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## ATTITUDE DEVELOPMENT IN DESIGNERS' EDUCATION

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### ABSTRACT

*Modern academic design and engineering education adopted the issues and goals of holistic development of design competence. Holistic design competence is a combination of generic capacities: capability, knowledge, skill, experience and attitude. All capacities should be addressed in academic education, but the development of attitude is not sufficiently emphasized. Designers' attitude can be seen as the relationship between a designer and the design profession. With a good designers' attitude, different types of design problems can be solved and all the capacities, including attitude, can be developed. This paper proposes that developing a good designers' attitude can be implemented in design education and should be done. We present the five different elements that comprise an attitude: communication, reliability, trust, motivation and open mindset. The relations between elements of designers' attitude and other capacities of design competence are discussed. We studied the manifestation of attitudes and their development in a project of the so called Global Product Realization (GPR) course. The GPR course incorporates students from several European universities who are asked to solve a real design problem for an industrial company. The conclusion is that this project has supported the development of all five attitudinal elements. Since GPR projects are multi disciplinary, multi cultural and communication is non face-to-face, a certain level of designers' attitude is required for such projects. Further research is needed to support the vision that development of designers' attitude needs to be addressed earlier in design education, preferably from the very first course.*

### KEYWORDS

Design competence, designers' attitude, Academic Virtual Enterprise, Global Product Realization

### 1. INTRODUCTION

Design education nowadays follows the holistic view, instead of the reductionist view as in earlier education programs (Horváth 2006). With the focus on the holistic view in design education the view on design competence changes. In the reductionist view, design competence is considered to be nothing else than a set of skills and knowledge, which have been typically addressed disjointedly. The work of designers differs depending on context, situation and perspective. A designer therefore needs more than a set of skills and knowledge. In the holistic view, design competence is a synergetic construct of some generic capacities (Horváth 2006). In this paper we follow Horváth's (2006) synthesis of five different design capacities: knowledge, skill, experience, capability and attitude.

The main issue addressed in the literature about design competence is the development of design competence in academic education. There however is insufficient attention for attitude development, which is also not structurally addressed in current educational programs. Although attitude development is a continuous process, our hypothesis is that students can be supported in the development of a good designers' attitude. In order to implement attitude development in designers' education, a clear vision on the most important aspects of designers'

attitude is needed. In this paper we therefore present (i) the results of our investigation of the meaning of design attitude and the related aspects, and (ii) our observations of attitude development in a multi-disciplinary, multi-cultural and international educational design course.

We studied the implementation opportunities of developing attitude in academic education on the basis of a case study of the Global Product Realization (GPR) course. The concept of an academic virtual enterprise (AVE) was implemented within the GPR course. An AVE typically includes one or two industrial partners and a couple of international academic partners with multidisciplinary backgrounds. In an AVE partners communicate in a virtual environment. The Global Product Realization (GPR) course was developed to guide participating students in the development of new capacities. In this, the course also aimed to add significantly to an intensive development of attitude.

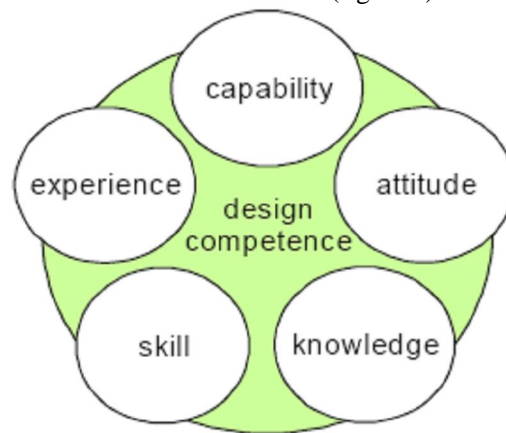
This paper starts with a short explanation of design competence literature, followed by an overview of aspects concerning the issue of developing attitudes. Relations between the different elements of attitude and the other capacities are discussed. Then the case of developing designers' attitude in the Global Product Realization (GPR) course is presented followed by a discussion and the final conclusions.

## 2. DESIGN COMPETENCE

The capacities that together constitute design competence have been characterised differently in the literature. Overbeek et al. (2004) name nine competences focusing on the different tasks during the design process. Crain et al. (1995) suggest seven design competence categories, or capacities, focusing on both the design process and the nature of design teams. Horváth (2006) synthesizes five different design capacities: knowledge, skill, experience, capability and attitude. The different views on design competences however are not as different as they seem. They all write about the skills, the knowledge, the experiences, the capabilities and the attitude a designer must have or develop. Although not specifically mentioned, attitudes are part of five of the nine competences of Overbeek et al. (2004): user focus and perspective, social and cultural awareness, market orientation, multidisciplinary teamwork and self directed and continuous learning. Crain et al. (1995) write about teamwork – participate effectively in groups or teams, information gathering and

communication. McCormack (2005) states that a career in design should actively encourage the attitude to try to understand the way people relate to each other, to objects and to their environment. A good designers' attitude is characterized by being open for reassessment, adaptation and resignation. Therefore, having an open perspective, being market orientated and open to learn, able to deal with criticism, developing good communication skills (listening and asking questions), and lateral thinking are important attitudes for any designer.

In design education, students should be able to equally develop all the five capacities in a well-balanced education curriculum (figure 1).



**Figure 1** Holistic view on interacting capacities of design competence (Horváth 2006).

Only through integration of multi-disciplinary knowledge, designers are able to create competitive products (Horváth 2006). In design education, knowledge is addressed in four contexts; obtaining, exploration, management and application (Horváth 2006). Design skills are various abilities that enable the designer to do design actions well (Horváth 2006). Development of skills asks for practical training, which involves correct application of design methods, effective use of design tools and creating virtual and physical objects. Design experience means the familiarity gained from seeing and doing things in the course of acting as a designer (Horváth 2006). As design skills need to be developed through practical training, through experience, skills are closely related to experience in design education.

Capability is defined as a talent or ability that has potential for development or use (Houghton, 2001). Capabilities are innate, but can be developed through many years of focused learning and practice. The possibility of development is higher if the level of the

innate capability is reasonably high. Capabilities can be developed via design exercises that focus on a part of the entire design process.

Attitude is defined as “a state of mind or a feeling; disposition” (Houghton, 2001). Designers’ attitude can be seen as the relationships between a designer and the design profession (Horvath 2006). The designers’ attitude influences the performances of a designer in various ways and is generally not innate to the designer. Developing attitude however is not directly addressed in current design educational programs. Therefore, we focus in this paper on the analysis of designers’ attitude and the inclusion of the development of attitude in a design education program.

### 3. DESIGNERS’ ATTITUDE

Empirical research has shown that specific behaviours can be predicted quite well from compatible measures of attitude toward the behaviours in question (Ajzen, 2005). Consequently, a good attitude is of importance for all professions. Attitudes influence the way of thinking, acting and seeing concerning the design tasks. For creative and intuitive professions, like the designers’ profession, a good attitude is of extra importance. According to the cognitive dissonance theory, individuals attempt to reduce dissonance between their attitudes and behaviour by decreasing the importance of the element involved in the dissonant relationship or by changing one of the dissonant elements. People generally are more resistant to change their behaviour then to change their attitudes (Halpern, 2004). Once formed, attitudes toward a behaviour can work backwards to influence the formation of new behavioural beliefs (Ajzen, 2005). A good designers’ attitude thus supports good designers’ behaviour. Changing the designers’ attitude helps changing the designers’ behaviour. This however is a long-term process. Reciprocity is another powerful social force; research has shown that a person is more likely to change their long-term behaviour if they first have been placed in some sort of debt or under an Anti-social Behaviour Order<sup>1</sup> (ASBO), even

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<sup>1</sup> ASBOs enabled the police and local authorities to obtain an order to prohibit a person aged 10 or above from engaging in behaviours specified by the order. Violation of the order can result in criminal prosecutions and a custodial sentence of up to five years.

if unwillingly. Acceptable Behaviour Contracts<sup>2</sup> (ABCs) have shown to have even more effect (Halpern 2004). So forcing the change of behaviour in order to influence the attitude can be very successful. This however seems to be a quick but stressful process that is attended by intermittent processes.

#### 3.1. Developing attitude in academic education

In order to implement development of attitude in academic design education, the phenomenon of attitude is analysed to obtain a deeper insight into elements that must be addressed during design education. Bakarman (2005) gives the following summary of designers’ attitudes that have to be addressed:

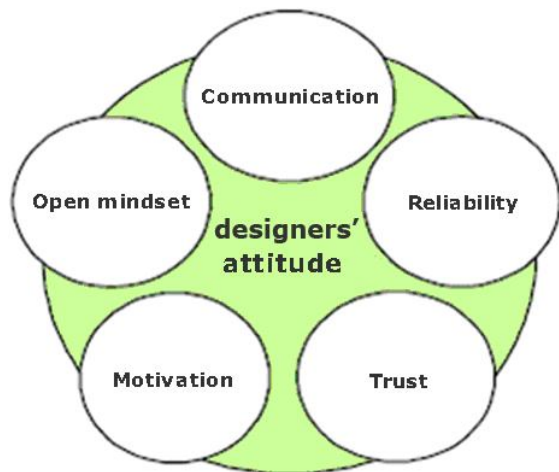
1. Professional behaviour in dealing and handling the design problem; such as exposure to different types of problems and solutions.
2. Dedication and motivation to be a professional designer.
3. Constant acquisition and management of knowledge.
4. Teamwork and the ability to run the task smoothly.
5. Applying good time management.
6. Feeling responsible for the outcomes.

However, when developing the different elements that together form a good attitude, a more structured overview is needed. Attitude is a complex integration of related elements that enable the designer to perform different types of design tasks effectively in a multitude of working environments. Taking Bakarman his list into account, we did more explorative research to get a deeper understanding of how to address attitude development in designers’ education. As an outcome of this research, which was based on a study of attitude related literature and experience with different design courses, we conclude that attitude is a combination of five main elements: (i) communication, (ii) reliability, (iii) trust, (iv) motivation, and (v) open mindset (figure 2). Together, they provide the basis for a good designers’ attitude, which supports designers in

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<sup>2</sup> Written agreements between a young person and the local authority in which the person agrees not to carry out a series of identifiable behaviors which have been identified as antisocial. ABCs are not legally binding.

design problem solving. These elements will be analysed in the sections 3.2 – 3.6.



**Figure 2** Combination of elements of designers' attitude.

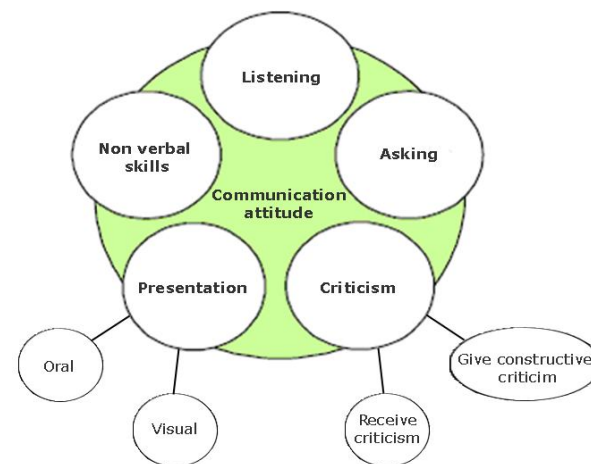
### 3.2. Communication

Most designers work in teams or rely partly on others for finances, production, etc. When working with others, it is important to understand each other and to have an agreement about the definitions and the semantics of the communicated concepts. According to McCormack (2005), the main aspects of communication are listening and asking questions, without taking everything for granted. Therefore, when developing communication skills, designers have to practice effective listening skills for receiving information accurately (Crain et al. 1995).

Part of communication is sharing ideas. A good attitude is to be open for discussion about possible design strategies and solutions. This means that a good attitude is to develop oral and visual presentation skills, in order to be able to clearly explain your own ideas. Designers should be open to constructive criticism in order to fully profit from sharing insights with others. On the other hand, designers should not be afraid to give constructive criticism to others, to create a two-way discussion. During discussions, keeping an eye on the reaction of others is important: be aware of the other's reaction towards your criticism and see how far you can go and whether you are understood. This means that in the attitude towards communication, non-verbal skills have to be taken into account.

Summarizing the above, a good designers' attitude towards communication is a combination of five elements: (i) listening, (ii) asking, (iii) criticism, (iv)

presentation, and (v) non verbal skills (figure 3). This figure is based on the elements to be addressed. However, there is an overlap between the elements.



**Figure 3** Elements of communication attitude

### 3.3. Reliability

When working in design teams, it is important to rely on each other and to be reliable. This means that designers have to fulfil their promises and should not hesitate to entrust tasks to other team members. Being reliable is being punctual, since reliability has to do with performing tasks on time and performing a task accurately. In order to be reliable, designers therefore need to have insight in their own capabilities and time planning. Only then, designers can have a good overview of what can be realised and promised.

Good designers feel responsible for the tasks they have to perform and for the total outcome of the project. In an educational context it has been shown that students who tend to believe that they are responsible for their own success are more successful than students who tend to blame their poor result on external factors (Atkinson, 1999). By feeling responsible, they will also feel the need to be reliable and the need for motivating others to be reliable as well.

Preferably, a project has the same priority for all team members. In practice however, team members will have different priorities. Once individual team members make priorities explicit and are honest about the time available for a project per team member, a realistic task deviation can take place.

Summarizing the above, a good designers' attitude towards reliability is a combination of four elements:

(i) time management, (ii) responsibility, (iii) punctuality, and (iv) priority (figure 4).



**Figure 4** Elements of reliability attitude

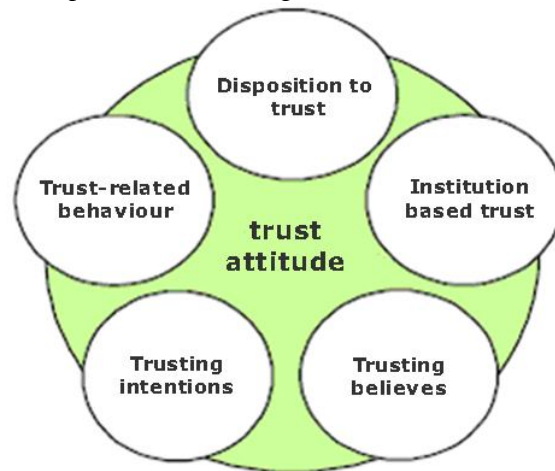
### 3.4. Trust

Relying on others means trusting them. Trust is viewed as an attitude held by an individual in relation to another individual or group of individuals and it is applicable to work relationships in team contexts (Costa et al. 2001). The extent to which trust may be considered a determinant factor for the functioning of teams is inconclusive, but teams with high levels of trust seem to be more open to discussion, develop more innovative and original solutions, solve their problems effectively, and have more self-control and less arousal when under threat. In teams with low levels of trust members have the tendency to share less information and ideas, are less personally involved, and impose controls when coordination is necessary (Costa et al. 2001). In order to enable efficient teamwork, a sufficient level of trust therefore is needed. The members of a design team often know whom they trust and whose abilities they value, and when. However, the degree of trust within a design team is not often made explicit (Wijngaards et al. 2004). Wijngaards et al. (2004) state that by discussing trust issues within a team, the team members can develop themselves for the better and the team can improve its performance.

There are different components of trust, each having a distinct but related effect on a designer and on the design team. McKnight et al. (2002) distinguished five conceptual trust types (figure 5):

- Trust-related behaviour: actions that demonstrate dependence of the truster<sup>3</sup> on the trustee<sup>4</sup>
- Trusting intentions: the truster is securely willing to depend, or intends to depend, on the trustee.
- Trusting beliefs: the confident truster perceives that the trustee has attributes that are beneficial to him/her.
- Institution-based trust: the belief that the required structural conditions are present (in the institute) to enhance the probability of achieving a successful outcome.
- Disposition to trust: general extent to which trust is placed in others.

A person with a good trust attitude has sufficient institution-based trust towards the institutions involved and has sufficient disposition to trust in general. By gaining insight in the expertise, skills, experience and knowledge of the other team members, trusting beliefs can be made explicit and trusting intentions and trust-related behaviour can be improved. It teaches the team members for what tasks they can trust specific team members and under what conditions. A good attitude needs all types of trust, without losing a critical view and not taking other person's views for granted.



**Figure 5** Elements of trust attitude

### 3.5. Motivation

Research has shown that performance and motivation can mutually affect each other (Atkinson, 1999). With a high motivation, people tend to work harder

<sup>3</sup> the person who places trust in something or someone.

<sup>4</sup> the person or institution who is trusted

on the task at hand and therefore tend to be more successful in performing the task (Atkinson, 1999). According to Small (1997) a person has to value the task at hand in order to be motivated, and must believe he or she can succeed in performing the task. According to the ARCS<sup>5</sup> Model of Motivational Design developed by John M. Kell in 1983, relevance is an important factor for the motivation attitude (Small 1997). On the other hand, people with a wide field of interests can be motivated more easily for different types of tasks. We conclude that having a broad interest helps designers to be easily motivated for solving different types of design problems.

Dedication to the design profession and the design task at hand is of importance for a good designers' attitude. Dedication means not having a "nine to five attitude"; so being prepared to work overtime. Dedication also means adopting design as a way of life by means of constant acquisition of knowledge, instead of only searching for new knowledge when needed for the current design problem (McCormack, 2005). A good designers' attitude is to always look for new knowledge and opportunities for personal growth, so continuous learning is an important part of a good motivation attitude. Atkinson (1999) states a person has to believe in being able to solve the task in order to be able to be motivated. When being focused on continuous learning, a designer can however be motivated by the fact that he or see needs to learn in order to be able to solve the design problem at hand. The challenge becomes the motivational factor.

Research has shown that students who are inclined to have an internal focus of control, who are self directed, are more motivated and more successful then students with an external focus (Atkinson, 1999). Being self-directed also enhances motivation; tasks are preformed for personal development, not for the satisfaction of others.

Summarizing the above, a good designers' attitude towards motivation is a combination of four elements, (i) interest, (ii) dedication, (iii) continuous learning, and (iv) being self directed (figure 6).



**Figure 6** Elements of motivation attitude

### 3.6. Open mindset

Every design problem comes with a user context and various stakeholders. A good designer must be user focused, feel empathy for the target group and take into account all other perspectives of the design problem. They must also make an effort to learn about the world that is entered. Designers willing to improve the quality of life should first gain an understanding of the market and experience it fully (McCormack, 2005). In order to gain insight in the design problem, designers must seek contact with the various stakeholders. To develop the tools to communicate effectively in a variety of circumstances, the designer needs to understand some ideas that are within the existing social and industrial framework (McCormack, 2005). The complete creative experience embraces usability, business, finance and managing the complete lifecycle of the design project, not just the design itself. Social and cultural awareness are needed in order to be able to feel empathy with the user. Market orientation also helps the designer to understand the business context of the design.

Design is a creative process. This means that designers should experience the world from an open perspective, treating all experience as new, as something that cannot be taken for granted. An approach with an open mind, with focus and with perseverance, lateral thinking, can help to develop new ideas.

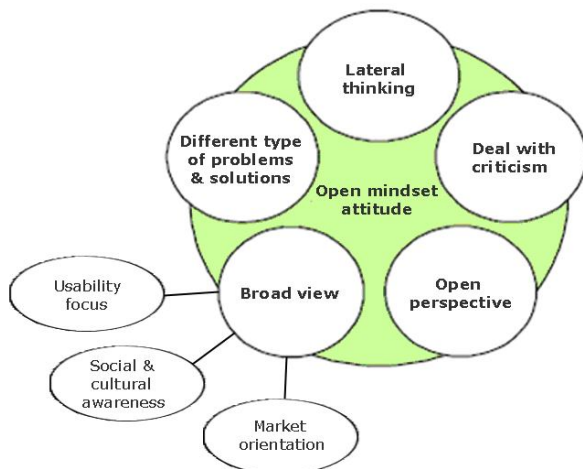
Design problems are often complex problems and there is no single answer to them. The first solution found might not be the best solution possible. Developing more than one solution helps in

<sup>5</sup> [A]ttention, [R]elevance, [C]onfidence and [S]atisfaction

understanding the design problem and delivering a comprehensive assessment (or solution). According to Cross (2004), both generating too few alternative concepts and generating a large number of solutions are weak strategies. Successful designers perform a balanced search for alternative solutions. Designers must be critical and look for different types of solutions, but not generate as many solutions as possible. The danger of single solutions increases when a designer only works on similar design problems. In order to keep an open perspective, designers should always work on different types of problems in new fields, with new, challenging conditions.

Having an open mindset also means a designer has to be open to other points of views. There is no absolute solution to most of the design problems and side effects can easily be overlooked. When receiving constructive criticism, it is a good attitude to deal with it, to accept having made a mistake or overlooked a problem or opportunity. Designers should always seek constructive criticism, since it is an important source of fresh points of view. Therefore, early user testing and discussions with design colleagues and people from different disciplines are very useful.

Summarizing the elements mentioned, a good designers' attitude towards an open mindset is a combination of five elements: (i) lateral thinking, (ii) deal with criticism, (iii) open perspective, (iv) broad view, and (v) different type of problems and solutions (figure 7).



**Figure 7** Elements of open mindset attitude

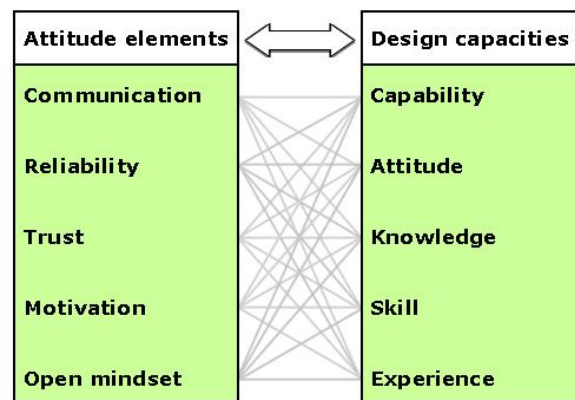
#### 4. RELATIONS BETWEEN ATTITUDE AND THE OTHER CAPACITIES

There are many relations between attitude and the other capacities (experience, knowledge, skill and capability). A good designers' attitude also supports further development of the attitude. To gain a good designers' attitude, it is essential that design students develop in different fields (Cross 2004):

- Acquiring experiences because professional ability depends directly on the amount of experiences students acquire.
- Gathering the appropriate knowledge and integrating it in the design process.
- Being pro-active in problem framing, imposing their view on the design problem and directing the search for solution conjectures.
- Being solution-focused, not problem-focused, in handling any design problem.

Bakarman (2006) added developing communication skills, for negotiation with others, as clients and team member(s).

The relationship between attitude and the other capacities differs among the different elements of attitude (figure 8). The following sections discuss these relations focusing on the elements of attitude.



**Figure 8** Relations between attitude elements and design capacities.

##### 4.1. Communication

Communication related capabilities such as linguistic talent, can be further developed with a good communication attitude like careful listening and the attitude of continuous development of presentation skills. A good communication attitude also helps a person to gain more knowledge by always asking questions and careful listening. Development of



communication skills, like being a master of the used languages and visual and oral presentation skills, is supported by a good approach towards criticism. Constructive criticism helps to realise points to be improved. With a good communication attitude, designers tend to acquire more experience by looking for opportunities for discussion.

Linguistic talent and being self-confident and analytical are some of the capabilities that support peoples' enjoyment of communication. A good communication attitude is being interactive in your communication by active listening, asking questions and giving and handling constructive criticism. Developing a good communication attitude therefore is difficult if someone does not enjoy communicating. Knowledge of communication techniques and social rules, as well as sufficient communication skills are needed to be able to communicate and develop a good communication attitude as well. Communication skills and communication attitudes can only be developed through practices. Experience is therefore essential for developing a good communication attitude.

#### **4.2. Reliability**

In order to be reliable, designers need to have insight in all of their own capacities and limitations. The more experienced a designer is, the better this insight will be. Time management is one of the skills designers have to develop in order to be able to be reliable. A good mind set towards the importance of planning will help the designer to develop this skill. Some designers, however, have an innate talent for maintaining an overview of their time planning. When having a lot of knowledge on the subject of the design problem at hand, it is easier to estimate the time needed for a task. When a lot of knowledge still needs to be gained, the amount of time necessary to do so is less certain. By developing a good knowledge acquisition attitude and management attitude, these skills will more easily be developed and their uncertainty will be reduced.

#### **4.3. Trust**

Some people have an innate level of disposition to trust, while others are intuitively more suspicious. The capability to trust therefore differs among people, but this can be developed. While gaining experience of working in teams and working with institutions, institution-based trust and disposition to trust in general are built up. Only through experience

can the importance of trusting others be learned, as well as the importance of being critical. When a sufficient level of trusting beliefs and intentions are developed, new knowledge can be gained by exchanging knowledge among members of a team. By having enough knowledge themselves, designers can verify the correctness of knowledge shared, and therefore adapt their level of trust in the trustee. Accurately estimating the trustworthiness of others is a skill that can be developed, but this takes a lot of time and experience for those who have no inborn capability to do so. By gaining insight in the expertise, skills, experience and knowledge of the other team members, trusting beliefs can be made explicit and trusting intentions and trust-related behaviour can be improved.

#### **4.4. Motivation**

When being motivated to work hard instead of solving a task the easiest way, when looking for new problems and solutions instead of performing tasks that have already been mastered, new experience can be acquired. Attitudes which help designers to gain more experience are motivation, concentration, and willingness to work hard on improving performance (Bakarman 2005). These attitudes also help a designer to gain more from experience in order to be able to develop all competences needed. High levels of motivation also result in developing more skills and acquiring more knowledge; research has shown that there is a positive correlation between a pupil's drawing, writing, design, and manufacturing skills, and their levels of motivation (Atkinson 1999).

#### **4.5. Open mindset**

With an open mindset attitude, designers will more easily develop their other capacities. Lateral thinking helps a designer to gain knowledge in totally different fields. By dealing with constructive criticism, the designer will look for more knowledge or develop more skills in order to be able to solve the problems pointed out. An open perspective, not taking things for granted, means that a designer will always try to verify knowledge, looking for different sources on the same issue. This helps the designer to increase knowledge of higher quality and quantity. A broad view attitude also helps the designer to acquire more knowledge, since having a broad view attitude means that the designer is looking for knowledge about different stakeholders and general social and cultural awareness. By looking for different types of problems to work on and different types of solutions

to solve the design problem at hand, more experience will be gained in comparison to people who mostly work on the same type of problems and solutions. We conclude that an open mindset attitude has an influence on knowledge, skill and experience.

Capability, knowledge, skill, experience and attitude also help to further develop an open mindset attitude. The capability of being curious for instance can help a designer to further develop an open mindset attitude, because he naturally has a broad view and open perspective. Having knowledge about the market and different stakeholders can stimulate a designer in developing social and cultural awareness and a broad view attitude in general. Well developed analysing skills support a designer in getting insight in different stakeholders, which is needed for a broad view attitude. Lateral thinking is a skill that needs to be developed before it can actually be used in the everyday design profession and can become an attitude. Experience with different types of problem and different points of view teaches a designer the variety of perspectives and opportunities for different types of solutions.

## 5. DEVELOPING ATTITUDE IN THE GPR-COURSE

Global trends in product development ask for more multi-disciplinary, multi-cultural and multi-national (multi-x) teamwork. Design education therefore needs to provide students with competences that allow them to successfully perform their tasks in multi-x teamwork (Fain et al. 2007). Because of this, we recognise the necessity to incorporate attitude development for multi-x cooperation.

Over the last seven years, the Global Product Realization Courses were guiding the participating students in developing multi-x design capacities. The courses aimed to add significantly to:

- Deepening and widening the design attitude.
- Increasing the formal and informal knowledge of designing.
- Increasing the experience of collecting technical information and non-technical information.
- The technical, social and psychological skills, which are related to designing.
- The experience of working on real-life problems, and in challenging environments.

Compared with regular design courses, the GPR-course has two extra educational elements: working in a multi-x design team and working in a virtual

environment. This requires additional elements of the designers' attitude (Horváth, 2006). Therefore, this section first discusses the aspects of attitude in multi-x and remote teams, and finally in which ways the designer's attitude can be developed in a GPR course.

### 5.1. Multi disciplinary teams

Working in multi-x teams has an influence on all the elements of the designers' attitude.

#### Communication

Since the participants in a multi disciplinary team have their specific knowledge, expertise, experience, goals, attitudes, etc. (Wijngaards et al. 2004), it is more difficult to understand and rely on each other and to manage teamwork. For the designers' attitude this means that for example the designer must avoid using design specific terminology and ask questions about technical terms used by others. In multi disciplinary teams it is important not to hesitate asking questions and not to abstain to answer questions from other team members. Every designer should therefore be aware of the strengths and weaknesses of team members, including his own. Adapting the oral and visual presentation techniques might be needed. Team members from other disciplines have insight in other parts of the project, so asking them for constructive criticism and knowledge can lead to new insights and better design solutions.

#### Reliability

In multi-disciplinary teams, the task allocation is usually based on the disciplinary backgrounds, while different team members often depend on input from the other team members in order to be able to continue their own tasks efficiently. Verification and validation of the delivered knowledge and judging the completeness of the input from the other disciplines is difficult, since sufficient knowledge about the other disciplines is often missing. This asks for extra responsibility from the different team members. Even more than in regular team work, they need to make sure that their tasks are completed in time and they should test the correctness and completeness of the new knowledge themselves, not relying on rectifications from other team members.

#### Trust

An important aspect of trusting the members of a multi-x team is the insight in the respective

capacities. However, when working in multi disciplinary teams, the abilities of the team members are often not fully known to others. Gaining insight into other people's skills and knowledge is therefore important for delegating tasks and evaluating input from all the different team members. Participants of multi disciplinary teams also need disciplinary based trust; trusting the insights and capacities of other disciplines. Trustworthiness is often based on stereotypes, especially if the participant is unfamiliar with the others discipline. By making doubts explicit, the cause of doubts can be removed.

### Motivation

Since the participants in a multi disciplinary team have specific knowledge and expertise, working in multi disciplinary teams puts the participants in touch with knowledge from other disciplines. To fully profit from this, a good attitude is to be focused on continuous learning. It however also means that the team members need to be self directed towards discipline specific tasks. The team members from other disciplines often miss the knowledge and skills to support solving tasks from other disciplines.

### Open mindset

Especially in multi disciplinary teams, each team member has his or her own view of the project at hand (Wijngaards et al. 2004) and his personal work attitude, which requires a slightly different attitude compared to working in a team of only designers. A designer in a multi disciplinary team must be open to other perspectives, visions, ideas, knowledge and skills of the other team members: an open mindset attitude is needed to fully use all capacities within a multi disciplinary team. Constructive criticism in multi disciplinary teams should focus mainly on discipline overlapping fields. In order to protect the trustworthiness of the different team members, discipline related criticism should be carefully discussed within the team, without questioning each others professionalism. Discipline related criticism can also be asked from outside the team, for instance from colleague designers.

## 5.2. Teamwork in a virtual environment

In the long run remote teamwork appears to be less expensive and more time efficient, while the knowledge and the skills of the teams increase

(Bellamy 2005). Working in remote environments also points at other specific elements of the attitude. Remote environments create an atmosphere of 'ambiguous' communication, where it can be difficult to interpret whether a person's communication is promoting unhealthy conflict (Bellamy 2005). Additional difficulties were defined by Horváth (2006):

- The lack of personal contact minimizing the ability to use social cues and body language.
- A possible lack of leadership hierarchy within the remote groups.
- The members being dependent on the technology used for remote communication; the communication channels may fail to perform as planned.

Therefore communication related attitudes and providing feedback is important and a clear definition of roles, responsibilities and objectives is needed (Bellamy 2005).

### Communication

One of the main difficulties of working in remote teams is the fact that several aspects of human communication are hindered or even not possible. This is not only caused by a loss of some aspects of non-verbal communication and language problems. When working in non face-to-face teams, there are fewer possibilities for personal contact. For instance, lunch breaks or leisure time are not shared.

In the case of remote teams, feedback must be a constant process, provided mostly by the team leader (Bellamy 2005). Without a team leader, as is often the case in student design projects, it can be difficult to arrange feedback. Bellamy (2005) suggests that it is the ability of distant team leaders to influence and guide their team, rather than leading by force that creates an effective remote environment. Again, this is more difficult to do when a team leader has no insight in its team member's lives and personalities. Good listening and asking attitude elements can overcome this problem.

Remote presentations are different from face-to-face presentations with respect to communication channels and interaction with the audience. Adaptation to these differences is needed; therefore a good attitude towards presentation is of importance.

### Reliability

In remote teams, reliability is even more important compared to face-to-face teamwork. Team members will not meet until the next meeting and therefore

cannot encourage each other to do their tasks. It therefore is easier not to perform your own tasks. When not participating in agreed meetings, remote team members have fewer possibilities to check whether a person forgot about the arrangement, did not feel like joining or had another reason not to participate. It also becomes more difficult to make new arrangements, because the schedules of the others are often unknown and team members do not meet on other occasions.

### Trust

Especially in remote teams, insight in the expertise, skills, experience and knowledge of the other team members is not always there at the start of a project. Therefore it is more difficult to trust each other, while trust helps successful teamwork. Insight into the personality, the personal situations and the understanding of humour are important in all social intercourses and in gaining trust. Meeting in person at the start of the project can be very valuable for gaining insight into others' ways of working, which helps to understand each other and to overcome trust issues.

### Motivation

Since within remote teamwork the team members do not meet outside the scheduled meetings, it is difficult to be motivated by the other team members in-between the arranged meetings. Motivation for remote teamwork should therefore partly come from within the team members themselves. Being self-directed is essential. On the other hand, working in remote teams can be a motivation for continuous learning and for the development of interest in new ways of teamwork. Developing non face-to-face teamwork skills should become part of the work motivation. It has been our experience that the prospect of physically meeting each other in the end phase of the project, for instance for assembling and prototyping of the product, includes an additional motivation. Looking forward to verifying assumptions about the others makes remote teamwork even more interesting.

### Open mindset

In remote teams, all communication takes place during planned meetings, including discussions about other opportunities or design solutions, constructive criticism, and discussions about other points of views or opinions. Therefore, these discussions need to be taken into account when scheduling remote team meetings. Otherwise there might be no time to

discuss the different mindsets within the available time.

Since working in a remote team asks for a different approach compared to regular teamwork, participants should enter this experience with an open perspective to be able to adapt to the situation. New methods or technologies might be introduced by other team members or a failure of communication channels might ask for quick adaptation. With an open mindset, participants will be able to significantly develop their capacities in these challenging conditions.

## 5.3. Designers' attitude in the European Global Product Realization Course

In the last GPR course, which took place in the spring semester of 2007, teams had to develop a Point Of Purchase (POP) display for male grooming products for a high-end brand. This assignment differed from the previous GPR assignments because the main focus was not only on solving technical problems. There was also a focus on the market problems. For most of the participating students, this was a new issue to address. It required a broader interest and the students had to be more open minded towards the new fields of study and practice. Those with no experience in market research had to trust their team members who had more experience in such research. The multi-disciplinary and multi-cultural aspects of the course forced the students to deal with many other points of views and methods, while the remote teamwork required a high degree of reliability and self directedness. All together, the GPR course forced the students into specific roles and behaviour and therefore supported them to develop their attitude. This however makes the GPR course a more stressful course where students experience many ups and downs, compared to regular design courses where long-term attitude development takes place.

### Communication

The GPR course creates a work environment with many communication difficulties to be tackled. There are no assigned team leaders within the teams and the team members from different universities do not meet in person until the prototype phase. All communication takes place via video conferencing, e-mail, telephone conversations, Breeze, Skype and so on. The conversation language is English, which is the second language to most of the participating students. All teams experience some form of

communication difficulties. Communication using video conferencing means that only one person can speak at once and nonverbal communication is strongly reduced. Therefore students need to listen effectively and verify whether the received information is accurate. Ideas are developed individually and the tasks performed independently from each other as well. The oral and visual presentation skills have to be developed in order to be able to cooperate in this virtual environment. The students have to be flexible to adapt their way of presenting according to the programs supported by the communication media and the programs available by their team members.

Students are forced to adapt to these new conditions and develop their communication attitude accordingly. Without doing so, it would be impossible to successfully perform the assigned tasks and meet deadlines. The course showed us that an important deadline early in the project, in this case an interim report after three weeks, is of great importance. In this way, students are forced to adapt quickly.

### Reliability

Within face-to-face teamwork and single disciplinary teamwork, it is easier to check whether tasks are performed correctly and in time than within remote multi-disciplinary teamwork. During the GPR course the students learn the significance of being reliable towards each other. All team members have their own areas of expertise and all team members are needed to successfully solve the design problem at hand.

Besides the task related reliability, good reliability is also important for more practical issues: it is more difficult to contact each other apart from when appointments are made, and it turned out to be easier not to stick to appointments. When students do not show up at appointments, or come late, this can lead to significant problems. There is no new tasks allocation and no new appointments can be made.

Since the remote team members have no insight in the working hours of their fellow students, it is of great importance to document all things done. Otherwise, work is easily lost and the students will feel less need for being reliable. Interim reports and presentations therefore are needed to help the students to develop a good reliability attitude, since they force the students to consider the importance of all the work they did.

### Trust

In a GPR course, many issues are addressed and task allocation has to take place at the start of the project, while the students were not yet familiar with each other. Although institution based trust in universities in general could help the students to have some trust in their team members, most students are not familiar with the individual universities, apart from their own. The GPR course allows the participants to have experience with students from different universities, and therefore enables them to develop their institution based trust. In order to be able to delegate tasks, trust in each other is needed. Those with no experience in market research for instance, have to trust their team members who are more experienced in market research. Due to the need of trust, students also are able to develop their disposition to trust.

We noticed that trust relations within the different teams develop significantly during the one week workshop, in which the teams finally meet at the end of the project to build their working prototypes. It seems to be very hard to fully trust someone you never met face-to-face. A real-life meeting at the start of the project could overcome this problem. For the development of a good trust attitude however, this experience was very valuable to the students.

### Motivation

The GPR course is an elective or special variant of a regular course for all participating students. This means a certain level of motivation can be expected from all participating students. The level of motivation however differs among the students and depends on the task at hand. Students who have difficulty in understanding the relevance of marketing research for instance are less motivated to put effort in this phase of the project. Team members try to motivate each other in order to overcome this problem, but these attempts are not always successful. However, students who are open to continuous learning become more motivated and dedicated after successfully performing tasks which they did not believe they were able to perform beforehand. This means students with a good continuous learning attitude are able to develop their overall motivation through this course.

The GPR course showed us that there is an important relation between priority and motivation. Motivated students consider the GPR course as a top priority course. The greater the importance of the course was for the students, the greater was their motivation.

This should be taken into account when selecting students for this course.

### Open mindset

As discussed earlier, the subject of the GPR project of 2007 asked for a broad interest and the willingness to learn from other disciplines. Insight into the male grooming market was needed, as well as insight in the POP display market. For most students, market research is a new point of view, but they learn that it is important for the success of the project. The E-GPR course shows us that most students who have no experience with market research within their education, have difficulty understanding the importance of marketing at the start of the project. It is not until the end of the project, that its significance is clarified, despite the lectures on this subject during the first part of the project. This shows the significance of really participating and experiencing the entire design process. Open-minded students however, clearly put more effort into understanding the market than the less open minded, but otherwise well motivated students.

From the educational point of view, this shows us that it is important to select projects that ask for insight in other disciplines, when addressing the open mindset attitude.

## 6. DISCUSSION

Although it is difficult to address attitude development in general, our hypothesis was that a more structured approach of separately addressing the different elements of a good designers' attitude, can help the students to significantly develop their attitude. Therefore, insight in the elements of a good designers' attitude is needed. We defined the designers' attitude as a well balanced combination of five elements; communication, reliability, trust, motivation, and open mindset. The case study of the GPR 2007 course showed us that it is possible to develop these elements in a design course. It however does not give us sufficient information to conclude how to best address the different elements. More research on how to implement structural development of the different elements of a good designers' attitude therefore is needed.

We assumed that forcing students' behaviour can contribute significantly to designers' attitude development. Although our case study confirms to this assumption, it also shows that this is only possible if a certain level of attitude has already been

reached or is innately present. This not only because of the stressful process itself, but also because of the many difficulties students have to overcome in order to fully participate in the project. These findings arouse several questions and research topics. Firstly, insight is needed into the required level of attitude that is needed at the start of the course. Getting insight in the required level of designers' attitude requires the development of a method to measure the designers' attitude. Secondly, the question is raised how to develop a good designers' attitude from scratch. Do design students need a minimum level of innate designers' attitude? Presumably, development of the elements of a designers' attitude should be done by applying less stressful, more long-term methods in the first years of education. Behaviour guiding methods, such as the GPR project, probably are more efficient at Master's level education.

## 7. CONCLUSION

The goal of this paper is to gain more insight in the possibilities to support students to develop a good designers' attitude. The Global Product Realization course is used to verify our assumptions that the development of the students' attitude is possible if the elements of a good designers' attitude are addressed disjointedly.

Our experiences show that the educational concepts applied in the GPR course offer the possibility of balanced attention for the different elements of a good designers' attitude. We found that the development of the aspects of the designers' attitude can significantly be supported: (i) a sufficient level of attitude at the start of the course, (ii) a challenging real life industrial design problem, which demands broadening of students frame of reference, (iii) an academic virtual enterprise; working in cooperation with an industrial company and other international academic partners, (iv) working in an multi-disciplinary, multi-cultural and multi-national team, and (v) professional support, both in tools and coaching. We conclude that the GPR course can be an effective tool for a comprehensive development of the designers' attitude.

Another assumption was that forcing the students' behaviour can contribute significantly to their designers' attitude development. When working in remote, multi-x teams, a good designers' attitude is of more importance for the success of the project then in face-to-face teamwork. Besides, remote multi-x teamwork asks for a different approach and

therefore different behaviour; students have to adapt to this new working environment. We can conclude that the GPR course can only be completed successfully if the students are willing to change their usual working behaviour. Our experiences show that this indeed results in a significant development of the students' attitude, since they are forced in new situations and enriching experiences. Assembling a working prototype during face-to-face teamwork in the final phase of the project is important for the success of this method, because it (i) enables the students to verify the importance of all aspects of the design process, (ii) helps the students to respect and understand their team members, and (iii) supports a satisfying completion of the educational process.

Another interesting conclusion is that, despite the stressful and difficult process, the course is highly appreciated by the students. The international and multi-disciplinary context is not only a motivating factor, but it also highlights the importance of a good designers' attitude, especially considering the elements of communication and open mindset.

Our final conclusion is that the scope of our research was limited and case studies, although they provide us with rich insights, can not be used to prove or disprove anything. More research therefore is needed in order to have a validated theory of comprehensive designers' attitude development.

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