# A WORKING MODEL TO INCREASE AWARENESS OF SOCIAL IMPACT

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**ABSTRACT**
Designers are not always aware of all social consequences of technology, despite practicing user-centred research. With the introduction of disruptive technologies intended and unintended social impacts can be expected, therefore they need to be anticipated. But in general design practices social impacts are completely overlooked. An awareness of the need to anticipate social impacts will not develop automatically. For this purpose a model of awareness has been developed. The model  has been evaluated by 12 students. It  appeared that the students were able to use the working model, but it turned out to be difficult to imagine changing social practices. It was therefore concluded that students need to increase understanding of the complexity of social practices.

*Keywords: Social impact, model of awareness, anticipation, technology*

## 1   INTRODUCTION

The use of email communication, mobile phones and cars are examples of technologies that have had wide-ranging social consequences. Email, for instance, was developed as an efficient mode of communication between two actors. As we all know, the introduction of email has fundamentally changed traditional business and office practices. These side effects were not identified until long after email was introduced.

During recent years, designers have grown increasingly interested in social impact of new technologies. Modern information technology, in particular, creates extensive possibilities to influence social behaviour. Persuasive technology has been developed to increase, e.g., environmental friendliness. Once a designer aims at defined social changes, the consequences of technology for practices become a responsibility, too. This may have consequences for design education.

### 1.1 Social consequences of technology: mediation

The process leading to changed social practices is called mediation. Mediation comes about in a complex interplay between technologies and their users [1]. The consequences of these mediations on social interactions will be referred to as social impact. According to Verbeek [1]'Technologies enable us to perform actions and have experiences that were scarcely possible before, thereby helping to shape how we act and experience things.' Technology, therefore, is active: it helps to create a situation that was not possible without technology. A new technology is changing the script [2] of its users. This mediation between users and artefacts is formed by interactions.

A new technology will be translated into a form that is more appropriate for potential adopters, by choosing some elements of the technology and leaving out others [3]. So, it is not sure what kind of mediations will take place. The potential adopter will not use all scripts available. A social environment will have an influence of its own [4]. This means that social impacts are difficult to predict at forehand.

### 1.2  Importance for designers

If unintended consequences can be expected it may be wise to avoid them in social contexts. This seems, however, to be a poor solution. According to Christensen, Bohmer and Kenagy [5] disruptive technologies may be the cure for healthcare, because the healthcare needs to be transformed. Managers and technologies need to focus on getting less expensive professionals to do more sophisticated things

(with the help of technologies) in less expensive settings. It is needed to design disruptive technologies and therefore it is needed to perform anticipations of social impacts.

In order to anticipate the future use of a product an engineer needs to have an understanding of the working of the technology in the real world, which Roozenburg and Eekels [6] refer to as the cosmonomy. This reality is simplified through causal models. Insights from causal models are translated into concepts, which can then be tested in the real world.

Insights into social impacts need to be translated into concepts for new designs. These steps can also be applied in anticipations of social impact [7], but, unlike technical impacts, social impacts are completely overlooked in design contexts. A probable cause for this is that mechanical engineers are confronted with unintentional consequences of products immediately. Malfunctions within a product can lead to high costs and user dissatisfaction. In the case of social impact, however, consequences are not directly related to a new technology and may evolve over time. A designer is not directly confronted with unwanted social impacts. An awareness of the need to anticipate social impacts will not develop automatically. It is therefore important that a designer is able to assess whether implementing the anticipation of social impact in a design process is necessary or not. This has implications for design education. Future students need to become aware of the risks of social impacts when designing for sociable sustainable solutions.

## 1.3  Awareness of social impact

It is needed to assess whether technology will lead to social impact. Disruptive technologies in design environments are already viewed from the perspective of whether they are able to change social contexts. An example is the introduction of the compact disc player and, more recently, the iPod [8]. A difference is that these visions of disruptiveness focus on the question of what kind of innovation is needed to make sure that a company stays healthy. Only focusing for instance on incremental innovations is considered to be a risky strategy that might harm a company in the long run. This explains why a matrix to describe disruptiveness is called the 'Ways to Grow' matrix [9]. The matrix evaluates innovation efforts within an organization. This model focuses on what a company needs to know in order to design a new product (new offering) for new users. However, it does not explain the consequences for the social environment itself. What social practices will be changed through new technology?

According to the paradigm of social impact, the disruptiveness of designs will be considered from the perspective of outcomes. When technology intervenes in a script, leading to changed practices, a technology will be considered disruptive. Thus observed, innovation might be understood differently[1]:

- A new technology (new offering) means that the kind of social impact that can be expected is unknown. It might be difficult to know which contextual characteristics will lead to what kind of social impacts;  unintended outcomes may therefore be expected [3].
- Users are replaced by social practices: understanding a new social practice leads to difficulty in understanding the consequences of implementing a new product, because social patterns are not identified. Hence, there may be a higher risk of unintended outcomes.
- Another aspect that can be disruptive for a social environment is the question of whether a certain practice is about to be changed through a new technology. A product designed to interfere with a script might lead to changes in social interactions and can therefore be considered disruptive.
- Vulnerable users may have fewer options to adapt their behaviour to changed practices and are therefore more affected by the introduction of new products[10].
- When a product is developed for an undetermined social environment, it is much more difficult to control and anticipate social impacts of a new product and hence the consequences can be more disruptive.
- Finally, a product that mainly has individual consequences is believed to be less disruptive than a product which has social consequences as well.

A designer therefore needs to understand different aspects of disruptiveness in order to understand the possibility of social impact. From this analysis six dimensions can be defined which are translated into three matrixes:

1. The newness of the functionality of a product **vs** the newness of the social practice; this explains the expected difficulty of an innovation.

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[1] For an explanation of how these aspects have been deduced from literature and earlier studies, see [7]

2. The way practices will be influenced **vs** the vulnerability of the expected users; this explains the expected level of social impact.
3. The expected environment in which the product will be introduced **vs** the expected individual or social consequences; this explains the expected scope of influence.

## 1.4 A working model
In this section I will discuss the six dimensions of the working model.

### 1.4.1 Matrix 1: expected difficulty of innovation (figure 1)
This matrix is linked to the 'ways to grow matrix' and aims to determine the level of innovation of a new technology. Introducing new functionalities in unknown social contexts causes uncertainty about the consequences. This makes it more difficult to anticipate social consequences.

Existing vs new functionality: A user is only influenced by new technology if it offers new functionalities. A new functionality can be a new technology (for instance, nanotechnology), but can also be an existing functionality that had hitherto been unavailable to a user. The social impact of cars was felt only after users acquired cars.

Known versus unknown social practices: practices consist of interaction patterns within social environments - such as the interactions between members of a social environment within a physical and technical context. An example would be the members of a family or workers in an office. It is easier to develop a product for a well-known practice than for an unknown practice.
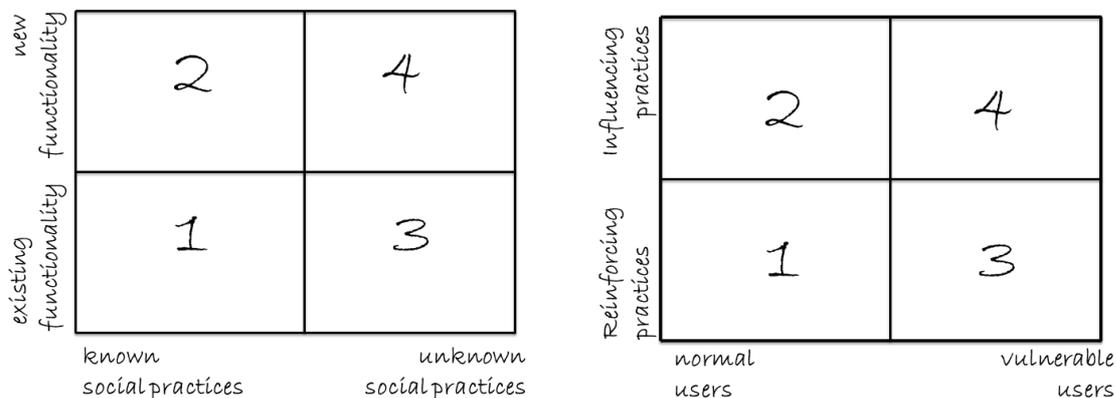


Figure 1 and 2. the expected difficultness of innovation and the expected level of social impact

### 1.4.2 Matrix 2: Expected level of social impact (figure 2)
This matrix determines the ethical responsibility and necessity to anticipate social impact.

Reinforcing or influencing existing practices: A designer needs to consider what the starting point of a new design is and what his intentions are. Is it his intention to influence or merely to reinforce existing practices?

Normal versus vulnerable users: Whether a user is vulnerable depends on the technology that is introduced. A change in our energy supply requiring us to use less energy and forcing us to use the washing machine at night can be inconvenient. But it is questionable as to whether such a change will lead to harmful situations. However, when a hospital introduces a new care system for nurses, the relevant patients are vulnerable to changes, especially if they are unwanted and unexpected.

### 1.4.3 Matrix 3: Expected scope of influence (figure 3)
This matrix determines the scope of influence of the anticipated social impacts.

Specific versus general environment: Is it possible to determine what kind of users will be using a product, and in what kind of physical and social setting? In that case, social impact can be determined for a specific environment. If it is impossible to specify a social environment, we refer to a general social environment.

Individual consequences versus social consequences: This attribute is related to the possible consequences of an anticipated product. Is it restricted to individual users or does it also involve social environments? A digital whiteboard is focused on the use in a social environment, while a shaver is focused on individual use.

*Figure 3. expected scope of influence on ….*

The model of awareness does not give absolute, quantified results. The model is meant to stimulate discussion between designers and to stimulate the anticipation of social impacts in design contexts. In a next stage of research, it is important to verify whether the model has the ability to generate new discussions between students. The goal of this research is an evaluation of the model of awareness in educational settings.

## 2   EVALUATION OF THE AWARENESS WORKING MODEL

A descriptive study was carried out to evaluate the working model. Students doing a Care and Technology minor at the Hanze University of Applied Sciences were selected for this purpose. Twelve students from different academic backgrounds (social, medical and technical) completed the questionnaire; 3 female and 9 male.

The respondents were presented with two cases and asked to decide how much social impact the products in these cases were likely to cause. The first case involved a urine analyzer intended for use in a hospital for patients in the intensive care. In the current situation, urine is collected and taken to a lab. In the new situation using the new analyzer, urine could be analyzed directly at the bedside.

The second case involved a homecare system developed by Nedap, a manufacturer of intelligent technological solutions. Nedap proposed to redesign its homecare system in order to make this suitable for hospital use. The products have not been developed at this moment. The respondents were asked to make a preliminary assessment anticipating the social impact of the products and needed to use the working model to help them to become aware of possible impacts.

In the questionnaire, the respondents were asked to rate each dimension on a scale from 1 to 4. Furthermore, they were asked to explain why they had chosen a particular score.  The respondents' explanations were categorized according to their relation with the question asked (green: in line with dimension, yellow: more or less in line, red: not in line with dimension). The answers were only used to see whether respondents were able to justify their answers based on the given dimensions.

### 2.1  Results

The results are represented by case and matrix.

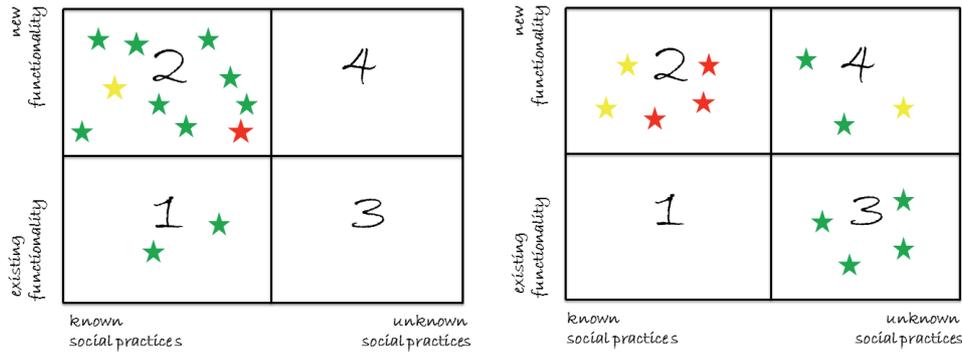## Results for matrix 1: expected difficulty of innovation



*Figure 4 and 5. results for case A and B of the expected difficultness of innovation*

Case A Urine analyzer (figure 4): The respondents agreed on the fact that the product would be introduced in a known environment. Whether the functionality was new or already existed remained a point of discussion, although the majority agreed that it was new.

Case B Planning system for a hospital (figure 5): The opinions about the difficultness of innovation of the respondents were more varied and there were more answers that were not related to the matrix 'difficulty of innovation'. For instance, the five respondents who chose option 2, all gave motivations that were not in line with the dimensions.

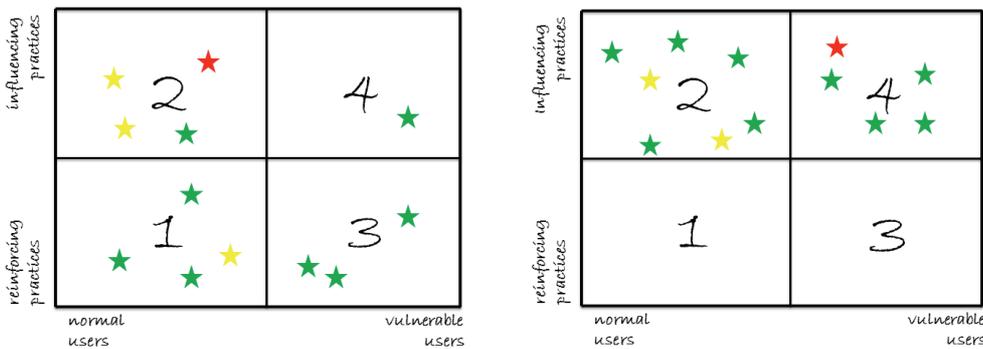## Results for matrix 2: expected level of social impact



*Figure 6 and 7. results for case A and B on the expected level of social impact*

Case A Urine analyzer (figure 6): The expected level of social impact is viewed differently by the respondents. Most respondents considered the target group to be the patients' physicians, others focused on the patients. One respondent thought that practices were influenced for vulnerable users.

Case B Planning system for a hospital (figure 7): For this case the expected level of social impact is viewed more equally. The respondents agreed that the product would influence hospital practices. They differed on who the target group of the product was; normal users or vulnerable users.

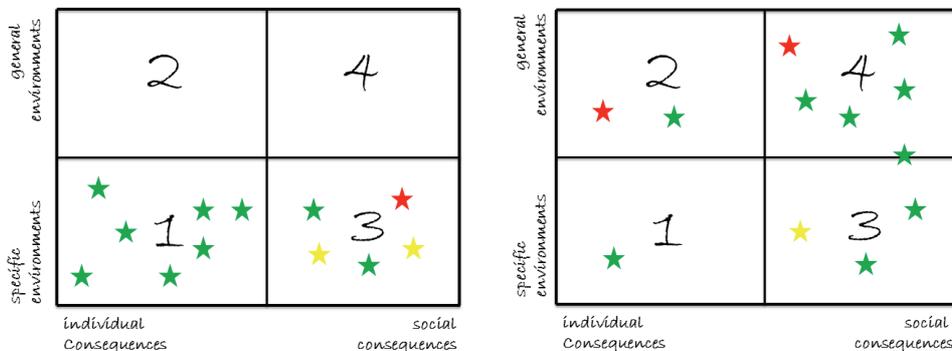## Results for matrix 3: Expected scope of influence



*Figure 8 and 9. Results for case A and B on expected scope of influence*

<u>Case A Urine analyzer (figure 8):</u> The respondents agreed that the use of the urine analyzer occurs in a specified social environment. What they did not agree on is whether the product influenced individual behaviour or individual and social behaviour.

<u>Case B Planning system for hospitals (figure 9):</u> The respondents showed greater variation in their answers regarding the scope of influence of case B. Most arguments were in line with the dimension; the estimated use of the product was interpreted differently.

## 3  DISCUSSION AND CONCLUSION

This study was carried out to determine whether students were capable of using the model of awareness. Although some respondents used unrelated answers in some cases, most answers were related to a matrix. The model would therefore appear to be able to be understood by most respondents. Where the respondents appeared to be less clear about a case itself, their own interpretations increased.  For instance, the respondents seemed to find it hard to interpret the social impact of the urine analyzer, which led to more unrelated answers being given, but for the planning system for hospitals it seemed to be less difficult to give answers that related to the different dimensions.

In general, it was found that respondents have difficulties in understanding the complexity of a social practice. An example of this is the fact that most respondents thought that specialists would be the sole users of a urine analyzer (case A) in a hospital, in the case of the new planning system for nurses (case B), that only nurses would be involved and that these products would have no impact on patients. My assumptions had been that these would be clear examples of vulnerable users.

For this target group, it may be necessary to increase understanding of the complexity of social environments. This might lead to a better understanding of the influences involved in the cases.

### 3.1  Conclusion

Students need to gain more knowledge about social practices in order to be able to use the awareness model properly. The model of awareness therefore will be extended with an analysis of the social practices involved at forehand. The use of a screenplay method [7] that allows simulating new social practices might be beneficiary.

## 4  LITERATURE

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