

Modified Critical Incident (mCIT): A Means to Uncover Experience of Mobile Social Messaging System Using Informant-Specific Cues

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Abstract: Part of Human-computer interaction (HCI) research evolves around understanding of the experiential aspects of users -their *what, why* and *how* of technology use in the domestic setting which is always privy to the users. The process of understanding is often not straightforward and a reliable means to develop this HCI knowledge is deemed necessary. This article describes a study where Critical Incident Technique (CIT) was adapted to HCI research and applied in the context of social messaging system use in understanding technology-mediated familial bonding enactment. CIT often involves the recalled critical incidents – or significant instances of a specific activity as experienced by research participants to recognize similarities, differences, and patterns, and to seek insights into how and why people engage in the activity of interest. However, such approach may contaminate the reliability and trustworthiness of the findings. Thus, our adapted version of CIT utilizes the procedures and logic of CIT, but differs in two ways: 1) Relying on situated and informants' genuine critical incidents to elicit experience of interaction and 2) 'uncritical' incidents were also included as complementary to critical incidents to cueing informants on the phenomenon of interest. This uncritical incident represents negative evidence to counter the drawback of existing technique. Considering both critical and uncritical incidents in the study has provided a bigger picture and rich descriptions of the technology-mediated familial bonding enactment from both lens of genuine incidents and informants.

Keywords: critical incident; group chat; technology-mediated familial bonding; social messaging system; user research method; WhatsApp

1. Introduction

Conducting research and technology design for domestic life is very challenging as family life is increasingly mobile and complex. Communication, awareness and needs of family interaction are nuanced with the differing roles and dynamics of members (Judge & Neustaedter, 2015). The scenario may change from day to day and vary based on location. One of the many potential areas in studying domestic life is family virtual space that is created through social messaging system or novel connecting technologies invented by researchers. It provides a basis for delving more deeply into the creation of interesting unknown phenomenon which may lead to the new inventions or designs of technology. Domestic life also involves situations and activities that occur outside of the home and often interwoven with play, work and other mundane events (T. Padmapriya et al, 2020). It is increasingly difficult to capture interesting actions and behaviours of the interaction as the family members move through them in various locations and contexts. Thus, there is a need for a more specialized method for conducting real research in the area of connecting technology design for family and evaluation (Judge & Neustaedter, 2015; Neustaedter, Harrison, & Sellen, 2013).

One of the increasing methodological approaches for studying user when interacting with technology is Critical Incident Technique (CIT) (Kitzie, 2019; Skågeby, 2019; Tanaka, 2019). Originally developed in the organizational psychology field (Flanagan, 1954), CIT has been extensively applied in many areas of academic studies such as social science (Kostamo et al., 2019), education (Akpovo, 2019), and health (Bergman, Pettersson, Chaboyer, Carlström, & Ringdal, 2019). Despite its wide application in many areas, one important issue that researchers must deal with is the establishment of credibility and trustworthiness (Butterhead, Borgen, Amundson, & Maglio, 2005).

Thus, this article describes a study where CIT was adapted to address experience of a user group - *family*. Rather than relying solely on the user reported experience of their recent interactions with the system through recalling or memorising the critical incidents, this study preceded with the identification of critical incidents using behavioural logging of user's situated actions. Also, samples of uncritical incidents were included as complementary to critical bonding incidents to represent negative evidences to counter the drawback of existing technique while provides validation to the research outcomes. We want to find out if such adaptation could be applied in user study of domestic setting and could be useful for eliciting experiences of families in the setting that is always privy to the members.

2. Literature Review

Researching domestic sphere of family life

As HCI studies moves from the lab into people's homes and domestic lives, the shortage of information about the practical details of how to execute informative but sensitive research in complex, real-life settings is apparent.

Critical Incident Technique (CIT)

Critical Incident Technique (CIT) is a well proven qualitative research approach that was first introduced in 1940s by John Flanagan in the field of occupational psychology (Flanagan, 1954). While offering a practical systematic approach to collecting and analysing data about human activities, the method is capable to yield rich, contextualized data that reflects real-life experiences. A series of relatively systematic observations can be performed using the suggested procedures on many instances of a behaviour. The value and efficacy of this technique has been attested by studies in a widening range of areas including HCI (e.g. Capra, 2002; Kaye, 2015; Makri, Hsueh, & Jones, 2018; Skågeby, 2019). The study by Capra (2002), for example, highlights its strength that lies in its suitability for remote studies where participants use interfaces 'in-the-wild' for daily tasks. Integration of critical incidents with the existing methods of research process offers a promising rich source of evidence that lent supports to conceptualization of a particular phenomenon. It can be regarded "*as a flexible set of principles which must be modified and adapted to meet the specific situation at hand*" (Flanagan, 1954, p.335). As such, "*CIT that uses an inductive approach becomes helpful in exploring a phenomenon which may not be very theorised, or which may be context-dependent*" (Skågeby, 2019, p. 136).

As its name suggests, critical incident technique involves the study of critical incidents – or significant instances of a specific activity as experienced by research participants. Detailed analysis of critical incidents enables researchers to recognize similarities, differences, and patterns, and to seek insights into how and why people engage in the activity of interest. The incidents are scrutinized in the light of relevant established principles of human behaviour and of the known facts regarding background characteristics and conditions operating in the specific activity. In layman's term, critical incidents are occasions or events which have significance impact that stay in mind. While they are not necessarily dramatic or obvious, they still embody aspects of human experience that are significant to the individual or a group of individuals concerned. Often these incidents appear to be typical rather than critical at the first sight but are rendered critical through analysis. Flanagan (1954) asserts that "*an incident is critical if it makes a "significant" contribution, either positively or negatively to the general aim of the activity*" (p.335) and it should be capable of being analysed. The technique uses only the extremes of behaviour in activity since extremes incidents can be more accurately recognized than behaviour which is more nearly average in character (Flanagan, 1954).

Although the main source of empirical data in CIT has moved from primarily relying on direct observations to using retrospective self-reports such as interviews (Butterhead et al., 2005), the retrospective feature with no illustration of situated and solid critical incidents exposed the research to the information biases introduced by informants. There is a high tendency for informants not to recall all details, or selectively remembering and exaggerating certain aspects (Skågeby, 2019). Also, emphasis of CIT thus far is relatively constrictive because only significant or critical events are taken into account when describing activity of interest. The technique abandons the uncritical incident in which the influence on the description of the overall phenomenon is not known yet. In a similar vein, real interaction and user experience are nuanced and complex, and binary descriptions to user experience of interaction (close/not close, together/not together) are not sufficient to describe the gradation. Hence, this article further argues that contrasting the critical with the uncritical incidents provides overall understanding of the phenomenon of interest.

3. Method Development

In this section, we present our work on modified critical incident technique (mCIT) to provide a medium where more situated critical and uncritical incidents that serve as cues can be tailored to the informants so that user experience and perceptions of technology usage elicited by informants will be uncovered. Reflecting on the use of incidents that are often elicited by requesting from informants to further provide detailed story of their experience of a specific activity (Skågeby, 2019), we identified the need to further explore the issues around the specific kind of incidents to understand connecting technology use by family members.

Implementation

The implementation of mCIT is preceded by gathering and organizing behavioural log data. Since the main researcher is an insider in this study, participants' and informants' names are anonymized in the log data before proceeding to the next step. The retrieved logs consist of separated .txt files for text messages including emoticon and emoji, .jpg files for photos, .mp4 files for movie clips, and .aac or .amr files for audio clips. A corpus of message log for a period of 318 days was selected to be examined and the total messages is 31,232 including 4287 photos, 46 audio clips, 136 video clips, 88 location data, 10 Virtual Business Card (VCARD) and 105 external links. The logs were reorganized by partitioning them into chat segments for convenience of analysis. A chat segment is defined as a sequential message without five minutes or more separation between two consecutive messages (Isaacs, Walendowski, Whittaker, Schiano, & Kamm, 2002). Altogether, 6328 chat segments were ready for the next step.

Adapting the existing critical incident technique to identify incidents of interests for further exploration of themes, we categorize chat segments as critical, uncritical or unlabelled bonding incidents. We then conducted a consistency check of the categorization with the informants to ensure that critical and uncritical perceptions of phenomenon under study aligned with the theoretical-informed frame of the researcher. Finally, a set of informant-specific incidents that serves as cue in focus group discussion was displayed to be reflected by the informants. An initial study of this method was performed by Jørgen Skågeby (2019), exploring participant's recalled experience on digital media failures. This study suggested the potential value of using 'tailored critical incident' to elicit more nuanced and reflective responses to family everyday technology use but did not go far enough to further consider the use of genuine incidents and uncritical incidents in the investigation. Thus, we have performed and will now next describe findings from a case study exploring the potential strengths and weaknesses of tailored critical incident in the context of social messaging use in technology-mediated familial bonding conceptualization.

Modified Critical Incident Technique (mCIT): A Case Study of Technology-Mediated Familial Bonding Enactment via Social Messaging System

Modified critical incident (mCIT) was developed and applied in this research project that aims to conceptualize technology-mediated familial bonding to inform future designs of social messaging systems for family. In the case of this study, the mCIT was part of user research and was used in conjunction with behavioural log (Dumais, Jeffries, Russell, Tang, & Teevan, 2014) and focus group discussion (Blandford, Furniss, & Makri, 2016). Detail of these two methods is beyond the scope of this article. Five essential steps have been adapted and performed in the implementation of mCIT, and each step is described as follows:

Step 1 - Establish the general aim

The first step is to define the online family activity to be examined and establish its aim. It generally provides direction for data analysis as well as presentation of the finding and supports the development of the whole framework. The general aim was encapsulated in a concise statement; a functional description that indicates the objective of the activity and what is expected to accomplish as a family when engaging in the activity. Activities of interest are depicted in Table 1.

Step 2 - Establish plans and specifications

This stage involves developing a detailed plan of data collection including identification and categorization of both critical and uncritical bonding incidents, and analysis of their behaviours. The four key considerations that were considered during its execution are described as follows and summarized in Table 1:

i. Situation

The researcher specifies the situation, research participants and the activity. In this research, the situation is represented as:

Where? – Family virtual group

Who? – 10 family clusters

What? – Engaging in ritualistic and non-ritualistic interaction within family virtual group via social messaging system

ii. Relevance

The researcher specifies the kind of critical and uncritical bonding events and the criteria of behaviours that are relevant to the research objective and thus worthy of being scrutinized. Critical incident is represented as critical bonding incident that occurs while engaging in ritualized interaction. On the other hand, uncritical bonding incident represents bonding incidents that occurs while engaging in non-ritualistic interaction. In brief, the selection of bonding incidents is on the basis that ritualistic human-technology interaction involves deeper level of emotional investment and engagement during interaction (Kamal, Noor, & Baharin, 2015) whilst non-ritualistic interaction does not involve deeper level of emotional investment and engagement during interaction. For chat segments to be labelled as critical or uncritical, the occurrence of the similar kind of online activity, for example activity planning, must be at least three times of which the re-occurrence is beyond one month. Such duration is reasonably sufficient to denote the stability of ritualised interaction within naturalistic setting (Fiese & Kline, 1993) as in this study. Sociologists’ portrayal of ritualistic interaction as embodying significant impact upon family member’s bonding experience suggests such interaction is likely to be vividly remembered by participants. Similarly, a deep level of engagement during interaction is likely to be recognized by the researcher through analysing existing documented interaction. In place of Flanagan’s term of critical behaviours, this work opts for a more context-specific and appropriate terms critical and uncritical bonding behaviours. The behaviours include the usage of specific features of social messaging design that are salient to elicit bonding experience. As such, the terms represent shared characteristics of mediated bonding emerged from interaction that goes beyond human actions.

iii. Extent of influence

The researcher uses criteria informed by the theoretical framework (Kamal, Noor, & Baharin, 2015) as a guiding tool for collecting bonding incidents and analysing the behaviours in terms of the extent of their influence on the general aim.

iv. Observers

Flanagan suggests the researcher to ensure that all data collectors are familiar with the activity being studied and receive thorough instructions and training in data collection process. In this study, we considered the use of sole researcher and considered our own experience as an interactionist in both work and domestic virtual environment warranted our familiarity with the activities.

Table 1. Data Collection

Aspect / Description	Critical bonding incident	Uncritical bonding incident
Activity	Engaging in ritualistic interaction within family virtual environment via social messaging system.	Engaging in non-ritualistic interaction within family virtual environment via social messaging system.
Aim of activity	To give rise to bonding-related experience positively or negatively.	
Situation	Where? Family virtual group Who? – 10 family clusters What? – Engaging in ritualistic and non-ritualistic interaction within family virtual environment via social messaging system.	
Bonding incident	<i>Critical bonding incident</i> occurs while engaging in ritualistic interaction within family virtual environment via social messaging system.	<i>Uncritical bonding incident</i> occurs while engaging in non-ritualistic interaction within family virtual environment via social messaging system.
Bonding behaviors	Any instances and experience involved during the occurrence of <i>critical bonding incident</i>	Any instances and experience involved during the occurrence of <i>uncritical bonding incident</i>
Dimensions	Constituent elements including setting, content, and mode of practice Outcome element including bonding-related experience	
Sole researcher	Maintain consistency in data collection Personal experience affords familiarity with activities No training or recruitment of additional researchers is required	

Step 3 - Collecting the data

This step involves collecting bonding events with corresponding behaviours that relate to the activity of interest. We were fully aware that the technique is often used to collect data on observations recently carried out, which are reported through memorizing. However, sufficient coverage of critical and uncritical bonding incidents cannot be obtained if only recent incidents are considered (Flanagan, 1954). Therefore, this study collected the samples of critical and uncritical incidents from behavioural log. In other studies, incidents are often elicited by asking respondents directly to describe a memorised detailed story but in our study the informants reported the story relating to their experience of a specific activity or practise based upon actual informants' incidents captured during interaction.

The identification of bonding incidents was a part of analysis since collection and analysis of bonding incidents were performed in parallel so that bonding incidents were continuously collected until redundancy occurred – that was, when no new theme of bonding incidents emerged. There is no clear-cut rule thus far that suggests appropriate sample size of critical or uncritical incidents to be collected but factors concerning complexity of the activity, as well as variety and quality of the critical behaviours were considered. The optimum number of critical incidents for a critical incident study lies between 50-100 incidents to several thousand incidents (Flanagan, 1954). In this study, the number of chat segments recognized as illustrative of bonding incidents is fairly sufficient – 1350 critical bonding incidents and 3877 uncritical bonding incidents (1101 chat segments were excluded for deeper analysis since it contained a single message, unreciprocated with no reference in future segment).

Step 4 - Analyse the data

This step involves with thematic analysis (Braun & Clarke, 2006) of bonding incidents with two aims: to identify and categorize critical and uncritical bonding incidents, and to examine bonding behaviours to increase usefulness of the data. At this point of analysis, the evidence represented general categorization and initial coding of bonding behaviours based on the researcher's interpretation that needs further validation. Thematic analysis was chosen for method of analysis for three reasons: 1) It is an appropriate approach for understanding a phenomenon with incomplete theoretical support and prior research, 2) finding of this approach extends the conceptual framework and in our case it illustrates initial elements of technology-mediated familial bonding (Kamal, Noor & Baharin, 2015), and 3) the method is also appropriate to explore transferability of previously developed conceptualizations from different contexts (varying types of family of interest and designs of family connecting technology) to the context of this research (extended family that use social messaging system). Since the first goal was to identify bonding incidents, the coding process began by highlighting chat segments on first impression appeared to represent critical and uncritical bonding incidents. The next step in analysis was to thematize all highlighted chat segments using the pre-determined themes identified from the review of literature. Any chat segments that could not be categorized with the initial coding scheme would be given a new theme. Qualitative analysis software ATLAS.ti was used to assist the researcher in the coding process.

To eliminate the researcher's bias in interpretation of themes and sub-themes that might otherwise blind the researcher to the inherent meaning behind what were exhibited in behavioural log, a focus group discussion was conducted. Before focus group was implemented, consistency check on the identification of critical and uncritical bonding events with the informants was performed. Selected bonding incidents were used as cues to gather the perspective of the informants. This opportunity provided the researcher with highly relevant accounts of incidents which may otherwise have gone unnoticed. As was implemented within the study of this article, cueing informants with exactly what constitutes an 'incident' leaves it open for informants to develop a genuine but relevant frame central to them. Corroborating themes of bonding incidents with the themes of perceptions elicited from focus group discussion, a more nuanced and rich descriptions of the phenomenon was obtained.

Step 5 - Interpret and report the finding

Prior to interpreting and reporting the finding, existing evidences from observation and both critical and uncritical incidents was corroborated with evidence of focus group interview. No specific report format is suggested to be applied but the findings importantly include a set of elements and characteristics that define the technology-mediated familial bonding enactment. Accompanying descriptions are also offered to clarify the meaning inherent in each element. In sum, the overall finding is presented as thematic narrative illustrated with vignettes, tabulations, and excerpts of chat segment (Miles et al., 2014) illustrating both critical and uncritical bonding incidents.

4. Discussion

The scope of this paper is demonstrate how and why mCIT as a technique that may be used to provide validation by including uncritical incident as representation of negative evidence. Therefore in this section, behavioural logs are only used as examples. The findings of our behavioural log analysis is outside the scope of this paper.

Critical incidents

Analysis of critical bonding incidents reveals these interaction segments as repetitive but most variable over time, noticeable, and meaningful. They serve as essential common contexts for mediated bonding enactment that have considerable contribution to the formation of bonding experience during interaction. Note that one significant bonding event could potentially rely on combination of these ritualistic events. For example, in the middle of engrossed discussion about planning the upcoming family activity, the occurrence of online joking has induced another sub-ritualistic event. Nevertheless, an example of bonding event shown below demonstrate those which exhibits remarkable ritualistic characteristic. Figure 1 shows an example of a critical bonding incident in the chat. This interaction is very focused, with multiple chat participants replying to each other in a short amount of time, and it centres on the a birthday of one the youngest generations of the family whilst remembering the family member from the older generation that has passed away. Using symbols (images of said family members), the interaction is emotionally-laden (made explicit through the use of emoticons) and it provide continuity from the past to the future for the family as a group – these are all characteristics of ritualistic interactions.

Setting: Remembrance of one's birthday and a deceased person on the same day

Event Label: SBE02, Source: P123

08:04 - Aidan: *Happy birthday Ariz*



08:05 - Aidan: *Al-Fatihah to our late father@grandpa*

08:06 - Aidan: *Al-Fatihah*

08:06 - Jasmin: *Eight years already...🥺*

08:07 - Aidan: *8 years passed...🥺🥺🥺*

08:08 - Jasmin: *He looks like him...hopefully he's as smart as him too*

08:10 - Jasmin: *Grandpa wasn't well-educated...but he's so creative and good in other things...*

08:11 - Jasmin: *Al-Fatihah ... Happy 8th birthday*

08:13 - Anita: *Birthday boy is a shy person*

08:14 - Anita: *Happy birthday ariz...May you remain in good health and cheerful and be a*

08:16 - Rose: *pious son...Also, Al-Fatihah to our late father*

8 years passed... Al-Fatihah

08:16 - Azhan: *Happy birthday ariz...be a pious son*

08:17 - Azhan: *Happy birthday...ariz...be a pious son*

08:17 - Mila: 🍰🍰🍰

08:19 - Mila: *Al-Fatihah to our late father...May Allah place him with other fortunate*

08:20 - Rose: *ones...Amen 🥺 Any tahlil this week for his demise? ...🥺🥺*

08:23 - Anne: *Al-Fatihah to our late father🥺happy birthday to Ariz...*

08:23 - Anne: *It's Sis Jasmin's turn to organize the tahlil for this month...When are you going*

08:17 - Mila: *to do that sis?*

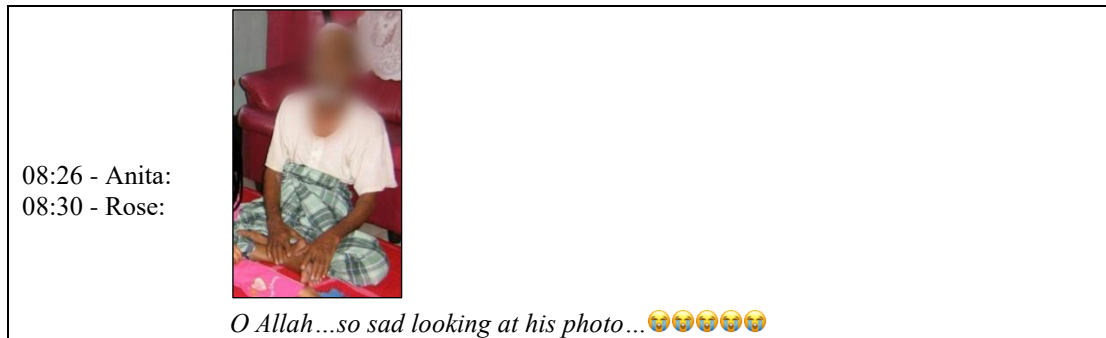


Figure 1. An example of critical bonding incident

Figure 2 shows a critical bonding incident as a sub-ritual where family members telling endearingly making fun of each other and telling jokes, in the midst of conversation about planning a family gathering. This is bonding in a form of a sub-rituals, because it has the characteristics of bonding of heavily-laden with emotions, in this case, humour, and the conversation is sustained through a period of time by using symbols or token that elicit emotions.



Figure 2. An example of critical bonding incident as a sub-ritual

Uncritical incidents

In contrast of critical incident illustrations, there are evidences on interactions representing mundane, undramatic, and nuanced practices of family doings in virtual environment. These practices are viewed as non-ritualistic events characterized as continuous incidents with insignificant emotive contents that occurs on a regular basis, hence routines. These are incidents which Collin (2004) refers to as sociable interaction or filler containing talks just for the sake of keeping up often illustrated by cat segments which are short/brief and less participating members involved. Figure 3 shows an example of an uncritical incident where family member shares his routine activity of washing a car. It is the first message of the day, which is usually populated by mundane conversations, as a sign to show that the group is still there and are open for further communication. This is much like when people say, "How do you do?" or talk about the weather.

Setting: Sharing situated activity of participating member.

Event Label: IBE01, Source: P97



Assalam...let's wash the car first



Goodbye PJH

Do you want to sell that Proton Saga car?

Sold out...sold out...

lol

10:11 - Sean

10:12 - Sean:

10:13 - Sean

10:14- Mila:

10:24 - Omar:

10:25- Mila:

10:25 - Omar:

Figure 3. Uncritical Incident

Figure 4 shows another uncritical bonding incident where the main aim of communication was to break the silence in the group. It is also an invitation to start a conversation that also signals the availability of connection between the family members through the group. As seen in Figure 4, this type of uncritical bonding does not create a flurry of sustain messaging between the group members – messages by Arman was not reciprocated by group members, only Anne replied almost 3 hours later. Figure 4 demonstrate the contrast between critical and uncritical bonding, which does not involves emotional investments through sharing of tokens unique to the group.

Setting: Breaking the 'silence mode' in the afternoon

Event Label: IBE03, Source: P99

13:22 - 😊

Arman: Greetings. It's very quiet on every Saturday

13:22 - What are you up to?

Arman: Don't you have any latest updates? Perhaps the hot one...

13:23 -

Arman:

15:50 - Anne:

Figure 4. Uncritical Incident

Through the use of examples above, we have demonstrated how our modified Critical Incident Technique (mCIT) may be used to understand user experiences in the private digital realm of the mundane, everyday living. These interactions may or may not have a specific purpose. Unlike human interactions studied in other research that used CIT, especially in work context, which have specific goals, families do not create group chat with the explicit goal of 'bonding.' But families communicate and through their communication, either to achieve a practical goal, like organising a family event, or communication for the sake of communication, bond is forged and maintained. Thus it is important, through the use of mCIT to recognise the critical incidents when the interactions became ritualistic, thus give rise to bonding, but also to recognise when the interaction is not but routine and hence do not contribute to the feelings of bonding – these are the uncritical incidents. Unlike many processes in work context, which has a specific endpoint, that is the achievement of goals, bonding is not a process which with a clear cut goals as endpoints. Hence, by providing contrasts between critical incidents and non-critical incidents, we can shed light into what constitute the achievement of bonding and what does not. Through this contrast, a process which consist of interactions in the digital realm, with does not have a definite ending or goal, are made explicit, through the ebb and flow or routines and rituals as family life in the physical world also alternate between routines and rituals and give rise to family bonding.

5. Conclusion

This paper discusses a modified CIT technique (mCIT) which was used to understand bonding as family ritual in a family's social messaging group by analysing the group's behavioural log. Compared to CIT, this modified technique also include uncritical bonding incidents, to validate the critical incidents of bonding through ritual by providing counter examples of routine social interactions in the group. The procedure to conduct mCIT starts with establishing the general aim, followed by establishing plans and specifications. The next step is to identify situation to be studied by setting up the definition of critical vs. uncritical incidents. Then, the extent of influence of incidents is defined. Identifying the observers is proceeded by data collection. Data is then analysed using thematic analysis. The last step in mCIT is the interpretation and report of findings.

We applied mCIT to understand how bonding is achieved through a family's social messaging group. In our study, the definition of critical incidents are ritualistic interactions that are intense, reciprocated, and make use of group identity symbols to invoke emotions, while uncritical incidents are the mundane routinised conversations. The data used is behavioural log of a family's social messaging chat group. Unlike establishing goals in work context, family social interactions is do not necessary have clear cut goals, and bonding cannot be recognised as the end or final product of an interaction. Thus, mCIT is important to provide counter examples of bonding by defining and identifying uncritical incidents. We argue that mCIT may be applied by in studying interactions outside work contexts, or in novel use of technologies where open-ended interactions occurs.

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