Exploring decision-relevant information pooling by humanitarian disaster response teams

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Exploring Decision-Relevant Information Pooling by Humanitarian Disaster Response Teams

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ABSTRACT

It is a well-known fact that a lack of information will lead to suboptimal decisions. But even when actors jointly have all the information they need to make a well-informed decision, they may fail to find a superior alternative. This hidden profile paradigm would cause misrepresentations of crisis situations and lead to ineffective response. In this research-in-progress paper, we present the first stage of our experimental study on group decision making in humanitarian disaster response, in which we want to find out how teams can be supported to share more information, make better sense, and ultimately avoid such misrepresentations of crisis situations. First results reveal that humanitarian disaster response teams are able to share significantly more information if they would make use of more advanced information and communication systems. However, none of the teams in the experimental setup managed to find the optimal decision.

Keywords

Crisis, group decision making, group support systems, hidden profile, humanitarian disaster response, information management, information pooling.

INTRODUCTION

Misrepresenting a crisis situation is disastrous for an effective response. Therefore the starting point in crisis response is to make sure that there is free exchange of information, so an accurate picture of the situation can be constructed by coordinating and responding organizations (Van de Walle and Turoff, 2008). Organizations cannot make the right decisions if their understanding of the situation is not based on all information that is available. If humanitarian organizations do not know a) which type of aid is needed b) in which area, and c) which organizations are already providing d) what type of aid, there is huge probability that areas are overlooked, the wrong type of aid is provided in certain areas, several organizations provide the same type of assistance to an area, and organizations deploy first to an area in lesser need than others.

One would think that the ideal situation of free information exchange would solve these problems. However, such problems will also happen if decisions are based on all available information, but this information is misinterpreted or misrepresented. Even when people jointly have all the necessary information to make a decision, and there is an infrastructure in place for the group to share all information, they often misrepresent the situation and make suboptimal decisions. These situations are studied in so-called "hidden profile" experiments.

This paper describes a research-in-progress of a hidden profile experiment, through which we study the influence of information systems support on Sensemaking and information sharing by humanitarian disaster response decision making teams, and the effect it has on their performance. Because of the limited space that is available and the ongoing nature of our research, we will in this article present a short background on hidden profile studies, the experimental setup and some tentative results.

Reviewing Statement: This paper represents work in progress, an issue for discussion, a case study, best practice or other matters of interest and has been reviewed for clarity, relevance and significance.

HIDDEN PROFILE STUDIES

A hidden profile exists when group members individually have possession of only a part of the information required to reach an optimal decision or solve a problem, so the group needs to pool and process this information to solve the problem or reach the optimal decision (Choo, 2007). In hidden profile experiments, individuals have both common information, which is known to all group members, and unique information. Because the common information supports a suboptimal alternative, the group needs to pool the unique information to find the optimal alternative - the hidden profile.

Stasser and Titus (1985), who are basically the founders of hidden profile tasks, found that groups tend to share, discuss, and use information that is known to all the members at the expense of information that is known to a single member when jointly making a decision. Other research has confirmed that groups consistently fail to pool the available information, achieving distinctly suboptimal decisions (Dennis, 1996; Lightle, Kagel and Arkes, 2009; Stasser and Titus, 2003). A number of reasons for this have been reported in literature. One of the prominent causes reported in these studies is that groups unequally discuss common information as opposed to the group members' unique information. Other factors include information overload and biased recall of pre-discussion information indicates (Stasser and Titus, 2003).

Hidden Profiles and Group Support Systems

Group Support Systems (GSS) have some benefits in comparison with face-to-face collaboration, such as the ability to communicate in parallel with each other and the possibility of storing all contributed information in an automated, digital memory (Shirani, 2006). Furthermore, GSS can remove barriers to communication, increase equality of participation, and increase information exchange, thereby increasing the quality of decision making.

There have been a substantial amount of hidden profile studies in which face-to-face groups were compared to GSS supported groups, such as by Dennis (1996) and Shirani (2006). The usual outcome of these studies is that groups supported by GSS share more information, but the unique information is often not exploited in the decision making process and consequently the hidden profile is not found.

RESEARCH OBJECTIVE

As hidden profiles can occur in practice, we want to find out how crisis response teams can be supported in their group decision making, so they share more information and are supported to make better sense of the situation, and hence perform better. We observed before (Muhren and Van de Walle, 2009) that humanitarian assessment teams now usually communicate through radio when they are traveling by themselves in the country, and meet face-to-face later on to discuss their findings. In this way, it takes a lot of time and (traveling) effort to reach a decision. A possible solution would be to provide these teams with more advanced information systems, so they are better supported to communicate when they are physically separated, for example through Skype (voice and chat) communication. The objective of this hidden profile experiment is to simulate both these conditions, and to observe the effect of more advanced communication on information sharing, Sensemaking and performance.

EXPERIMENT

Design

In the experiment 48 undergraduate students took part, of which approximately half were Dutch and the other half were international students from the United States, Bulgaria, Germany, China, Indonesia, Portugal, Spain, and Vietnam. A quarter of the participants were female. The students were taking part in the course "Decision Support Systems" at Tilburg University, and were obliged to take part in the experiment as they had to write an individual assignment based on their experiences in the experiment.

The participants were randomly assigned to a three-person team, and the teams were randomly assigned to a treatment condition regarding the communication mode. Half of the teams were assigned to the "simple communication" condition, which reflected the reality of humanitarian assessment teams, in which they communicated through radio communication in the first 20 minutes and convened face-to-face in the second 20 minutes. The other half of the teams were assigned to the "advanced communication" condition, which reflected the possible advancement in communication within teams by using Skype's voice and chat functions continuously, and not gathering face-to-face at all. We also altered the information load that the groups were exposed to, but it is not the objective of this paper to discuss this treatment condition.

Scenario

The exercise was based on a floods scenario, developed by the UN Office for the Coordination of Humanitarian Affairs (OCHA) for exercise purposes, which affected the fictive country of Juliandia. Following heavy rains in the North Eastern Provinces of Juliandia, severe flooding had especially affected three Juliandian districts, all bordering the neighboring country of Emirana: North District, Norktown District, and Grotti District.

The students were part of three-person UNDAC (United Nations Disaster Assessment and Coordination) teams that were deployed to the affected districts to conduct rapid initial assessments. These rapid initial assessments should help determine the extent of the disaster and its impact on the population as well as needs for international assistance during the immediate relief phase. The role of the team was to advise the United Nations Humanitarian Coordinator to which district the international humanitarian organizations need to deploy first.

The students were told to be travelling through the area separately to conduct assessments by observing the impact of the disaster and interviewing survivors, school teachers, priests, and key officials. In reality, the students were each seated in a one-person cubicle, and were presented a set of information elements which they gathered on their imaginary assessment trip on six different sub-categories of humanitarian assistance: health, water sanitation and hygiene, food and nutrition, shelter and non-food items, logistics access and security, and protection. Although it was not explicitly mentioned, they were given two types of information for each of the three affected districts: positive information and negative information. Positive information indicated that humanitarian assistance is needed for some sub-category of humanitarian assistance; negative information indicated that a sub-category of humanitarian assistance is not needed in the specified area. These information elements were based on OCHA training documents and the authors' experiences in humanitarian workshops, case studies and exercises (Muhren and Van de Walle, 2009; Muhren, Van Den Eede and Van de Walle, 2008; Muhren, Van Den Eede and Van de Walle, 2009).

The students were explicitly told that the international humanitarian community can respond to all the types of needs listed as sub-categories of their assessment, and that they could consider all sub-categories to be of equal importance to each other for this exercise. For example, a need in "health" was said to have the same importance of humanitarian response as a need in "logistics access and security". The students were instructed to discuss the situation according to their assessment results with the other team members and to give the Humanitarian Coordinator an advice on the order of priority of the three districts for international humanitarian assistance.

Hidden profile outline

Team members received either 27 information elements in the low information load condition and 45 information elements in the high information load condition, of on average 35 words each. Every team member had an equal mix of common and unique information. Common information is information that is known to all team members; unique information is information that is known to only one team member.

Information was distributed by us as follows. All positive information about Norktown District was common information; all negative information about Norktown District was unique information. In contrary, all positive information about North District was unique information; all negative information about North District was common information. The positive and negative information about Grotti District was approximately equally divided into common and unique information.

All team members had an equal amount of unique information elements, but not all the same information. In total, there was about 50% more positive than negative information for North District, and about 50% more negative than positive information for both Norktown District and Grotti District. If therefore all information is put together, it is obvious that Grotti District and Norktown District already get more humanitarian assistance than is needed, and that North District needs more humanitarian assistance than is provided. North District is the hidden profile: Given the information, it is the best alternative to send immediate humanitarian assistance to.

Difference to traditional hidden profile studies

In our experiment we did not ask the teams to "pick one right alternative" as is most common in hidden profile studies (e.g. identify the murderer, the "best" candidate for president), because in humanitarian assistance – as in many other situations – it is very difficult to say that there is one right course of action. Instead, we ask the teams to rank-order (prioritize) the alternatives (cf. Hollingshead, 1996; cf. Mennecke, 1997). This is more in line with reality, as a decision to send scarce humanitarian relief to the alternative that is supported by the least amount of arguments is not a bad decision, but one of less priority. On the other hand, identifying an innocent person as the murderer is a bad decision.

In most hidden profile studies, participants have to hand in the information elements after they have read them. In our experiment the participants had perfect recall (Hollingshead, 1996): We did not ask the teams to hand in the information elements before they started the group discussion, but allowed them to keep the information elements. This is more in line with real-life humanitarian assistance, as it is unlikely that assessment team members will lose information they collected. To prevent the hidden profile from being too easy to solve, we increased the number of information elements compared to traditional hidden profile studies, even in the "low information load" condition. But because we feared that the teams would find the hidden profile easily since they had perfect recall, as happened in one of the few other perfect recall hidden profile studies (Lightle et al., 2009), we increased the difficulty for the teams. Instead of creating conflict in the decision making teams by distributing the information elements in a way that team members each would favor another alternative before discussion, we made sure that all team members were favoring the same (wrong) decision alternative: Norktown District. As we will see now, however, this probably caused too strong a bias.

PRELIMINARY RESULTS

Unfortunately, none of the sixteen teams managed to uncover the hidden profile and choose North District as the District that is most in need of humanitarian assistance. We however observed a difference in information sharing between the two communication mode conditions.

	Communication mode condition	**Mean**	**Standard deviation**	**Groups (n)**	**ANOVA results between groups**
Relative percentage of common information shared	Simple communication	31,800	22,2459	8	F = 3,505 df = 1 p = 0,082
	Advanced communication	52,238	21,4096	8	
Relative percentage of unique information shared	Simple communication	15,000	12,6819	8	F = 8,404 df = 1 p = 0,012
	Advanced communication	37,575	18,0086	8	
Relative percentage of total information shared	Simple communication	21,723	15,9119	8	F = 6,838 df = 1 p = 0,020
	Advanced communication	43,445	17,2876	8	

Table 1. Descriptive statistics and ANOVA results of the effect of communication mode on information sharing

ANOVA results show that groups that were using advanced communication shared more common information (at $p < 0,1$ significance level), shared more unique information ($p < 0,05$) and shared more information in total ($p < 0,05$) than groups using simple communication.

DISCUSSION

All participants were aware of the positive information about Norktown District and negative information about North District; both the negative information about Norktown District and the positive information about North District were equally spread among the team members. Most of the people therefore thought that Norktown was most in need of humanitarian assistance before the group discussion started, and North District was least in need. Grotti District was usually somewhere in the middle. The bias that this caused appeared to be too big to overcome. If all information elements would have been shared by team members, so that unique information would become common information and everybody would have the same information, it would have been clear that North District had more positive than negative information, and both Grotti District and Norktown District had more negative than positive information. Although the advanced communication groups shared significantly more information than the simple communication groups, hardly any team revised their initial decision of not taking North District seriously into consideration and consequently did not find the hidden profile.

We believe that in this way, the experiment was not representative for a real humanitarian disaster situation. Based on their relevant experience, professional humanitarian disaster responders would not a-priori discard an area for humanitarian response. Beforehand we were afraid that – as happened in previous hidden profile research – groups would find the hidden profile easily when being able to keep the information elements during the group discussions. In hindsight we can conclude that we made the experiment too difficult for the students,

and should have created some conflict in a-priori preferences for the alternatives. However, it is already promising to see that groups using voice and chat communication share more information than groups who reflect the current reality of humanitarian assessment teams, and that these groups might not need to convene face-to-face for more efficient information sharing.

FUTURE RESEARCH

Because of limited space for this research-in-progress article and the ongoing nature of our experiment analysis, we have not been able to discuss the role of Sensemaking in our hidden profile experiment or our second treatment condition: the altering of the information load that teams were exposed to. We are currently analyzing the role of Sensemaking, which we will discuss in our future research. Moreover, we are planning to conduct a similar hidden profile experiment with more participating teams, in which we will reduce the preferential bias, and create a conflicting situation in which two or maybe three students in a team have a different preference. Another interesting topic for future research is to examine alternative ways of how information could be collected and shared, such as through pictures and video, on Sensemaking and decision making by humanitarian assessment teams. This will most probably have to be studied in a field experimental setting, rather than in a laboratory experiment.

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