User-designer collaboration during the early stage of the design process

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Abstract: As user involvement becomes a necessary part of the product development process, various ways of accessing users' latent needs have been developed and studied. Reviews of literatures in user involvement and product development have revealed that accessing users' latent needs and transferring them into design process could be facilitated by effectively implementing user-designer collaboration during the early stage of the design process. In this paper, various types of user-designer collaboration were observed and the n distinct characteristics of user-designer collaboration were classified into three categories. 1) Passive objectivity, 2) workplace democratisation, and 3) shared contexts were observed as strategies for better user-designer collaboration, which have been employed in the area of user-centred design, user participatory design and design for experiencing. Based on the literature review, this paper proposed a basic collaboration mechanism between the users and the designers during the early stage of the design process and then discussed how its mechanism will help to describe the interactions between the users and the designers during the user involvement sessions.

Key words: Co-design/Co-creation/participatory design, Design Management and Strategy.

1. Introduction

Direct contact with users at the early stage of the product development process has been understood to be an important initiator for product improvement and innovation [17, 25, 28, 29, 43]. Nonaka and Takeuchi (1995) argued that the main benefit of involving users in the design process was an increase in opportunities to access to users' tacit knowledge and latent needs. Recently, designers have encouraged employing user involvement sessions to better understand users' tacit knowledge and latent needs during the early stage of the product development process. However, direct contact with users does not always guarantee the successful outcomes. Quite often, user involvement session resulted in a long list of users' physical and cognitive limitations, dissatisfaction of the product, or wish lists for future technological advancements. None of these seemed to have

a direct implication to the creation of a new product concept. In order to assist practicing designers to work with users, various design tools and guidelines were published [30], yet practicing designers (especially industrial designers) still have a difficulty in implementing successful user involvement sessions for their product development processes. Successful user involvement needs more than just employing design tools or guidelines in the design process: it requires better understanding of how users and designers can work together in the design process to get better design outcomes.

Some researchers suggested employing social science specialists for conducting better user involvement sessions. However, Sanders and Stappers [38] criticised the way in which traditional user research has been mediated by social science specialists and argued the benefits of direct user involvement during the design development phases such as idea generation and concept development phases. Nonaka et al. [25] also stressed the direct contact with users as designers' new competences, mentioning that users' latent needs and tacit knowledge need to be understood, shared, and sympathised by practicing designers in order to be explored, and then transformed into innovative design ideas. Huxham and Vangen [16] from the field of inter-organisational knowledge management and creation suggested that interaction with customers is a part of the creative knowledge generation process and that successful product developers should practice a continuous process of sharing users' tacit knowledge and of creating ideas for improvement at the early stage of the development process. Huxham [14, 15] argued that collaboration has been practiced naturally as a way of acquiring users' latent needs and tacit knowledge, but, the full potential of collaboration, which goes beyond mere communication and cooperation, has not been successfully implemented. Dillenbourg [10] also argued that tacit knowledge transfer and new knowledge elicitation could be facilitated through collaboration.

Wright (2006, p.195) [42] stated that collaboration was an effective strategy in finding unique solutions to complex problems. Carlile [5] argued that productivity increased when two different set of knowledge collide. This could be interpreted as showing that problem restructuring activities can also be supported through user-designer collaboration [11]. These authors indicated that user-designer collaboration can be implemented more effectively if the mechanisms of user-designer collaboration are better understood.

User-designer collaboration, in this paper, is defined as a set of coordinated and joint problem solving activities where two parties can learn about each other through an iterative process of constructing and rebuilding mutual identities [7, 10, 13, 15, 22, 34]. User-designer collaboration in product development has been considered a useful strategy for learning about users' latent needs and requirements, and therefore to be a way to assure success in commercial product development [21]. The user-centred design community has long argued for the inclusion of field studies, user observations, contextual analyses and procedures to identify true user needs before a project's launch [27] and for the involvement of users as much as possible [4]. To some extent, user involvement is now accepted as an automatic procedure by most designers [26].

However, the effectiveness of implementing user–designer collaboration as a strategy in product development has also been contested. For instance; "The best way to satisfy users is sometimes to ignore them" (Norman, 2005, p.17). "The user is not a designer and studies have shown that users' designs are generally inferior to those of interface professionals" (Scaif, Rogers, Aldrich, and Davies, 1997, p.82). "This is because often users cannot properly articulate their needs." (Pekkola, Kaarilahti, and Pohjola, 2006, p.21). "All too often the actual contribution made by users is too little, too late" (Scaif et al., 1997, p.343).

These pessimistic views partially stem from a misunderstanding of the nature of users' knowledge and the user-designer relationship in user involvement sessions. Users' knowledge is usually localised, embedded and invested in their daily experiences [5]. It cannot easily be articulated as words, numbers, and procedures [35], and is therefore hard to communicate. Through the process of collaborative experiencing, users' tacit knowledge can be transferred to product developers [25]. Nonaka et al. (1995) reviewed successful product development cases and reported that transferred users' tacit knowledge should remain within the design team throughout the process, transforming users' tacit knowledge into innovative design concepts.

The problem is that most designers are aware of the importance of user-designer collaboration and have implemented user-designer collaboration as a way to access users' latent needs during the early stage of the product development process. However, they have not developed strategic views of how user-designer collaboration could be implemented as a design method. Therefore, identifying the collaborative mechanism between the users and the designers during the early stage of the product development process was needed.

2. Approaches developed for better user-designer collaboration

2.1 User Involvement in general

Literature indicates that the motives for employing users at the early stage of the development were 1) empowerment of the participants, 2) efficiency and 3) improved user acceptance [9]. The first benefit - empowerment of the participants - was realised and practiced by the Scandinavian participatory design approach [20]. The goal of the Scandinavian participatory design approach was to democratise workplaces by evenly distributing decision-making processes among participants. The second type of benefit - efficiency - has evolved from North American practices [41]. Acquiring users' latent needs, wants and requirements was regarded as the major rationale for involving users in North American practices. The third benefit - improved user acceptance - has been realised through educating users even before manufacturing the product [19]. These benefits were better understood by reviewing the existing user involvement approaches, which include user-centred design, participatory design, and design for experiencing. After reviewing these approaches, characteristics for better user-designer collaboration were summarised.

2.2 User-Centred Design

The user-centred design approach has been popularised and practiced among industrial product developers, Human-Computer Interaction specialists, and usability experts since the early 1990s [37]. The nature of the user-centred design approach was said to have originated from applied social and behavioural sciences and/or from engineering, therefore the procedures were developed with research-oriented and expert mindsets [37]. Ker and Buur (2002) [18] pointed out that in traditional user-centred design approaches, the researchers were kept at a distance in order for them not to engage in interaction with the users. Passive objectivity, therefore, has been widely accepted among user-centred design practitioners. However, Buur and Bagger (1999) [3] argued that a passive attitude toward direct dialog with users sometimes impedes better understanding of the users' context. Therefore passive objectivity should be understood as a strategy for encouraging the users' active participation in the generation of design context.

2.3 Participatory design

Participatory design is a set of theories, practices and studies that actively involve the end users in the design process to help ensure that the product meets their needs. It has been used in urban design, architecture, landscape architecture and planning as a way to create environments that are more responsive and appropriate to their inhabitants and users' cultural, emotional, spiritual and practical needs [40]. The resulting knowledge and philosophy have been transferred into the fields of industrial design and information technology. Early participatory design literature emphasised the development of tools and methods of participation; workshops, games and prototypes [23, 39]. Participatory design has branched into diverse trajectories, influenced by political, socio-economic and cultural factors [41]. Europe (especially Scandinavia) and the US [31] have developed quite different participatory design approaches. Based on Asaro (2000) [1], the participatory tradition in Europe, especially in Scandinavia, was developed with a strong emphasis on democratisation of the workplace. While the other trajectory of participatory design approach, which was developed mostly in the United States and the United Kingdom, focused on users' knowledge of work processes to improve the usability of end products.

2.4 Design for experiencing

Sanders and Dandavate (1999) [36] used the concept of 'shared contexts' as a theoretical framework for describing their concept of 'design for experiencing'. Design for experiencing used various generative tools and participatory prototyping methods as ways to empower users in the design process. These tools were used to encourage and challenge the users to express their latent needs, aspirations and dreams and therefore facilitate the transfer of the users' context to the design teams. Sanders later used the terms 'co-designing' (Sanders, 2000) and 'co-creation' (Sanders, 2005; Sanders and Stappers, 2008), gradually expanding the concept of 'design for experiencing.'

2.4 Characteristics of better user-designer collaboration

Passive objectivity, workplace democratisation, and shared contexts were identified as key characteristics of better user-designer collaboration in the area of user-centred design, participatory design, and design for experiencing. These approaches have implemented different tools and methods, however, the key strategy for better user-designer collaboration could be summarised as the mechanism for encouraging, empowering and challenging the users to bring their own contexts for idea generation during the early stage of the development process. The framework for better user-designer collaboration was developed using the identified mechanism and the coding system was described in the following section.

3. Developing a framework for user-designer collaboration

3.1 Theoretical background

In order to describe the structure of collaboration between people with different cultural backgrounds, a concept of a shared workspace was introduced [24]. Muller adapted Bhabha's in-between culture concept[2] and suggest a shared workspace, where the process of collaboration among participants could be observed. The concept of a shared workspace is similar to the concept of a constructive space in 'design for experiencing' (Sanders and Dandavate, 1999) and a collaborative space (Mitchell, 1993). A constructive space in 'design for experiencing' was also constructed from participants' own spaces.

In modelling a structure of user-designer collaboration, it is important to include the individual's knowledge and culture as input elements of the structure [5]. Carlile (2002) argued that knowledge is localised, embedded, and invested within each participant's territories or culture; knowledge should be clarified, understood, and transformed in order to be used as a resource for collaboration.

Muller [7] described the shared workspace as a 'third space' in which both sides challenge each other, learn reciprocally, and create new ideas, which emerge through negotiation and co-creation of identities across differences. Through continual negotiation and the creation of identities within this overlapping space, a new culture could be generated (Figure 1).

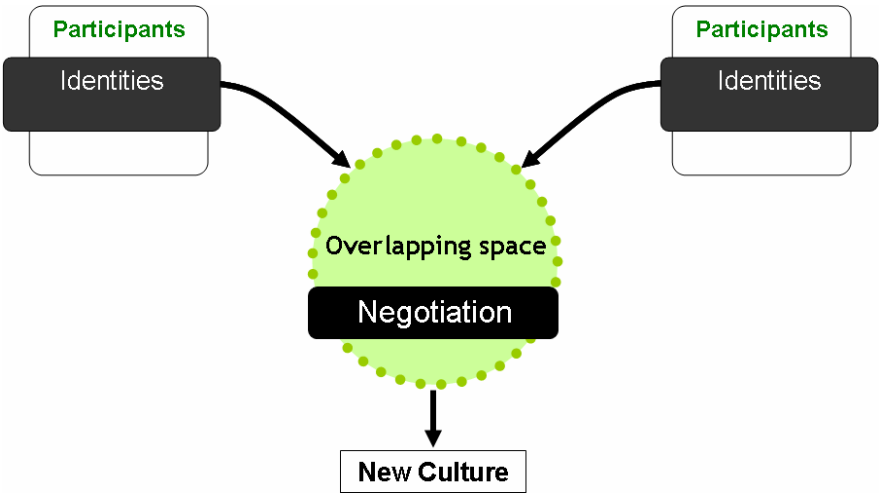

Figure.1 Theoretical framework for user-designer collaboration

Figure 1 represents the overall structure of an overlapping space in which all participants are interacting. This space does not belong to any participants. The space is a place that all the participants can access and where they can interact with each other to negotiate, construct and discover. The left and right boxes represent participants with their own identities. New culture is generated only when all the participants depart from their own territories and negotiate their identities in the overlapping space. The centre circle represents the overlapping space where each party shares its identities and generates new culture. The theoretical framework (Figure 1) represents the iterative, recursive interaction of knowledge [22] which aims to develop a beneficial relationship between two or more individuals, groups or organisations [6, p.41] in a synchronous manner [34].

3.2 Elements of the research framework

The research framework (Figure 2) was developed in order to describe the interactions between the users and the designers during the idea generation sessions. The research framework has included three elements for better understand the user-designer collaboration mechanism. Firstly, individual contributors - knowledge, identities and resources that all the participants bring into a shared working space. Secondly, collective contributors. Thirdly, designers' managerial activities.

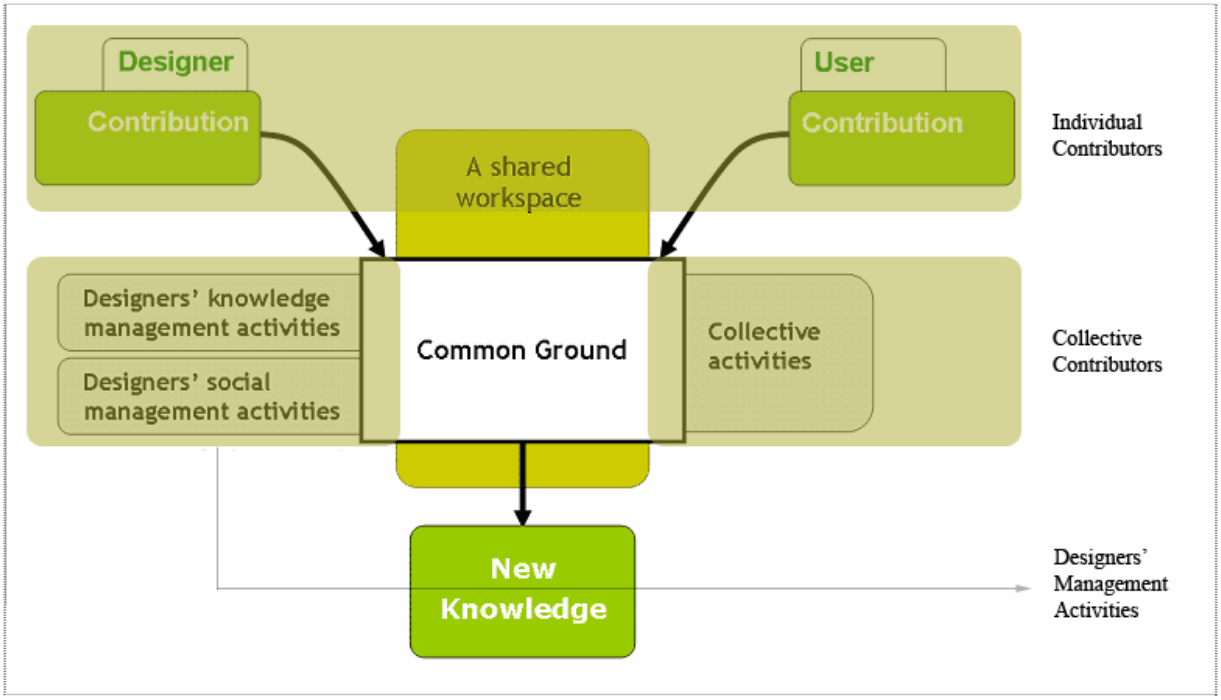

Figure.2 Research framework for describing user-designer collaboration mechanism

Robillard et al. [32]developed a cod ing sch eme fo r th e an alysis o f a tech nical rev iew m eeting held in an industrial environment. They employed the procedure of protocol analysis, which started with video recording all of the interactions among participants, moving through to the transcription, coding, analysis and modelling of cognitive behaviours. From the study, they identified the following 10 ind ividual activities and four collective activities (Table 1):

Table 1. The types of individual and collective activities (modified from Robillard et al.'s research, 1998).

Individual activities	Collective activities
Management, Introduction, Request, Evaluation, Justification, Rejection, Acceptation, Information, Hypothesis, Development	Cognitive synchronisation, Review, Conflict resolution, Alternative elaboration

The individual activities were cod ed from a state ment mad e by a si ngle sp eaker, whereas co llective activ ities were coded from the smallest individual dialog unit among different speakers. Collective activities were coded when at least two s peakers were contributing, th rough c onversation. Am ong collective activitie s, cognitive synchronisation was fou nd t o be th e m ost co mmon activ ity[32]. Cognitiv e syn chronisation was cod ed wh en participants showed that they shared a common representation of a given task. Pairs of 'hypothesis – acceptance/ rejection' and 'proposal – acceptance/ rejection' were the cases of cognitive synchronisation.

As part of t he cod ing system fo r co llective activ ities, conflict resolution was coded wh en p articipants h ad an argument and subsequent agreement about a given subject. This exchange was characterised by a pair of 'reject-agreement' statements. Alternative elaboration was cod ed when participants elaborated new solutions that were not originally part of the existing solutions. The alternative elaboration was the outcomes of the collaboration.

Karsenty (1 991, in Rob illard et. al., 1998a) stud ied m eetings between d esigners and fu ture users who were validating the conceptual schema of a database. The coding scheme for their collaborative activities was based

on evaluation, clarification, negotiation and problem analysis. In design meetings with experienced designers, discussions involving the design objects and individual clarification were found to be the most common activities[33].

To conclude, Robillard et al. [32] have shown that collaborative interaction must be understood in the context of both individual utterance and the social exchange. The study of user-designer collaboration, therefore, needs to be structured in such a way that it includes both individual statements as well as exchange units (pairs of statements).

4. Coding system

In order to develop a coding system for describing the user-designer collaboration, three different industry-sponsored case studies were undertaken, and a total of six user involvement sessions chosen for the study. Case study 1 was sponsored by SK communication and comprised three user involvement sessions to investigate users' latent needs associated with the use of mobile telephones whilst driving. Case study 2 was done by SK Context Lab and comprised one user involvement session to evaluate and clarify mobile service concepts. Case study 3 was carried out by Openmaru and comprised two user involvement sessions to enhance the usability and functionality aspects of the on-line community services.

In the video clips, it appeared that users and designers acted individually: designers introduced a particular task to the users and the users responded to the given task. Collaborative interactions were not seen on the surface level. A detailed coding scheme needed to be developed to see the mechanisms of collaboration within the shared workspace. Signs of understanding, confusion, interruption and repetition assist the accumulation of common knowledge. These individual and collective activities were the core contributors to the construction of a common knowledge in the shared workspace. Once the way in which individual contributions and collective activities combine to move the procedure forward have been understood, it is possible to articulate the factors that influence the way in which collaborative outcomes are generated.

4.1 Individual Contributors

In the video clips of the cases, two types of individual contributions were identified: user knowledge and designer knowledge. User knowledge can be accessed through the actions and experiences in the everyday practices of individuals. It relates to knowledge contained in the interaction between individuals and products (UPP: Users' product experience); the routines and practices regularly practiced by individuals (UCP: Users' contextual experience); and user preferences (UVE: User preference). For example, when the users expressed experience-based operational difficulties, the difficulties were coded as being product experiences (UPP). When the users' utterances were related to storytelling experiences[12], then they were coded as contextual experiences (UCP). Suggestions for product functions and features based on the users' personal preferences were coded as user preferences (UVE).

Table 2. Coding scheme for individual contributions (user knowledge and designer knowledge)

Category	Sub categories	Code	Description
User Knowledge		UK	Knowledge which is contained in the everyday practices of individuals. It is contained in the operational experience of using products, in personal stories, and in user preferences
	Product Experience	UPP	Articulation of the difficulties, problems and solutions associated with the operation of the product
	Contextual Experience	UCP	Articulation of the social and cultural issues
	User Preference	UVE	Articulation of the explicit and implicit personal preferences and wishes
Designer Knowledge		DK	Knowledge that is provided by the designers during the user involvement session
	Domain Knowledge	DAK	Provision of domain knowledge to users
	Information	DTK	Provision of detailed information about the tasks
	Instruction	DIS	Provision of instruction about the tasks

The designers' individual contributions either represented the introduction of a new subject or a continuation of the current subject. The introduction of a new subject was mainly expressed through instruction (DIS: Designers' instruction) and information (DTK: Designers' information). Domain knowledge (DAK) was expressed through the designers' utterances about manufacturing processes, organisational and developmental issues which could only be accessible through the designers' expertise. Two types of individual contributions are summarised in Table 2.

4.2 Collective Contributors

Users' and designers' individual contributions needed to be mutually clarified, understood, and then transferred to other participants within the shared workspace in order to proceed. Collaborative activities (CA) were used as the mechanism to facilitate this process. In a conversational situation (user-designer collaboration), collective activities work as indicators of acceptance, rejection, agreement, disagreement, compliance, and refusal[8]. Clark and Schaefer (1989) described collective activities as adjacent pairs of utterances produced by two different speakers. Examples were pairs of 'question – answer', 'request – compliance/refusal', 'request – acceptance/rejection', 'proposal – acceptance/rejection', 'offer – acceptance/rejection', and 'assessment – agreement/disagreement'. These pairs of utterances contributed to the construction of a mutual belief that the utterances were understood by both parties[8]. In this thesis, pairs of utterances were used to code the users' and the designers' collective activities. The collective activities are summarised in Table 3.

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Table 3. Coding scheme for collective activities (CA)

Categories	Code	Description
Utterances - Interruption	INR	When the presenters' utterances are interrupted
Utterances - Repetition	REP	When the respondents repeat what the speaker have mentioned
Utterances - Rephrase	REH	When the participants rephrase what they have been told using different terms
Utterances - Reminder	REM	When the opponents try to return their attention to the main topic
Utterances - Reasoning	REN	When the participants provide reasons for their choices and decisions
Utterances - Agreement	AGR	When the participants agree to a suggestion or a statement

Request - Refusal	RFS	When the participant refuses to accept what is proposed by the speaker
Question - Answer	UQE	When the users articulate a question regarding a task, situation or problem
Utterances - Confirmation	COM	When the participants agree to confirm what they have been told
Suggestion - Utterances	SUG	When the participants suggest something
Utterances - Confusion	CFS	When the participants get confused
Utterances - Correction	CCC	When the participants make a collective effort to correct a situation or task

4.3 Designers' management activities

The objectives of user involvement could vary from 'identifying the users' unknown needs', or 'clarifying the design concepts' to 'evaluating the usability and acceptability of the products.' The initial review of the video material revealed that the designers used various knowledge and social management activities in order to achieve their objectives.

Knowledge management activity equates to the designer's effort to facilitate the transfer of knowledge in the shared workspace. Any designers' activities related to the transfer of user knowledge can fall into the category of knowledge management activities. Knowledge management activities can include clarification, evaluation, contextualisation, negotiation, hypothesis, and development. Knowledge management activities are summarised in Table 4.

Table 4. Coding scheme for knowledge management activities (KM)

Sub categories	Code	Description
Clarification	CLA	The designers' efforts to make sure all the participants share a common ground
Evaluation	EVA	The designers' efforts to evaluate the users' knowledge
Contextualisation	CTN	The designers' efforts to provide a context for the task
Negotiation	NGO	The designers' efforts to negotiate the situation, problems, and partial solutions
Hypothesis	HYP	The designers' efforts to hypothesise about problems, situations or functions
Development	DEV	The designers' efforts to make progress based on the users' knowledge

Table 5 shows a list of designers' individual utterances found to be the most relevant to the description of social management activities. For example, (INT: To introduce) is coded when the designers ask for the users' attention in order to facilitate the process of transferring knowledge from the designers to the users

Table 5. Coding scheme for social management activities (SM)

Sub categories	Code	Description
To introduce	INT	Occurs when the designers ask for the users' attention in order to provide information about a new subject
To orient	ORI	Occurs when the designers ask for the users' attention in order to orient users to new

		problems or situations
To request	REQ	Occurs when the designers ask for the users' attention in order to request users to perform new design tasks
To inform	INF	Occurs when the designers provide additional information in order to improve the users' understanding
To engage	ENG	Occurs when the designers provide user-relevant information in order to engage users into certain problems or situations
To elaborate	ELB	Occurs when the designers ask the users to collectively develop alternative ideas, solutions or concepts
To challenge	CHE	Occurs when the designers put the users in a different situation or problems in order to evoke the users' unexpected responses

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5. Discussion

The main contribution of the paper is to identify types and characteristics of 1) individual contributors, 2) collective contributors, and 3) designers' managerial efforts. In the video clips, 1) individual contributors were observed as knowledge that users and designers bring into the shared work space; 2) collective activities were employed in supporting the construction of a common ground; and 3) designers' managerial efforts were observed as activities for facilitating the transfer of knowledge and new knowledge elicitation among the participants. The use of this coding scheme to analyse the case studies will reveal how designers use their knowledge and social management activities to facilitate the transfer of user knowledge and new knowledge elicitation.

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