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WHERE'S MY ROBOT? INTEGRATING HUMAN TECHNOLOGY RELATIONS IN THE DESIGN CURRICULUM

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ABSTRACT
In today's society, and in almost every forecast for the future, technology development plays a major role. From theories in Science & Technology Studies we learn that the development of new technology cannot be meaningful unless there are users that successfully adapt the products and services to their own lives. As a result, it is important that designers learn to explore the interrelationships between engineering and behavioural, cultural and social issues. Within our Industrial Design Engineering curriculum we therefore emphasise the influence of technology on human behaviour and vice-versa. Although every specific product and context demands for a specific relation, we have experienced that there is common ground in the developments of these relationships that makes our education work. At a higher level of abstraction, the human side of the relation stays merely the same, because human bodies and human needs and emotions do not develop fast. It is only the technology side of the relation that develops and therefore changes the relationship. Thus, by starting from the human side of the relationship, the technology side can be consciously developed and shaped. A carefully designed series of courses in Design Aesthetics, Philosophy of Technology, Cognitive Ergonomics and Usability develops the students ability to analyse the human needs and characteristics, to understand the impact of technology, and provides the skills to shape the desired relationships. And although we do not design robots, our experience with Industrial Design Engineering is that human technology relations are apparent within all sorts of design challenges.

Keywords: Human-Technology Relations, Design Curriculum, Curriculum Development, Technological Mediation

1 INTRODUCTION

In today's society, and in almost every forecast for the future, technology development plays a major role. For industrial design, the incorporation of smart products, like robot nurses, robot pets or even robot personal trainers, is often referenced as a solution for an ageing society where healthcare costs are going through the roof. On the other hand, at present the only robot type with considerable market penetration is the simple vacuum cleaner. So are these robots preferable solutions with respect to the users, bearing psychological and social needs of people in mind? To answer this question, one must learn to have a close look at the relationship between the user and the robot.

Figure 1. Human-Product relations in healthcare; the traditional device evokes undesirable associations, but is the robot a preferable solution?

Figure 1 illustrates some of the problems with a particular user-technology relation in healthcare. The device on the left evokes undesirable associations, which can be either suppressed when the device is controlled by direct manipulation of the patient by a caretaker or even strengthened when for instance the nurse stands at some distances and steers the device with a remote control. The feeling of being a 'thing' will be very strong with the patient in the latter occasion. The friendly appearance of the robot device on the right will probably overcome this, but the feeling of unease can remain because the robot cannot stand the comparison with a real nurse [1]. A comparison that is induced exactly by the friendly humanoid layout of the robot.

To prepare our students for the difficult task of dealing with these sort of issues regarding the development of the products of tomorrow, we developed our curriculum towards an integrated view on human-technology relations. This paper will describe the theoretical framework and educational principles underlying this integrated view, highlight some aspects of the related courses, and show some typical results from student's at several stages of the Bachelor and Master.

2 THEORIES OF HUMAN-TECHNOLOGY RELATIONS

From theories in Science & Technology Studies we learn that the development of new technology cannot be meaningful unless there are users that successfully adapt the products and services to their own lives [2]. To illustrate this concept we look at the example of the Videophone. As early as in the 1970s, this technology was available, but never came through to gain any considerable market share. Of course there was the difficulty of having the first Videophone in town and not being able to video-call anyone else. But the telephone faced the same problem when it was introduced and became a large success because there was a need for communication among the people (especially under bored housewives of the American country-side). Apparently there was not a need to actually see your friends while calling them in the seventies, eighties or even nineties of the 20th century. However, in the end video-calling became widespread when it was transformed to the cheap (for free) online service of Skype and FaceTime. Of course the financial threshold was eliminated in this way, but by the increase of travelling, working abroad and studying all over the world, also a human need for video-calling emerged. When it is no longer possible to simply call people for a face-to-face appointment because they are too far away, the video system fulfils a real need for actually 'seeing' your friends and relatives.

So the success of technological development does not rely on the level of sophistication of the engineering alone, even it is not determined by the level of usability or the pleasure and emotion gained by using the artefact. In fact, also developments on a social and societal level play a major role. As a result, it is important that designers learn to explore the interrelationships between engineering & technology, as well as behavioural, societal, cultural & ethical issues [3]. Within our Industrial Design Engineering curriculum we therefore emphasise the influence of technology on human behaviour and vice-versa. With a carefully designed series of courses throughout the Bachelor and Master, we prepare our students to shape the future of technology in a way that is meaningful to the individual user, meaningful to social groups and networks, and also meaningful to society at large.

The theoretical framework behind the courses is adapted from a combination of Science & Technology Studies, design aesthetics, behavioural sciences and usability [4]. Especially the theory of Technological Mediation [5] is used to explain, analyse, explore and eventually consciously design, human technology relations.

3 IMPLEMENTATION IN THE CURRICULUM

In our Project Based Learning environment [6], we work with three distinctive learning lines to cover the discipline: Engineering, Humanities, and Designing. To achieve the desired level of proficiency with these topics, each learning line comprises of three stages. We discern a basic course, normally positioned in the first year of the bachelor curriculum, a phase aimed at broadening the perspective and a phase aimed at gaining more in-depth knowledge [7]. Within this matrix of learning lines and learning phases, several courses in Design Aesthetics, Philosophy of Technology, Cognitive Ergonomics and Usability address the topic of human technology interactions from different perspectives. Table 1 gives an overview of the distribution of courses that specifically address human-technology relations across the several phases. The essential stage of integrating the knowledge is done in individual- and group design projects throughout the entire curriculum.

Table 1. Courses that address human-technology relations and the learning lines

	Basic Course	**Broadening the perspective**	**Deepening the subject**	**Master phase**
Designing	Methods of Form[1]	Human-Product Relations[2]	Design & Meaning	Design & Emotion, Create the Future
Humanities	Physical Ergonomics	Human Product Relations[2], Cognitive Ergonomics	Philosophy of Technology	Scenario Based Product Design
Engineering	Smart products	Design of Interactive products	-	Sources of Innovation

[1]) See also [8]
[2]) This course is an integrated course from both Designing and Humanities

4 EXAMPLES

In the second year of the Bachelor curriculum we start the integration of approaches on human-technology relations in a course called human-product relations [4], where the students have to design a piece of street furniture. The technology-component at this stage is not very complex, but this subject is very suitable to explain the concepts of mediating technology and behaviour change. In the example of Figure 2 for instance, it is clear that the seating suite on the left induces people to sit straight, at pre-defined distances from each other. The seating suite on the right leaves more room for interpretation and allows people to sit very close to each other or not, and at either side of the table. The picture shows also that the use of products is not always the same as intended by the designer.

Figure 2. Examples of street furniture to explain the mediating effect of technology

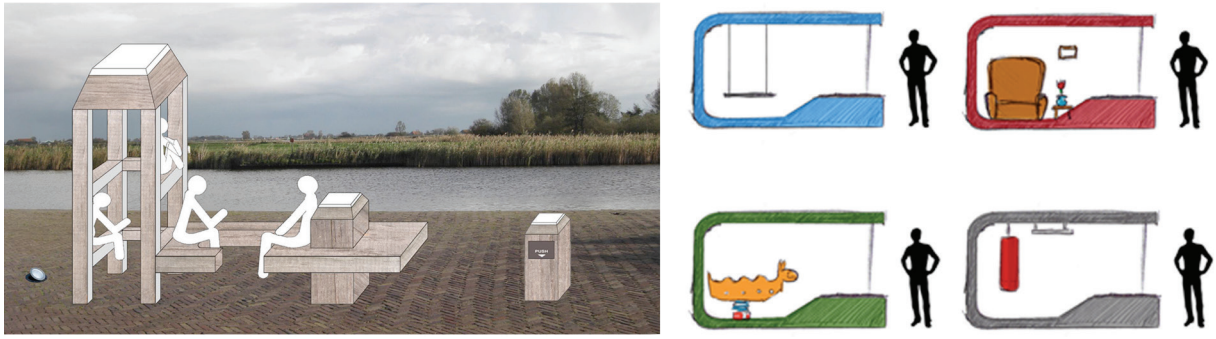

Figure 3. Street furniture concepts by Jessica Schraa (left) and Hieu Nguyen (right), 2011

Figure 3 shows two student results of the course. The 'Loswal' concept by Jessica Schraa is a hangout for tourists in a typical Dutch Canal-side environment. The concept does allow for different arrangements of people like the garden table in figure 2. It caters for sitting alone or together and also

in a high or a low position for different views on the landscape. The concept also mimics typical harbour equipment. The bus shelter concepts by Hieu Nguyen work in a slightly different way. They do not so much emphasize the physical relationship with the street furniture but rather a psychological one. The passengers that have to wait in the bus shelter are invited to spend their time playing around with the objects that are added to the simple shelter. The somewhat unusual objects therewith also have a second function as conversation starter between strangers.

The second example, comes from the master course Create the Future. Although industrial design is always future oriented by nature, in this course students have to develop an innovative product for in at least 25 years' time, and have to design the future context for their product themselves with the aid of scenario development [9]. The technology involved here is more advanced, especially because the students can make use of the expected developments in future technology, based on Delphi Studies. The design concept that is shown here is made for Philips healthcare. To quote the students themselves: "future studies allow companies to explore and pursue future opportunities. Therefore it is an important skill for designers to be able to develop and work with a long term vision." [10] p.7].

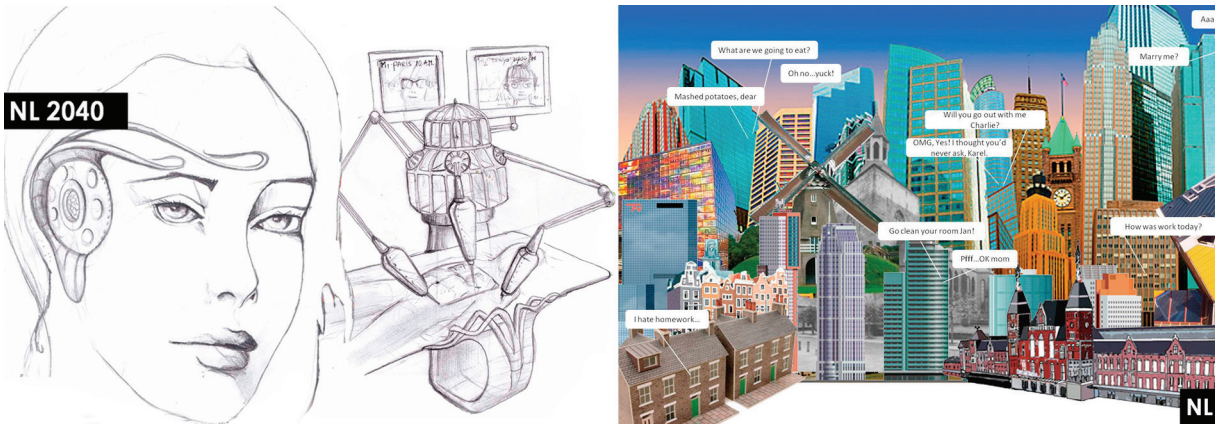

Figure 4. Scenario visualization "Healthcare in the Netherlands in 2040" by Ida Nordlöf, Liesbeth Stam and Ani Hovhannisjan (2012)

Figure 4 shows a visual of the scenario context that was developed by the group. They explain: "We believe that the most realistic future is characterized by free markets and an overall positive attitude towards technology. People in 2040 believe that technology rather enhances their lives than harms it. In 2040 health has become a commodity for both sick and healthy people. Everyone is responsible for their own health. It is not only technologically possible for people to design their lives into the smallest detail, but they also have the freedom to do so. Endless possibility and full responsibility for one's own success in life can make life-management rather stressful." [10] p.3].

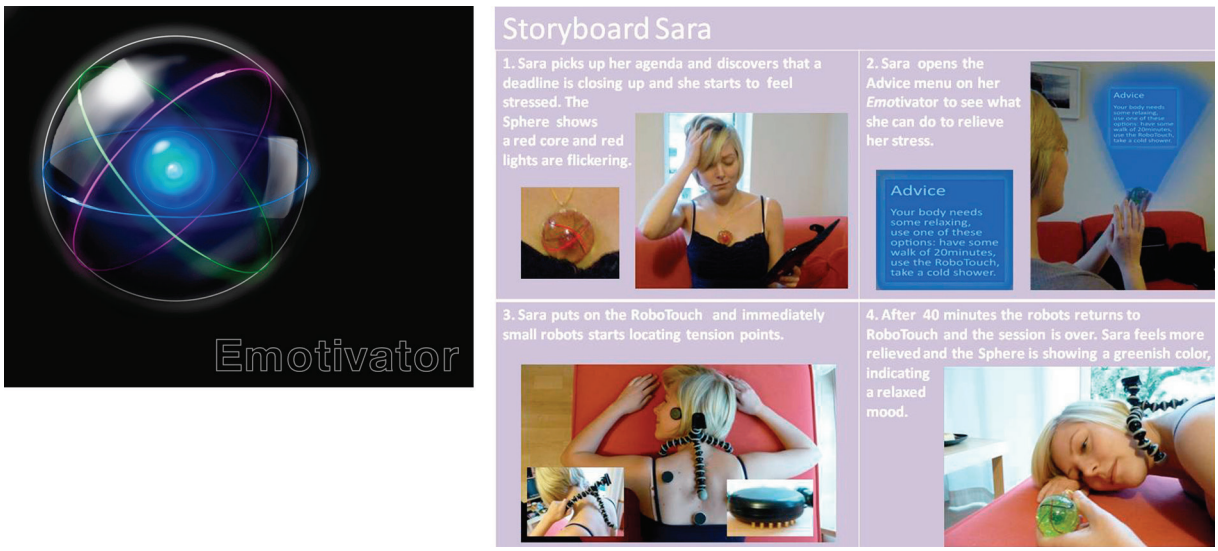

Figure 5. "Emotivator" concept and storyboard by Nordlöf, Stam and Hovhannisjan (2012)

Figure 5 shows the developed product concept of the "Emotivator", and a storyboard explaining the human-product relation: "In this demanding future we have developed a product concept that we named Emotivator. The Emotivator is a life-management assistant that will motivate the user to pursue his/her goals. Emotivator aims to stimulate individual flourishing and diminish stress in the demanding, but colourful society in 2040 in the Netherlands." [10] p.3]. And although the technology acts as a personal agent that helps people to achieve personal goals, like relaxing better (Figure 5) or eating healthier or doing more exercises, it does not mimic the shape of a real personal assistant, but is rather concentrated in a jewellery like object. This association with jewellery is not random; it was argued that the achievement of personal goals were indeed a very personal issue for the user, that needed for an object with which an intimate and 'valuable' relationship was possible.

5 COMMON GROUND

The two examples that are presented here are very different, and also our experience with ten years of developing the education of human-technology relations is very broad and diverse. So at first sight every human-product relation is characterised by the specific context of the user, the associated user groups, the product and technology type, and the social and societal context. Looking at a higher level of abstraction however, there is a common ground in the development of these human-technology relations, which make it work; although the characteristics of the technology side of the relation are always changing due to development of new technological possibilities, at the human side however, the characteristics stay largely the same over time. We come to know more and more about the workings of our human bodies, but the bodies itself scarcely change. So we have a lot more data on the measurements of the human body since the description of the Vitruvian man by Leonardo Da Vinci, however the contemporary remote control can have just the same shape as an axe from the Neolithic because it suits the same human need: to fit in the hand (Figure 6).

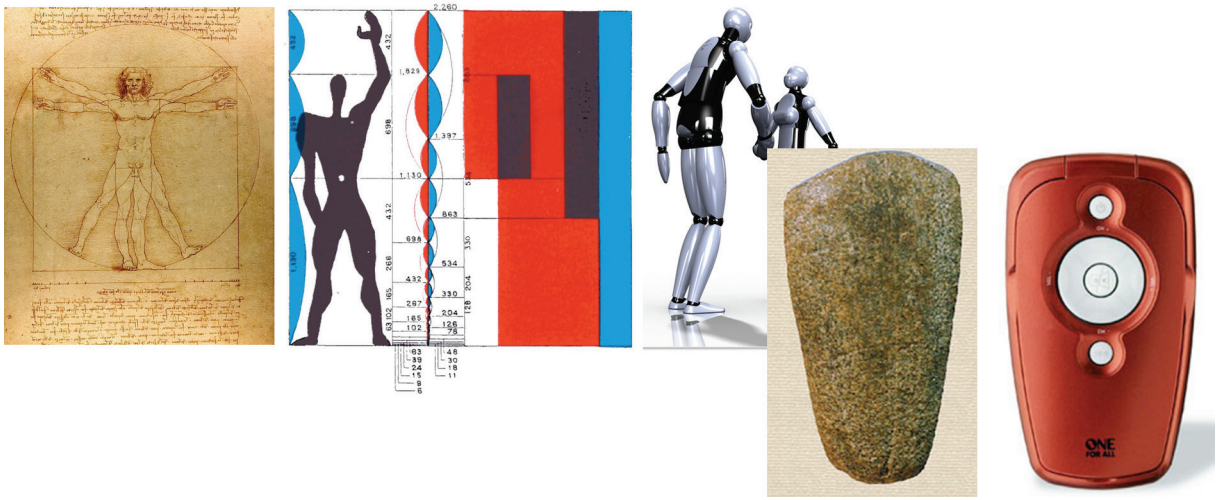

Figure 6. The Vitruvian man (ca.1490), the Modulor (1948) and a contemporary 3d Human Model (Dined). Below a fist-axe from the Neolithic and a contemporary remote control.

This effect is again visible on the three previously mentioned levels: the individual, the social and the societal. On a social level, one can think of the use of Facebook to inform friends about the things that you experience and like. This serves an underlying human need to share your thoughts with the ones that you care about. Before the development of the internet this was done by writing letters. Not so convenient and certainly not that immediate, but the principle is the same. There is also not much difference in going to a Shakespeare play in the 17th century or watching a StarWars movie in the cinema. In both situations one is entertained with a story about good and evil. And the introduction of 3d movies lately does not change the need for entertainment, it just alters the way we 'experience the experience'. It is also no wonder that we still go the cinema with friends, despite all the development in television screens at home and the competition in entertainment from the internet. It is the underlying desire of people to have a shared experience, an experience where one can talk about and share memories afterwards.

In the education of human-technology relations, this means that we have to start from the human side of the relation. Investigating, exploring and characterizing the human needs on all levels of the occasion. From there on, the technology can be modelled and adapted to suit the occasion. Of course the technology does not necessarily have to slavishly obedience the human needs, but can also be designed to influence the human behaviour for better health, a better society, better sustainability or whatever higher goal is desired. A proper insight in the needs and cravings of the humans involved remains however indispensable to make the human-technology relation a viable one in the end.
When we look at the user-technology relationship of figure one again from this perspective, we can conclude about the desired appearance for the robot. The robot is not substituting for the need of the patient to have a social relationship with the caretaker (talking, being taken care of, feeling looked after), but is rather substituting for the strength and power of the caretaker to lift the patient out of bed (to prevent back-injuries of the caretaker). Therefore the device should not look humanoid, but rather like an industrial robot arm with a friendly finish. Preferably operated by the caretaker. When we think of more of these examples it seems logical that there are still not many (humanoid) visible robots in our daily surroundings; they do just not fit properly to our user needs and expectations.

6 CONCLUSION

In the end, our experience is that human technology relations within Industrial Design Engineering, is mostly *not* about robots, but rather apparent within all sorts of design challenges. The relative stability of the human side of the relationship allows for conscious shaping of the future human-technology relationship in design projects. In our cases, covering from simple street furniture to advanced personal health monitoring systems.

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