is a very slow system”. Peter's response was that engineers have not been very successful in their communication with politicians, compared with other groups in society. This is partly due to “engineers being very passive. You *react* to society's decisions and solve the problem” (Peter). Nick agreed that there is a lack of “technology tradition in the political system”. Mark argued that the residents should make claims and realize the need for a change in the present sanitation system. The politicians must dare to have high ambitions and cover additional costs if it is beneficial to society. The politicians should define limits within which the technology can then be developed (Mark). Our role as developers of technology is thus not, according to Mark, to formulate the goals, but to fulfil demands identified by the politicians, without slowing the process down with reference to more time needed for studies.

6.4. Complexity

Ann brought up yet another aspect; namely, the fact that different solutions are needed in different areas. “In large cities, you want high-tech”. In urban areas, most people expect technical systems and specialists to take care of their waste. According to Ann, it is different in rural areas, where many people have their own separate sanitation installation and live in close proximity to farmers who could utilize the nutrients.

John saw risks associated with “replacing one colossus with another, being again trapped in an infrastructure with long-term investments”. This way of thinking is different from the present system, where the entire country has systems that are in principle identical. “I think that this poses a major challenge in the development of ‘forgiving’ systems; the fact that the user group is so complex” (Ann).

6.5. What do we expect from the residents?

Since the discussion had returned to the conclusion that sanitation engineers must design user-friendly technology and take care of the tasks that the residents do not have the time, knowledge or desire to perform, I asked if we can accept the residents’ expectations of a technology that is capable of taking care of everything. I also asked how we handle our hope that users will refrain from pouring chemicals down the drains, in order to produce less polluted sewage sludge. Nick said that knowledge is not enough, and Ann did not expect anybody to want an increased workload as long as there is technology available to solve the problem. John held that there must be simple alternatives to dumping waste in the sewage system. John believed in financial incentives as a way to initiate behavioural change, but added that “the reason for the difficulties might be that we do not trust people to use the system properly or to make the necessary changes in behaviour, along with the fact that the technology is underdeveloped”.

The interview ended in a dejected tone, where Ann concluded that “We don’t seem to think that people’s behaviour will change” and that information is not enough to change people’s behaviour.

7. Discussion

I have identified a few actors and activities mentioned in the interview and characteristics ascribed to the different actors (see Figure 1).

What emerged from the interview was an image of a user too stressed or indifferent to be expected to spend any more time or effort on the sanitation system. It is therefore our task as specialists to design ecological sanitation systems that can be used in the same way as the conventional system or that are even more convenient. At the same time, we expect the residents to take in the information we send out, since we depend on their behaviour in connection with both sewage sludge and ecological sanitation systems. We therefore need to improve our conveyance of information.

The politicians are rather anonymous in the interview, but they were expected to take the main responsibility for the regulatory framework and the visionary thinking.

We are presented with a picture of engineers as *performers* of other people’s orders, as intermediaries between political visions and users’ behaviours (asserted by Mark), and as *actors* that ought to be more active in the process for change (cautiously suggested by for example Ann and Peter). This ambivalence corresponds to what Hallström (2001) describes as the repoliticization of the sanitation system and the ensuing increased heterogeneity among actors.

Nobody talked about involving the users in the development of technologies (the missing arrow in Figure 1) in order to allow the technology and the user to mature together. The resulting picture is instead, as we can see in Figure 1 below, that the users/residents are recipients of different kinds of activities undertaken by politicians and sanitation specialists, aiming at changing the users’ behaviour.

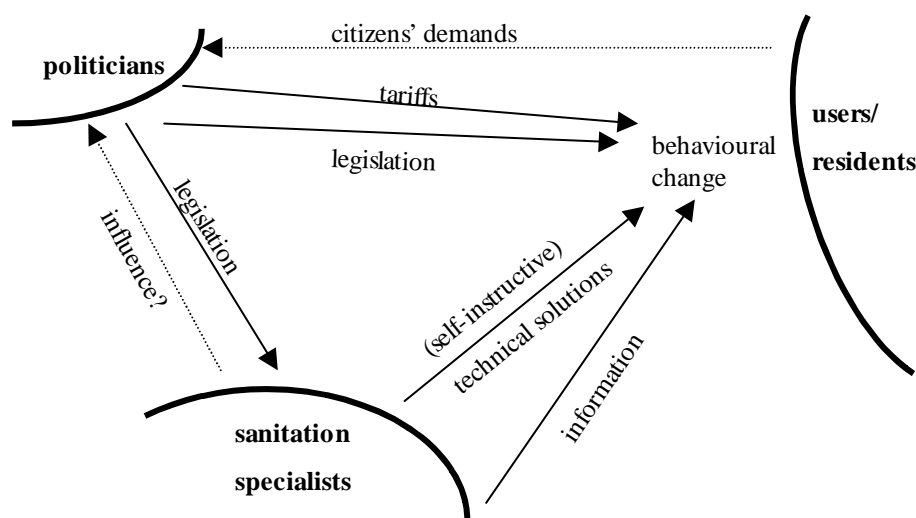


Figure 1. Actors and their activities in the introduction of ecological sanitation. The arrows represent the ways in which the interview participants suggested that influence is, could be or should be exerted. Continuous lines indicate that the participants identified a rather clear influence, while the dotted lines show where the extent and desirability of the influence was discussed. The “missing arrow”, from users to specialists, represents the relation the interview aimed at bringing up but failed to do.

I observed an interesting difference in the group. Some participants made a distinction between I—the specialist, and they—the users/residents, in which the role as specialist designer/problem solver is rather distinct. Technical solutions are attractive for the lazy user (with whom Nick associated) as well, as they require less behavioural change. Other participants expressed a more complex interpretation of life in modern society, where we all participate as both residents and (in our case) sanitation specialists. With this interpretation, the solution to the problem of sanitation is less clear. Technology cannot solve all the problems resulting from the modern way of life; social changes are also necessary. These two approaches affect approaches to changes in the sanitation system. The differences among sanitation specialists could be analyzed further with reference to gender and age, as the profession is currently undergoing a transformation with regard to both. Such an analysis would require further research.

As I inscribe myself in this text as a sanitation specialist, not only writing about “them” who participated in the interview, I admit that I share some of the ambivalence expressed in the interviews?. On the one hand, as engineers we are trained to regard ourselves as problem-solvers and do not expect too much from the residents. The residents have entrusted us with the responsibility for the system, and hence, we should develop simple solutions. On the other hand, we are frustrated when residents misuse (according to our definitions) the system and we want them to change their behaviour. This ambivalent perception reproduces the residents as the Other, whom we as specialists need to adjust to and try to influence.

Part of the ambivalence is related to the environmental consequences that are anticipated. At the EASST conference *Responsibility under Uncertainty* (31/7-3/8/2002), Jaap Jelsma argued that environmental technologies are different from other technologies, where changes and development have more direct benefits for the users. With regard to environmental technologies, the users cannot be expected to consider and negotiate environmental consequences in relation to convenience and user friendliness or appropriateness. Jelsma therefore talked about the engineers’ desire to “engineer around the user” in order to make it impossible to behave in an environmentally unfriendly manner. In the focus group inter-

view, my colleagues talked in a similar way about developing systems that are simple, intuitive, robust and forgiving.

My recognition of the reluctance towards involvement of the users, evident in the interview as well as in other reports, is meant as a starting point for the call for a change that I argue in favour of. My problematisation of the specialists' perceptions of users is not meant to freeze the development of ecological sanitation technologies through a critique of engineers as inattentive to the users' needs. I believe that engineers are important actors in the development of sustainable technologies, and I hope that the planning of new residential areas will benefit from the study of which this discussion is a part.

Reflective practice, as it is outlined by Schön (1995), offers a way to avoid falling back into the dichotomization between us-the specialists and them-the residents. As Schön (1995) points out, there is a place for specialists in society, but their relationship with the "clients" could be radically changed through a demystification of professional expertise (p. 34f). The new contract between reflective specialists and clients require that the specialists are open about their own preunderstandings, and invite the residents to judge the specialist's suggestions. The client, in turn, must be prepared to accept the uncertainty that the specialist will reveal, and to take her/his share of the responsibility for the decisions. I am convinced that if residents are to stop misusing the sanitation system, they must be invited to participate as equals in negotiations according to a contract like that. This was also suggested by John in the interview when he said, "the reason for difficulties might be that we do not trust people to use the system properly".

At the same time, I am aware that this kind of democratic development will take time and will require input from other sectors as well. The development of sanitation technologies needs to proceed parallel to this more general process, with a continuous interaction between the two. Just as the interview participants argued, the politicians play an important role, regardless of whether specialists and users are supposed to influence their work.

I think that the cracks that ecological sanitation has already opened in our social structure could be explored as openings for demystification and a broader participation. The discussions in the interview reveal that some of the participants were aware of these openings, as they reflected on their own place in the contemporary society. The presumption that ecological sanitation alternatives will require increased work of the users (asserted by all interview participants except Mark) also indicates a preparedness for changes in the framing of the problems sanitation specialists need to address.

A consequence of the desire to steer the sanitation system away from "taking care of waste in the least harmful way" and towards a "recycling of nutrients in the most beneficial way" is that we will have to get used to a variety of sanitation systems. This was recognized by some of the interview participants, and this, too, marks an opening of the present way of thinking towards increased heterogeneity in the engineering practice.

As the above comments indicate, the participants in the focus group interview were to various degrees aware of the increasing heterogeneity in engineering that ecological sanitation systems require. They included user aspects in their technological design and evaluation processes. However, their perceptions of the users did not include an invitation to increased user participation in the development of the technologies.

A modest suggestion to help initiate a process of user involvement is to launch a sincere discussion among engineers about our perceptions of the residents. As both Malbert (1998)

and Schön (1995) show, public participation requires a change in the approach of the engineers as well as the users. If user participation is to be successful, engineers need to respect the variety of knowledges that co-exist among the different actors.

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