MEASURING SOCIAL SKILLS IN DESIGN

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ABSTRACT

In many critical situations in design projects such as negotiating contracts, presenting and defending a solution at a review meeting or resolving conflicts with other team members or the client, a designer's social skills are at least as important as their technical capabilities. Despite ample evidence about the criticality of social skills for the success of design projects, there is only limited research and very little explicit instruction on how to develop and improve one's social skills as a designer.

This research aimed to identify the relevant social skills for team collaboration and for dealing with clients and to develop a standardised format for observing and providing feedback. A procedure for developing a so-called behavioural marker system was used that has been standard practice in other domains before. On the basis of a literature review and interviews with expert practitioners, critical situations and possible appropriate response are identified and then described in observable terms. Following this procedure, a prototype feedback form was developed and piloted. Four design educators rated the behaviour in a videotaped design meeting and then evaluated the prototype feedback form. The majority of the items on the feedback form were found to be usable but only 25% of the items were sufficiently reliable across different observers. It is suggested to improve the description of the behavioural markers and to devise a training module for observers how to use the feedback form for research or educational purposes.

Keywords: social skills, design teams, behavioural marker, design education

1   INTRODUCTION

Many situations in design projects require a combination of technical skills, problem solving and social skills: besides applying the technical knowledge of how to construct, test and produce a product, one also needs to be able to structure and systematically analyse a complex assignment and to communicate and negotiate constraints and ideas to other team members and the client. While technical skills are a necessary prerequisite to master design problems, they are often not sufficient. Many empirical studies have shown that there are reoccurring problems in design projects that are not mainly related to technical challenges but have to do with project coordination, team functioning and organisational factors [1-3].

Several authors have therefore concluded that that practicing designers cannot solely rely on their abilities to design suitable products. They also need social skills to deal with challenges within the team, with the rest of the organisation and the client. These skills refer to communication with others in a team and in terms of the critical information flow between client and designer during task clarification, concept generation, refinement, and the communication of results [4]. In order to build a shard mental model of what the design team tries to achieve, team members need to explicate their ideas and assumptions not only about the product, but also about the process and the team [5]. The empirical research so far indicates that design teams tend to focus on those aspects they are most familiar with, i.e. the technical aspects of their project, and typically neglect the internal coordination, process reflection and social and emotional issues within the team. This is understandable as a general human tendency to preserve one's own impression of competency [6], but it may not be the most effective way of addressing conflicts, resource problems or delays in the project.

Despite the fact that there is ample evidence for the relevance of social skills from systematic research and case studies, design education so far provides little systematic training and assessment for these

skills. The design education programme at the faculty Industrial Design Engineering at Delft University of Technology (http://campus.io.tudelft.nl/live/binaries//doc/Master_guide_IO_2005-2006.pdf) proclaims that a graduate

1. "is capable of being analytical in his/her work on the basis of a broad and deep scientific knowledge.
2. is able to synthesise knowledge and solve problems in a creative way dealing with complex issues.
3. has the qualities needed for employment in circumstances requiring sound judgement, personal responsibility and initiative in complex and unpredictable professional environments.
4. is able to assume leading roles, including management roles, in companies and research organisations, and to contribute to innovation.
5. is able to work in an international environment, helped by his/her social and cultural sensitivity and language and communication abilities, partly acquired through experience of team work and any study periods abroad.
6. is aware of possible ethical, social, environmental, aesthetic and economic implications of his/her work and to act accordingly.
7. is aware of his/her need to update their knowledge and skills."

This skill description acknowledges the importance of social skills for designers. Yet in practice there is only limited attention to social skills. A previous study on the product development course at ETH Zurich found that students regarded project management and team skills as even more important than the technical aspect of their project yet they received no instructions and limited feedback in this area. [7]. In Delft, over half of the education consists of working in groups. These experiences can and should teach the student more about social skills but there is no feedback or underlying theory; students are simply left to acquire these skills as part of the experiential learning in design projects. Informal feedback from students indicated that they often find teamwork frustrating because of problems of social loafing and free riding, and that they feel they have to figure out by themselves how to communicate with a client when they are confronted with a company for the first time in their final project.

Explicit training of social skills as part of a design project has so far only been explored on a pilot basis (see for example [8]). There are virtually no tools to help design educators in providing systematic feedback on social skills, and they are not systematically assessed as part of student performance. This research therefore aimed to identify relevant social skills and develop a format for systematic feedback in research and educational settings.

Many would argue that some people are "naturally" better at interacting with clients and team members than others. However, our focus was not on personality differences such as extroversion – these can be measured with standard tests but do little to help students develop the required skill set. Instead, skills were identified that can be taught and learnt, and also observed by an outsider. Unless good intentions and attitudes materialize as behaviour, they cannot affect other team members, or be assessed by an observer.

2   DEVELOPMENT OF BEHAVIOURAL MARKER SYSTEM

The criticality of social skills and lack of specific training is not unique to designing. In the aviation industry people recognized a similar need around 1980 [9]. Pilots were well trained from a technical point of view but evidence from accident analysis showed that this was not enough to ensure safety. As a result, Crew Resource Management training was introduced to improve the use of non-technical skills in everyday operations, providing 'a set of error countermeasures'. In order to evaluate the effectiveness of these trainings and to provide feedback to participants, so-called behavioural maker systems were developed [9]. Behavioural markers are observable, non-technical behaviours of teams or individuals that contribute to superior or substandard performance within the work environment [10].

A good behavioural marker describes a specific, observable behaviour, not an attitude or personality trait, with a clear definition. This behaviour does not have to be present in all situations; its

appropriateness depends on context. Behavioural markers can be used in any domain where behaviour relating to job performance can be observed. The use of these markers is for example to enable performance measurement, compare subgroups, and give feedback. The marker system contains the minimum number of categories and elements in order to encompass the critical behaviours. These categories and elements are formulated with minimum overlap. The terminology reflects everyday language for behaviour and the skills listed at the behaviour level are directly observable in the case of social skills or inferable from interaction in the case of cognitive skills [10].

In the aviation industry, the assessment of non-technical skills has now become an element of regular tests in the simulator in many airlines. Pilots risk their licence if they can technically fly an aircraft but cannot communicate effectively with their co-pilot or air traffic control about a potentially life-threatening situation. Similar efforts are being made in the medical domain, as the evidence is mounting that many medical errors could be avoided and patients saved if there was more proactive communication and listening in medical teams [11]. If social skill assessment becomes career relevant, it is of vital importance that the behavioural marker system is as objective and fair as it can be. Therefore the observers need to be knowledgeable about the domain and trained properly in the use of the behavioural marker system, and the system itself has to fulfil the standard of a psychometric instrument: its predictions should be valid, its measures reliable across different situations, and it should be objective and useable independent of the observer.

As part of this research, two teams of three design students were involved in developing a prototype feedback form that could be used for design research or by a design educator or mentor in a company. We followed an approach that has been used before in other domains, such as aviation and medical professions e.g. [11-13].

1. Firstly relevant critical situations are identified in which social skills can make a difference such as prevent a problem from escalating, open new options or reduce time and effort. The skills are identified from analysis of data from multiple sources regarding performance that contributes to successful and unsuccessful outcomes. It is important to ensure that content validity at this stage, that means the skills have to be actually meaningful and relevant for that domain. Therefore the critical situations and appropriate forms of dealing with them should be elicited from interviews with domain experts about their actual experience using appropriate task analysis techniques [14], or from previous empirical research in the area. In our case, we conducted a review of the literature on social skills and design research and interviewed six design educators who also practice as design consultants.
2. Based on the collected interview material and findings from the literature, the set of relevant skills is defined. This typically leads to a long list of skill descriptions from various sources (in our case 300 items from the literature review), which then needs to be systematised into a framework that those giving feedback can keep in mind. Here the emphasis is on construct validity, which means that the labels chosen to identify skills should be a good indicator of what is actually meant.
3. The skills are then defined as behavioural markers, i.e. a description of what a socially skilled designer would do in a given situation in observable terms. These descriptions are condensed into a format that can be easily used during a research or feedback situation, such as an A4 sheet, and a detailed definition of terms used for training purposes. This step should ensure usability of the feedback form and reliability of measurement (consistent responses from different observers).
4. The prototype feedback form and skill descriptions are then tested with the intended users, in our case design educators. Ideally a standardised situation is being used so that the responses can be compared. We opted to film a design meeting of a student group and asked the design educators to test the feedback form on the basis of a video recording. Responses are then compared for reliability.

3 FINDINGS FOR RELEVANT SOCIAL SKILLS

For social skills in interaction with clients, semi-structured interviews were conducted with seven designers who all had a minimum of 7 years of academic and commercial experience in design related areas. After open questions about examples from their own experience of critical situation and crucial social skills, the interviewees were presented with a list of social skills based on [15] and [8], and asked to comment on whether they felt a skill was relevant and why. The interviews were transcribed and coded. For social skills for interaction within the design team, a list from previous work [8] was expanded based on a review of the literature. The findings will be presented separately in this order.

3.1 Social skills for client interaction

The following table provides an overview of the findings on social skills for client interaction with example quotes from the interviews for each category (translated from Dutch and formulated in present progressive to indicate that an observer should be able to see these behaviours in action, rather than be told what is "normally done").

Table 1. Findings for social skills for client interaction

Situation	Possible appropriate behaviour	Interview examples
First meeting with client, early negotiation of contract / task	Asking questions to clarify wishes, needs, requirements, constraints, concerns Listening, paying attention, keeping a record Making clear agreements about scope, task, responsibilities, time, budget	*"My colleague instantly started making promises. But [then] the client will be disappointed if you don't manage to succeed."* *"When you see room for interpretation, you should make that room explicit and say [these are the options]"* *"Try to formulate the objective explicitly. The more explicit the better."* *"By asking good questions you can open a space from which the answer may come and were the client was afraid to go themselves"*
Project updates with client	Presenting ideas clearly and convincingly Taking initiative to prompt the client with suggestions and proposals Sparring ideas with client Responding flexibly Voicing concerns as own impression Reflecting on impression on others	*" Involve physical objects; mock-ups and sketches so that you can look something up (..)"* *"You need to be able to quickly sift through what you hear"* *"You have to develop a feeling for how others perceive you"*
Client indecisive or not design aware	Taking initiative to define the problem and solution space Presenting ideas in an assertive manner Use visualization and physical objects to illustrate design concepts Preparing beforehand how to support suggestions with arguments Setting boundaries to contain the discussion	*"Taking initiative is a quality of an entrepreneur; this means that you can convince a company to see things your way"* *"You are a sort of chameleon but at the same time you have to try to stick to your own vision and convince the client"* *"Taking away the fear of innovation – make them enthusiastic and curious"*
Changes or delays in the process	Updating client regularly Anticipating Communicating delays and implications as early as possible	*"If you can't make the deadline tell them. Never play hide and seek"* *"It is a bit like a chess game, you have to think a few moves ahead"* *"If the product turns out much more expensive than expected [don't] hide it."*

3.2 Social skills for team interaction

The skills for team interaction were largely derived from the literature and previous work [8]. The majority of the sources addressed social skills in work contexts but was only partly specific to engineering or designing as there is only limited research so far on social skills. Based on the review, 300 descriptions of skills were collated, which when then clustered into subsets. Not all descriptions could be transformed easily into behavioural markers: In many cases, the skill was described as a leadership issue, but the intention was to keep the behavioural marker system generic for different team roles and team members with equal status. Another problem was the transformation of attitude or effect statements such as "enthusiasm", "respect", or "trust", into descriptions of observable behaviour that might be related to it.

As in the previous section, the skills are listed as possible appropriate behaviour in critical situations. They generally describe proactive communication to ask questions and listen, rather than to make implicit assumptions that could lead to misunderstanding or diffusion of responsibility.

Table 1. Findings for social skills for team interaction

Situation	Possible appropriate behaviour
Project start with uncertainty and insufficient information	Clarifying target and intentions Agreeing a shared understanding of project goals Explicating constraints for the planning and coordination between team members Providing structure and coordinating efforts Voicing concerns about scope or planning Provide constructive feedback to colleagues
Diverse team (different disciplines, experience and interests)	Taking initiative to ensure involvement Explicating views and reasoning Asking questions and listening Contributing to team vision
Unclear responsibilities / division of labour	Taking initiative to coordinate efforts Explicating own understanding of task Visualising / record division of labour Showing commitment and keeping agreements Accepting responsibilities for own assignment
Time pressure, delays	Identifying magnitude and impact of problems Attending to signs of stress in colleagues Communicating implications to all who will be affected Negotiating solution (more resources, change of plan or deliverables) Retaining sense of humour
Dissatisfaction voiced by team leader or client, receiving criticism	Asking questions to understand reason for discontent Acknowledging perspective of other person Listening to critique and repeating what own understanding Presenting own perspective clearly and competently Agreeing on a problem definition and solution approach
Internal conflicts or tensions	Addressing conflicts openly & in cooperative manner Providing constructive criticism Emphasizing with perspective of others Reflecting on own contributions Identifying problems & underlying needs Expressing own expectations and emotions Agreeing way forward
Cognitive fixation, group think	Asking questions to test solution and approach Taking initiative to identify problem Considering long-term and side effects Actively searching for errors or mistakes Reflecting on process

FRAMEWORK FOR SOCIAL SKILLS IN DESIGN

The findings from the interviews and the literature on social skills in interacting with clients and team members were integrated into a general framework (see fig. 1 below). It shows on the left hand side team related skills, which are more generic, and on the right hand side design-specific aspects such as client interaction and dealing with uncertainty and failure.
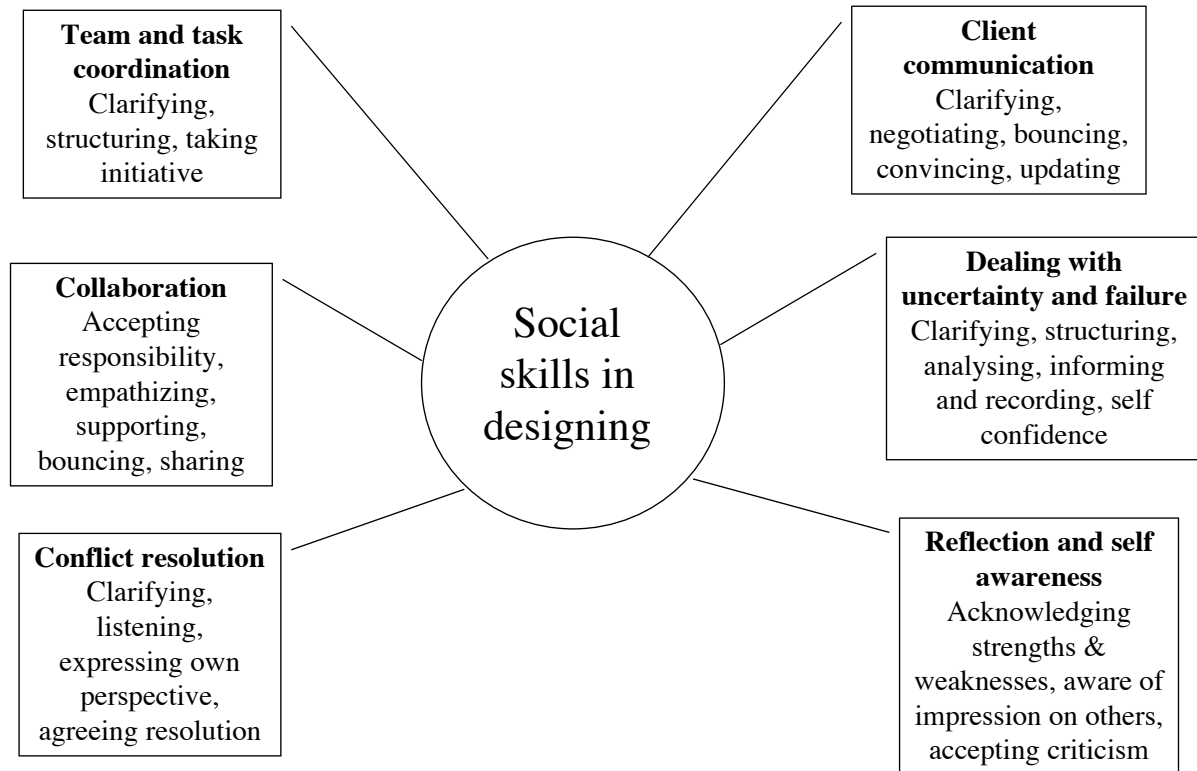

Team and task coordination
Clarifying, structuring, taking initiative

Client communication
Clarifying, negotiating, bouncing, convincing, updating

Collaboration
Accepting responsibility, empathizing, supporting, bouncing, sharing

Social skills in designing

Dealing with uncertainty and failure
Clarifying, structuring, analysing, informing and recording, self confidence

Conflict resolution
Clarifying, listening, expressing own perspective, agreeing resolution

Reflection and self awareness
Acknowledging strengths & weaknesses, aware of impression on others, accepting criticism

Figure 1 Framework for social skills in design

The core of the skill set is proactive communication with other stakeholders in the design process, as opposed to waiting for other to address the problem or assuming that everything is clear or will turn out well automatically. Although the emphasis was on social skills, some aspects clearly have a link to technical skills and knowledge (such as bouncing ideas with the client and team members), or to problem solving, decision making and design methodologies (dealing with uncertainty and task coordination).

Compared to other frameworks of behavioural marker systems, there are certainly similarities, particularly in the team coordination aspects, but also remarkable differences. Designer often face high workload but they typically do not operate high-risk, highly dynamic socio-technical systems as in aviation, the energy industry or the medical domain. They do not have to make decisions as a matter of seconds and although the uncertainty is high it is normally not life threatening for them as a person. They can therefore afford to spend more time on clarifying, sharing, elaborating and scenario building in order to explore and anticipate the potential consequences of a future design. As design problems are typically ill defined, there is also no standard procedure to deal with any given problem apart from rather abstract design methods that specify the type of desirable sub-goals but not the exact outcome or the precise way of getting there. It is therefore not surprising that the behavioural marker system outlined here for design incorporates more aspects of reflection and less of command and control.

EVALUATION OF PROTOTYPE FEEDBACK FORM

A draft version of a feedback form that focussed on the team interaction was pilot tested in the context of design education. Four teachers from the faculty Industrial Design Engineering at Delft University of Technology were asked to evaluate a 15 minute videotaped meeting of a student design team using the feedback form. They were provided with an introduction explaining of the use of the form and were asked to concentrate on one specific person while watching the video and filling in the feedback form. The participants were also given an evaluation form about the usability of the behavioural marker system. The evaluation sheet used was based on the one used in the development of the Anaesthetists' Non-Technical Skills System [12].

Usability of the form

For most skills, the pilot respondents found the behavioural markers clearly described and useful. They welcomed the initiative to systematize feedback on the social aspects of the design process and provided information on how to improve the forms. Two third of the behavioural markers were seen as useable but some were seen as more difficult to observe, particularly those that referred to self-reflection. The observers also noted that the prototype feedback form was too long and contained too many behavioural markers to judge, and that some behavioural markers were overlapping. This has been improved in the framework presented here but not yet tested as a revised feedback form.

The comments from the design educators included suggestions such as showing the video to the person being observed as part of the feedback, or making the form more specific to Design Engineering in terms of the use of visualisation or design tools. The latter point is certainly valid for the prototype version that was being used, but also indicates an overlap with method skills.

Reliability of the responses

Another problem was that the reliability of responses. Items for which all observers agreed within the range of one point on the scale were seen as sufficiently reliable, but this was only found for 25% of the items on the prototype form. In order to increase consistency across observers, the description of the behavioural markers needs to be improved and a more comprehensive training should be devised for observers on how to use the feedback form. In other domains this was typically practiced using constructed scenarios with critical situations and clearly observable appropriate or inappropriate behaviour, which were then enacted and filmed, rather than relying on a naturally occurring meeting in which certain critical situations may or may not occur.

3 DISCUSSION AND CONCLUSION

The success of design project depends on a combination of skills, but so far only the technical knowledge and to some extend methodological skills are being explicitly taught, leaving students to develop the essential social skills by trial and error. A more effective means would be to provide students and young professionals with systematic feedback based on substantiated knowledge of appropriate behaviour in critical situations. This research has identified a preliminary skill set and tested a prototype feedback form in the context of design education.

Generalisability to other areas of design

It may be considered a limitation that the description of social skills was solely aimed at the work of industrial designers. To what extend can the behavioural marker system be applied to other areas of designing such as architecture or engineering? The team skills and those relating to project management and task coordination should be fairly generic across domains. However, the skill set as presented here also placed considerable emphasis on client interaction and eliciting information about wishes and needs. This aspect of developing a vision for a product from a rather loosely defined assignment is characteristic for the work of industrial designers but may be non typical for the work of mechanical or software engineers who are used to start with a list of requirements or a specification. The empirical research reviewed in this paper however indicates that asking questions about the goal of the design from an external or internal 'client' reduces the risk of developing products for a misunderstood purpose.

Robustness of the skill descriptions

Another concern is that the behavioural marker system was developed on the basis of a rather small number of interviews, which elicited advice but not always in behavioural terms and their consequences. Prior to establishing the behavioural marker system as a feedback tool in education, the skill set should be further substantiated with additional interviews. The evaluation of the prototype system also indicated that the form needed to be further refined to make skill descriptions less ambiguous. Also the form needs to be accompanied by a more explicit instruction or short training to illustrate what is seen as good practice. Once the feedback form is sufficiently useable and reliable, it should be explored in a learning context (as part of a university course or training for practitioners) to test if those receiving feedback find it helpful to adjust their behaviour and to manage critical situations more successfully.

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