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Analysis Designers' Process of Insight Generation through Empathy with Users

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Abstract

This study aims to investigate the good way to generate insight through empathy with users. The fifteen experiment participants drew thinking processes of understanding users and defining insight statements while generating insight statements based on a given interview transcript. The thinking processes were assessed by qualitative coding, and the insight statements were evaluated. The results identified the types of thinking that should be avoided when gaining insights. This paper proposes a framework to categorise designers' process of gaining insight.

Keywords: design thinking, problem solving, insight, empathy, design cognition

1. Introduction

To succeed in today's market, companies aim to develop innovative ideas of new products or services, which respond to the underlying user needs (Leonard and Rayport, 1997). Literature proposed the framework to describe the design process, such as the Double Diamond Model (Design Council, 2015) and Design Thinking (Lewrick et al., 2018). The frameworks generally have two major phases: opportunity identification and solution realisations. Although those frameworks have differences in detail, they commonly point out that it is crucial to find a clear and correct problem to be solved to develop innovative solutions. Finding the right problems can be achieved by discovering insights from the target users (Yuan and Hsieh, 2015). Therefore, gaining insight is one of the most critical challenges in the design process (Yuan and Hsieh, 2015). In gaining insight, it is critical to get deep empathy with target users based on user research data such as interviews and observations (Lewrick et al., 2018). There is research on how designers empathise with users (Smeenk et al., 2019) and how designers think during the process (Dorst, 2011). However, the framework of empathy and cognition during insight generation are separately investigated, while both frameworks are two sides of a coin (Walther et al., 2017). Therefore, it is necessary to bridge both frameworks to investigate how (good) insights are formulated.

The purpose of this research is to investigate the good way to generate insight through empathy with users. In this research, we focus on answering a research question: "what is the difference in thinking processes between insight statements evaluated as good and bad?" This study reports an experiment where participants gain insight into users based on a given user interview transcript. The processes of gaining insight were analysed with a coding schema to qualitatively compare cognition of good and bad insight statements.

2. Related Studies

Empathy has been researched in psychology, which influences research of empathy in design (Kouprie and Visser, 2009). Although there are no widely accepted definitions of empathy in design, empathy is

commonly understood as an attempt of understanding users comprehensively (Chang-Arana et al., 2020). Kouprie and Visser (2009) modelled empathy in design as a process that comprises four phases: *Discovery*, *Immersion*, *Connection*, and *Detachment*. Through empathy, designers need to step into users' worlds and observe the users' world to contrast the users' experiences with designers' own experience and knowledge. Hess and Fila (2016) divided empathy in design into four distinct empathy types by two dimensions: affective experience versus cognitive process and self-oriented versus other-oriented empathy. The four distinct empathy types show that empathy requires cognitive and affective processes with users. Several studies provided frameworks for empathy's meta-level role in design projects or for describing overall empathy processes. However, the studies did not offer frameworks to analyse how designers empathise with users and analyse the data to gain insights at the micro-level, although designers need to simultaneously empathise with users and analyse the contents (Walther et al., 2017).

Designing is a unique problem solving because designing requires finding appropriate problems as well as solving them (Cross, 2001). Insight in design is defined as a "*clear, deep, meaningful perception into a particular design context*" (Kolko, 2010). The uniqueness of designing resulted in research on designers' cognitions during designing. Dorst (2011) described the abduction as a key reasoning pattern of design compared to basic human reasoning patterns: induction and deduction. Dorst explained the three patterns with a logical equation: *What* (things) and *How* (working principle) lead to *Result* (observed). The deduction is used to predict *Result* when *What* and *How* is known, while induction is used when *What* and *Result* can be observed. Abduction is used when how and the result are known. In design, the result is replaced with *Value* (to the users). Kolko, (2010) proposed a design synthesis framework to describe how designers gain insight. Insights are generated based on collected data and their own experiences. Designers first see what they collected through user research and what they know through their life. The data are then prioritised and selected for further consideration. Then, designers try to find links between the selected data to create hypotheses eventually using abduction. Insight generation can be supported by external tools such as concept mapping (Kolko, 2010; Yuan and Hsieh, 2015). A concept map is a graphical tool for organising knowledge by linking elements (Kolko, 2010). In design research, Linkography (Goldschmidt, 2014) and DRed (Bracewell et al., 2003) are used to observe designers' thinking processes. Similarly, a concept map is known as a tool that helps designers to visualize their thinking during insight generation. Concept map has the advantage of helping designers to organise data for research, problem-solving, and decision making. Yuan expanded the concept maps with a common-sense database to support association reasoning in insight generation (Yuan and Hsieh, 2015).

3. Method

Online experiments were conducted to investigate how participants empathise with users and gain insights. In the experiment, we observed designers' thinking processes to generate insight statements based on a given interview transcript. An insight statement is defined as a statement that expresses the needs of the user based on insight. Therefore, a good insight statement can convey a clear, deep, meaningful perception of the user which means the statement can accurately express the real needs and issues of the user. On the other hand, a bad insight statement cannot adequately express the real needs and challenges of the user.

The experiment participants were ten graduate students in engineering and an undergraduate student in art, who had been learning design thinking for more than six months, and four professional designers who had more than three years of working experience in design consultancy farms. The design task in the experiment was "design a new product or service for a pleasant morning based on the given interview transcript". The participants worked individually in the experiment at their homes for one hour, which was recorded by an online video meeting application. The experiment consisted of four steps. After a short briefing of the experiment procedure, participants were asked to read a user-interview transcript for five minutes as if the same team member did the interview. The transcript was a transcription of an interview conducted by the author with an interviewee focusing on the theme, especially waking-up time. The transcript contained sixteen questions and the responses (Q and R), the user's routine in the morning, and the user's profile information, such as age and gender (Figure 1). Then, the participants were asked to organise and analyse the transcript for twenty minutes to find out the interviewee's needs. The participants

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created a concept map to visualise what they were thinking and how they expanded their thoughts. A concept map was chosen to visualise the process because it lets researchers and participants easily trace the participants' thoughts. We asked the participants to visualise their thoughts in the form of a map without giving them any detailed rules because the detailed rules could make the participants think differently than usual. The participants connected the elements of their thought, which consisted of keywords and short sentences called nodes. In the third step, the participants were to write down at least one insight statement in eight minutes, based on their transcript analysis. A template of insight statement was given to the participants, which was "'OO' needs 'XX' because '…'" because a good insight statement should comprise the user, his/her need, and the reason why he/she needs it (Yuan and Hsieh, 2015). The participants were asked to select the best four insight statements and to rank the selected insight statements. Then, the participants explained how they came up with the insight statements defined in the previous step. This part aimed to clarify the participants' perspectives and the logic toward the insight statements. In the post-experimental interview, we attempted to clarify the flow of thinking: which parts of the transcript did the participants get inspiration from and connect to concept maps and why and which parts of the concept map were connected to insight statements.

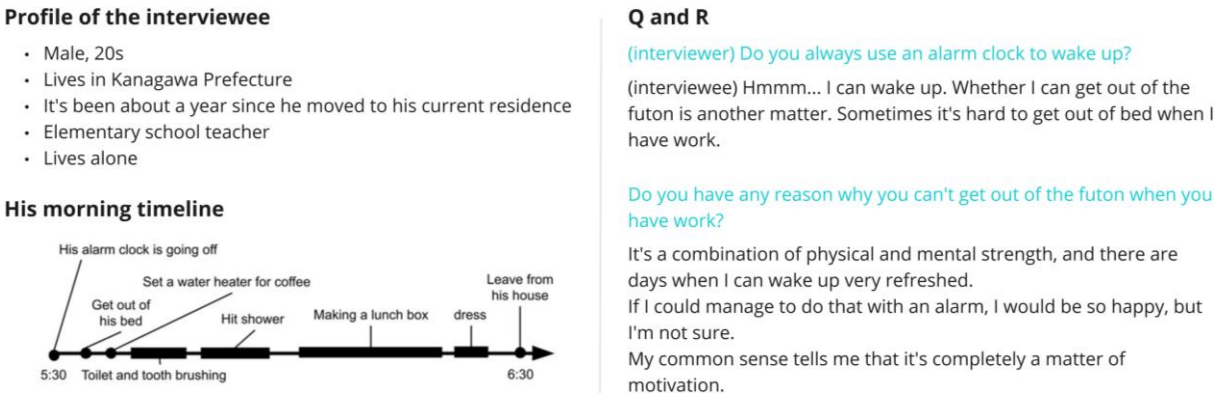

Figure 1. An excerpt of the given interview transcript

The concept maps which were relevant for the generated insight statements were analysed. The two authors reviewed all the concept maps and classified them by discussing the types of nodes and relationships between nodes. As the content and the amount of text in the nodes differed between the participants, we started by checking the content and the characteristics of the nodes one by one and naming them according to their way of thinking. After the typical types of nodes were grasped, we proceeded to classify them as "codes" Once the coding had been done, the classification and definitions were examined again, and the final codes were decided. The coding reliability was assessed by Cohen's Kappa between an external design researcher and one of the two authors, who evaluated five concept maps. Cohen's Kappa values were 0.68 for nodes and 0.60 for the relationship of nodes, which can be considered as good agreement (Kundel and Polansky, 2003).

Insight statements were evaluated by two researchers teaching design in the authors' university. The evaluators were asked to evaluate 48 insight statements on a 5-point Likert scale, where 1 is bad and 5 is good. The creators of the insight statements were kept anonymous to avoid any influence of the professions of the participants. After the evaluation, a 30-minutes interview was conducted to find out how they evaluated the insight statements. After individual evaluations, the evaluators discussed finalising the evaluation. The value of Cohen's weighted Kappa was 0.75, which is considered good (Kundel and Polansky, 2003).

4. Result

Figure 2 is an example of the outcomes of the experiment. The participants generated the area of the concept map and insight statement during gaining insights. The arrows and notes were added based on the post-interview about the generation of insight statements. For example, the generated insight statement was "people who wake up early need to have an open mind because rushing to get ready can cause much stress.".

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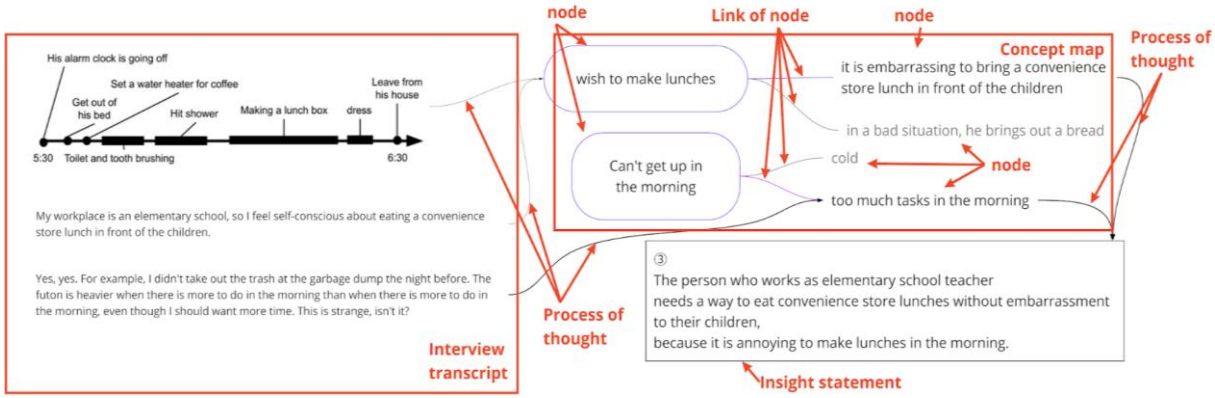

Figure 2. An example of a concept map and process of generating an insight statement

4.1. Codes of analysing concept map

Table 1. Definition of the codes of a concept map node

Name of codes	Definition
Idea	Nodes contain proposals for solutions to users or images of products for solving problems.
Question	Nodes contain questions for users that arose in the thinking.
Guess on action	Nodes are not written in the interview transcript but contain contextual guesses about the user's behaviour.
Guess on emotion	Nodes are not written in the interview transcript but contain contextual guesses about the user's feelings.
Quotes	Nodes are written in the interview transcript or contain contents based on the transcript or rephrased from the transcript.
Other	Nodes do not match any other code.

The analysis created coding schemes to visualise the participants' process of thinking, as shown in Table 1 and Table 2. Table 1 shows the classification of the nodes in the concept maps. *Guess on the action* and *Guess on emotion* were classified according to what participants were guessing. *Question* was used when the thought seemed to be seeking an answer from the interviewee, and codes of *Guess* were used when the node wrote a hypothesis. *Others* consist of nodes for convenience in creating concept maps and nodes of which the authors could not make sense. Table 2 shows the classification of the relations between the nodes on the concept maps. *Element* code is used for relations, such as the presentation of specific examples. *Information addition* includes relations such as explaining and adding more information on the earlier node, which have no logical relations.

Table 2. Definition of the codes for the relations between the nodes of a concept map

Name of codes	Definition
Reason	Relationships in which the later node explains or adds to the reason of the earlier node
Result	Relationships in which the later node shows the result of the earlier node
Element	Relationships in which the later node explains or adds a concrete example or divides cases
Development into an idea	Relationships in which the content is developed from facts or guesses to ideas, or in which ideas are further developed
Contradiction / Conflict / Objection	Relationships in which the contents of the preceding and following nodes point to different contents
Information addition	Relationships that only add new information to the previous node

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4.2. Evaluation of Insight statements

The number of participants who wrote good insight statements was counted. The number of insight statements rated as 1 out of 5 was 11, and the number of those rated as 4 out of 5 was 5. There were no insight statements that were rated as 5 out of 5. The ratio of people with good insight statements differed between novice (2 out of 11 participants) and professionals (3 out of 4 participants). Table 3 shows examples of insight statements evaluated as good and bad.

The interviews with the two evaluators revealed that their evaluation axes were similar within the evaluators. The evaluators agreed that a good insight statement should accurately define the user's problems and needs while not having too much constraint for following ideations. The interviews suggest that there were three types of cases that could be rated as poor: 1) point of view, 2) context, and 3) expression.

The point of view is an evaluation criterion assessing whether the user situation focused on in the insight statement is appropriate to point out the issues and needs. Point of view tended to be assessed as bad when the insight statements have a different point of view than the evaluators' expectation. The context evaluates whether the insight statement is not too far from the given interview transcript. The bad insight statement contained content that was not included in the interview transcript and/or the participant's imagination. The expression assesses whether the insight statement accurately expresses the issues and needs that should be pointed out. In some cases, even though the focus was good, and the information given was written appropriately, the lack of expression led to a lower rating.

Table 3. Examples of insight statements evaluated as good and bad

Evaluation	Example
Good (4)	The person who has trouble waking up in the morning needs to find a way to reduce the amount of work he/she has to do in the morning as much as possible because if he/she has many tasks to do in the morning, he/she will be too lazy to get out of bed.
Bad (1) Biased towards "I know this"	The person who has trouble waking up needs communication attractions because it is easier to wake up by moving one part of the body than by moving the whole body (getting out of the bed).
Bad (1) Biased towards "I saw this"	The person who drinks coffee in the morning needs hot water in their mouths because it is too much trouble.
Bad (1) Well balanced but not well expressed	Teachers who work in schools need to have a way to prevent children from knowing that they are eating a convenience store lunch because they have to make their lunches every morning with their children's eyes on them, which adds to their morning routine.

4.3. Qualitative comparison between good and bad insight statements

The following are examples of the coding results of the concept maps. Figure 3 shows the concept map that led to a good insight statement given a score of 4 out of 5 by both evaluators. The codes for the nodes are shown above or beside the nodes, and the codes for the relations between the nodes are shown on the lines connecting the nodes. The text surrounded by the solid black line below is the insight statement, and the arrows pointing to it indicate which node in the concept map the insight statement is based on. Figure 3 shows that a participant first quoted a part of the interview transcript and then thought of the reason for the *Quote* (as shown in green labels). Based on one of the nodes coded as *Guess on emotions*, the participants generated an *Idea* (as shown in the yellow label). The participant thought of reasons which prevented the interviewee from doing his/her *Idea*. Then, finally, the participants generated the insight statement.

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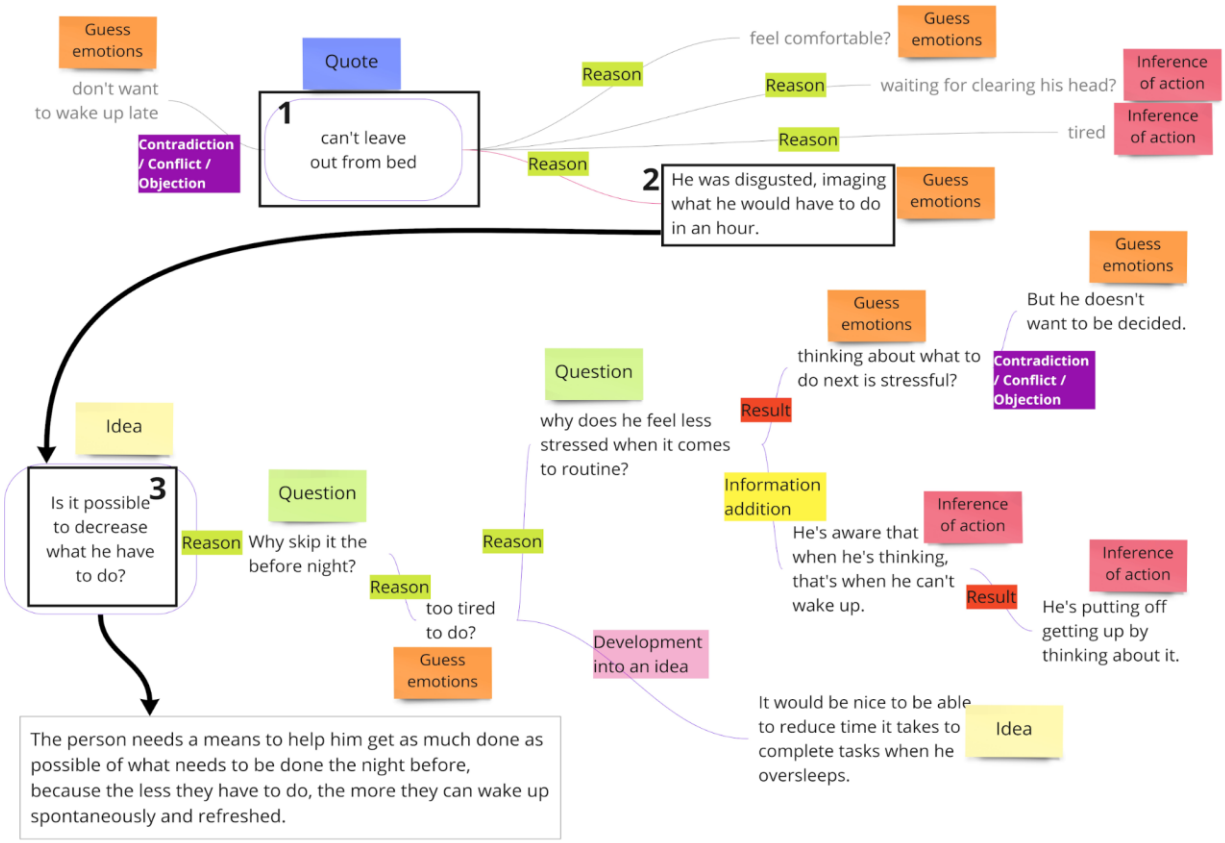

Figure 3. Example of concept map coding leading to an insight statement evaluated as good

Figures 4 and 5 show only the code of the concept map of the thinking process leading to the insight statement that was evaluated as bad. Figure 4 shows an example of using *Quote* to develop thinking, and it was biased toward "I saw this". Figure 5 shows three examples, and these were biased toward "I know this". In Figure 5-(a), *Guess on action* or *emotion* and *Idea* were supported by *Quote*, while in Figure 5-(b), the thinking was developed by *Idea* alone. In Figure 5-(c), a participant developed thinking divergently by guessing about the consequence of users' behaviours or wishes.

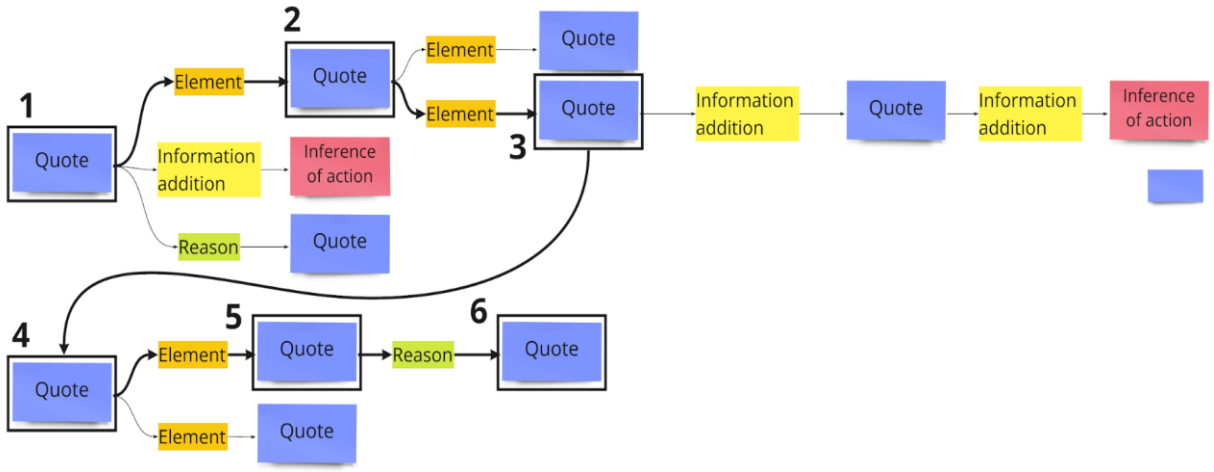

Figure 4. Concept map using only quotes to develop thoughts

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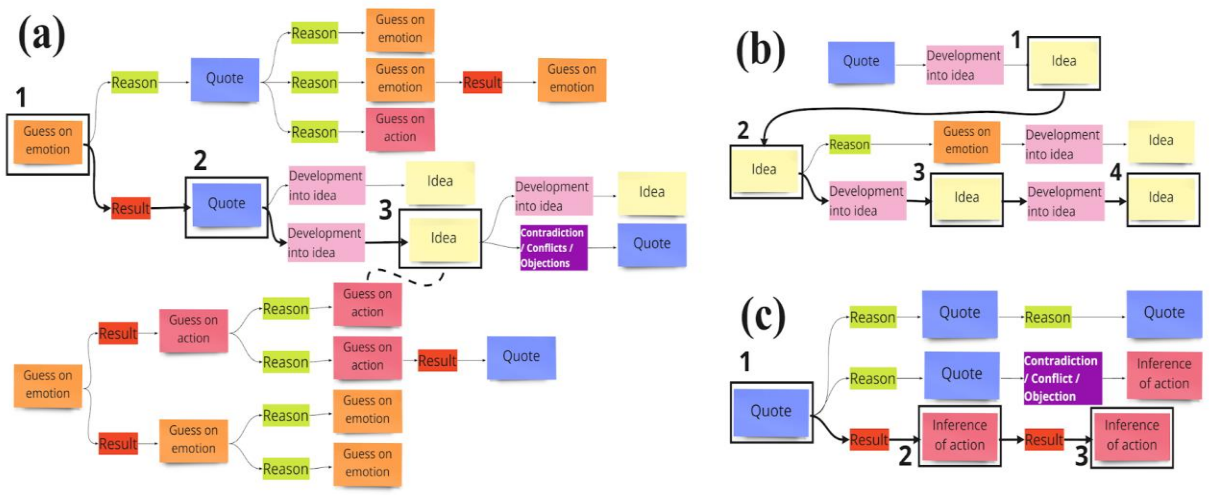

Figure 5. (a) Concept map using quotes to support ideas or guesses (b) using only ideas or guesses to develop thoughts (c) Divergent guesses about results based on quotes

5. Discussion

A classification of the types of thinking processes involved when insight statements are rated as bad was created and the characteristics of each stage were identified. To propose a categorization of thinking processes, the following section proposes three stages of thinking processes that influence the evaluation of insight statements. After that, the stages categorized bad insight statements.

5.1. The three stages of the thinking process to define insight statements

The three points that determine the outcome of the evaluation of the insight statement are the point of view, the context, and the expression. And they are related to the three stages of the thinking process: starting point, development, and organisation and writing. Then, we introduced three stages of thinking, as shown in Figure 6, so that we could analyse the characteristics of each stage. The three stages are *Sensing*, *Recognition* and *Expression*.

By checking the relations between the three evaluation axes obtained from the interviews with the evaluators and the concept map in which the thinking process was depicted, the three stages of thinking in Figure 6 were derived. By qualitative analysis of the concept map, it was found that the information handled did not change from the starting point of the thinking process (the first one or two nodes of the concept map) and that the initial stage of the thinking process influenced the point of view. It was also found that the thinking process that deviates from the user context is the one that includes participants' assumptions and imagination in the development of the concept map. In addition, there was no significant difference between the thinking process with a good point of view and a well-developed process and the thinking process with a good evaluation of the insight statement. This means that after the concept map has been fully developed, the thinking process of expressing it in writing is also an important point for the evaluation.

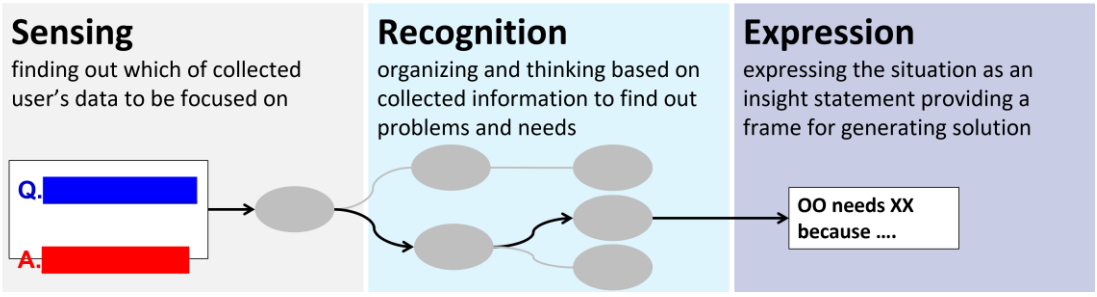

Figure 6. The relationship between a concept map and three stages of the thinking process

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The stages of empathy described by Kouprie (2009) have four steps: *Discovery*, *Immersion*, *Connection* and *Detachment*. *Discovery* is consistent with the first stage of the three stages presented here, *Sensing*, while *Immersion* and *Connection* correspond to the second stage, *Recognition.* Kouprie (2009) divided designers' processes of interacting with users into two: contacting with the user's information in users' world and connecting the user's information with the designer's own knowledge and experience. The two processes are not distinct but rather processes needing to be moved back and forth. This indivisible characteristic is the reason why *Recognition* includes these two stages of *Immersion* and *Connection*. *Detachment* corresponds to the third stage, *Expression*, and can be interpreted as a stage of defining the statement which describes a user's problem to be solved for ideation.

5.2. The relations between four types of thinking patterns and evaluation of the insight statements

Interviews with evaluators suggested that there are three types of insight statements that are rated as bad. A detailed analysis of each of the coded concept maps revealed characteristics of the thinking process. To these three types of thinking patterns, the ideal thinking pattern that leads to good insight statements were added, and the thinking processes that lead to insight statements were classified into four groups: "*Superficial*", "*Preconception*", "*Unrepresented*", and "*Ideal*", the results of which are shown in Figure 7. The vertical axis represents the final evaluation of the insight statements, with good ratings at the top and bad ratings at the bottom. The horizontal axis represents the reasons behind the designers' gaining insight statements based on problem-specific observations ("I saw this") and personal and professional experiences ("I know this"), which are the basis for the process of gaining design insights presented by Kolko (2010). On the left is the thinking that is biased by the user's information and on the right is the thinking that is biased by their own assumptions. Factors that cause these thoughts to be rated as bad were identified in either the *Sensing*, *Recognition*, or *Expression* thinking processes. This is illustrated in Table 4.

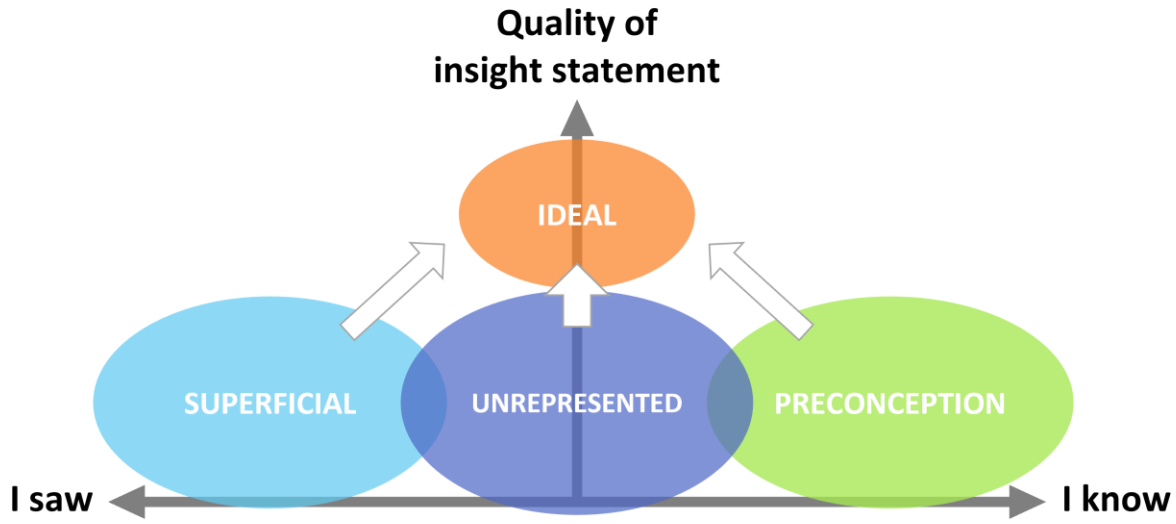

Figure 7. Classification by thinking process and quality of insight statement

Table 4 shows the four categories of thinking patterns and their characteristics in the three stages: *Sensing*, *Recognition*, *Expression*. "*Superficial*" and "*Preconception*" are biased thinking approaches. Kolko (2010) describes: "A design insight can be thought of as the additive of problem-specific observation ("I saw this") and personal and professional experience ("I know this")." In the "*Superficial*", analysis of the coded concept maps shows that they rely on *Quote* to develop their thinking. This means that their thinking is biased towards " I saw this" in their search for user needs and issues. The analysis of the coded concept maps showed two categories of "*Preconception*" thinking patterns: *Idea*- and *Guess*-centred thinking and diverging results thinking with *Quote*s as a

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starting point. This means that their thinking is biased towards " I know this" in the search for users' needs and issues. Therefore, these two patterns suggest that the thinking is terminated without gaining insight. In fact, the evaluators gave a bad evaluation to the insight statements obtained from these patterns of thinking as they did not contain any insight.

Table 4. Characteristics of the thinking process and insight statement in each classification

Classification of the thinking patterns	Sensing (start point of thinking process)	Recognition (procedure of understanding user)	Expression (output as an insight statement)
Superficial Biased towards user information	User-initiated (starts from Quote)	Uses only quotes to develop thoughts.	Pointing out the superficial problem and need.
Preconception Biased towards the designer's knowledge and experience	Self-initiated (starts from Idea, Guess on action and Guess on emotion)	Uses quotes to support ideas or guesses.	Proposing specific solutions and failing to define the problem or need.
		Uses only ideas or guesses to develop thoughts.	
	User-initiated (starts from Quote)	Divergent guesses about results based on quotes.	The problem definition is out of context.
Unrepresented The balance of information organisation is good, but the problem pointed out in the text is not appropriate	User-initiated (starts from Quote)	Guesses are made after organising the user's thoughts based on the quote.	The point of view is good, but the real deep and meaningful problem is not fully pointed out.
Ideal The balance of information organisation is good, and the expression of the text is good	User-initiated (starts from Quote)	Guesses are made after organising the user's thoughts based on the quote.	A good point of view and appropriate problem definition

Unlike the "*Superficial*" and "*Preconception*" patterns, the "*Unrepresented*" pattern of thinking is well-balanced and combines the user's information with the user's own knowledge and experience to analyse the user's needs and challenges. Therefore, the difference between the "*Unrepresented*" and the "Ideal" is only the *Expression* stage, where the thoughts are organized and expressed in the form of an insight statement. We cannot be sure what kind of thinking is going on at this stage, but we will discuss the possibilities below.

There are two possible reasons for the poor evaluation of the " *Unrepresented* " insight statement. either the participant has gained insight but does not recognise it, or the participant has not chosen a good insight statement.

Thus, in the Expression phase, it is not clear what is causing the difference in evaluation. In the future, it will be necessary to further investigate what makes a good insight statement, and to elucidate the thinking process in detail; what kind of thinking is involved in obtaining insight, and in what cases the obtained insight is missed. In order to do this, it is necessary to understand in detail the mode of empathy at the thinking stage and to observe the kind of thinking that takes place at the stage of constructing the insight statement.

6. Conclusion

This study was the first step to the understanding thinking process that generates insight. The insight statement and the concept map obtained from the experiment were analysed to examine the relationship between the thinking process and the text expressing the user's needs and issues. Two researchers were asked to evaluate the insight statements and the interviews revealed that there were three evaluation axes: point of view, context, and expression. In this study, the three stages were defined as "*Sensing*", "*Recognition*" and "*Expression*". The results showed that there are three types

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of thinking processes that lead to an insight statement with a bad evaluation. Two of them, "*Superficial*" and "*Preconception*", were evaluated as not providing insight due to biased thinking. The remaining one, "*Unrepresented*", was evaluated as having a good balance in the thinking process but a poor insight statement. In the case of "*Unrepresented*", it was suggested that, apart from the thinking process visualized in the concept map, the thinking process in the "*Expression*" stage, where the thoughts are organized and put into writing, was a factor that influenced the evaluation. In future research, it is necessary to clarify the characteristics of the thinking process that leads to a good insight statement, and also to clarify the thinking that takes place in the "*Expression*" stage.

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