Evaluation of the Performance of Marchionini's Information Seeking Model in Crisis Situations

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Abstract

Based on theoretical information seeking models that study the variables that influence human information seeking, Marchionini's information seeking behavior model describes the cognitive and behavioral processes used for research or recreation information seeking in formal electronic environments. The model is a comprehensive framework, however it does not account for alterations to the hierarchy of information sources and the rearrangement of information seeking variables' priority and value in uncontrolled environments, such as crisis situations. This paper evaluates the performance of Marchionini's information seeking behavior model based on information seekers' responses during the Democratic People's Republic of Korea's (North Korea) bombing of the Republic of Korea's (South Korea) Yeonpyeong Island in November 2010. This paper identifies three variables deficient in Marchionini's model: the effects of stress and collectivism on the information seeking process, the effectiveness of formal search systems, and the spontaneous creation of new search systems. Based on this evaluation, further qualitative research for a human-centered model that utilizes social media services' interactivity may provide the results to design electronic environments to facilitate searches that accommodate the cultural and socio-political context to withstand crisis situations.

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Historically, information seeking studies were system-oriented, focusing on relevance and recall retrieval results to measure users' success in finding information. In the 1980s researchers put forward that information seeking is a human-centered, problem-solving activity. Gary Marchionini built upon these studies and created an information seeking model that is the basis of his book *Information Seeking in Electronic Environments (*1998). Marchionini's model presents the factors that motivate a person to begin searching for information and the steps taken during the process. Based on studies in formal settings, Marchionini's model is a comprehensive tool to explain information seeking for research or recreation. However, the model does not fully account for people's thoughts and actions in uncontrolled environments, such as crisis situations. Using the Democratic People's Republic of Korea's (North Korea) bombing of the Republic of Korea's (South Korea) Yeonpyeong Island in November 2010, this paper examines how the relationship between the information seeker and the search system influences information seeking variables and the selection of information sources, ultimately affecting the information seeking process. The results will give insight for the development of an effective, user-oriented, and intuitive electronic environment that facilitates search systems to be utilized in crisis situations.

The Bombing of Yeonpyeong Island

Creation of the crisis

The Korean peninsula has a long history of unified cultural identity. Although various dynasties ruled the Korean people for over three thousand years, the past century has seen a disruption of the Korean political system. Japan was its colonial ruler from 1910 to the end of World War II, after which the victorious allies of the United States and the Soviet Union artificially split the nation along the 38th parallel creating North and South Korea. War broke out between the two in 1950 with both Koreas attempting to reunite the Korean people under their respective political system. The Korean conflict ended in a ceasefire rather than a peace treaty, consequently leaving Korea divided into the two countries

that have been technically at war since 1953. Since then the two nations have had a history of hostile transgressions that include bombings and political assassinations. During the last ten years, their relationship has taken an erratic course with peace summits in 2000 and 2002 juxtaposed against multiple incidents of artillery exchanges and sea incidents resulting in casualties on both sides. One of the most serious confrontations occurred on March 20, 2010 when a North Korean torpedo allegedly sunk the South Korean warship, *Cheonan,* claiming 46 lives (CIA World Fact Book, 2011).

The crisis

On November 23, 2010, North Korea fired over 100 artillery rounds against the border island of Yeonpyeong, which contains a military base and the homes of over 1,700 civilians. The attack killed two South Korean Marines and injured 19 others (Terry, 2010). South Korea returned fire and an artillery exchange continued for approximately two and a half hours. The incident left many South Koreans and the world fearing that the bombing would escalate into a major military confrontation. In spite of the day's events, relative calm returned to the country by the same evening (Rhee, 2010), even though the possibility of impending war still loomed on the horizon. On February 27, 2011, the United States and South Korea began a large-scale military exercise involving computer simulations, communication, and live-fire tests. Even as North Korea denounced the exercise as a military provocation, South Korean President Lee Myung-bak stated that Seoul was willing resume talks with North Korea.

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Evaluation of Marchionini's Model

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Marchionini (1998) posits that information seeking is a process in which people actively engage to change their state of knowledge (p. 5). This process allows people to understand and relate to their environment through exploration, problem-solving, and learning. Based on studies of people using electronic systems in controlled environments, Marchionini (1998) recognizes the information seeker controls, and is central to, the process and therefore an understanding of the cognitive and behavioral processes used during the search is important to develop electronic systems with a user-centered perspective. The eight-stage model consists of the following sub-processes: recognition and acceptance of the problem, defining and understanding the problem, choosing a system, formulating a query, executing

a search, examining results, extracting information, and reflection and stopping of the search process (p. 50-60). It is noted that not every problem or information need will require each of the sub-processes and, in some cases, some occur at the same time. In the model, a step may be repeated multiple times as the problem is refined or additional questions are raised during the search until the problem is solved. The model is affected by the following factors: the information seeker, the task, the search system, the domain, the setting, and the outcomes of the search (p. 32). In Marchionini's model (1998), search systems are formal, or structured, databases of information that include "people, books, libraries, and maps as well as a variety of electronic systems" (p. 38). Because the model was proposed in 1998, it does not fully account for the advances in electronic system designs that support seeker controlled searches and that provide information quickly at the seeker's convenience, changing the interrelationship between the system and the seeker.

The information seeker's response to the crisis

The bombing of Yeonpyeong Island provides an interesting candidate for an evaluation of information seeking in electronic environments during a crisis. Being first in global communications, South Koreans' high level of literacy allows for the examination of a group that represents the worldwide trend in social media use (e.g., Cyworld and Facebook social networking sites and micro web log sites like Twitter)(Lee, Y., 2009). One mitigating factor unique to this group is their strong cultural beliefs which may have over compensated and skewed the effects stress had on information seekers. Marchionini (1998) states people are predisposed to an outcome based on beliefs or political or ethnic national background even when new information comes to light (p. 64). South Koreans' remarkably strong cultural identity considers North Korea and South Korea one people and that disputes, no matter how serious, are between the two governments and not the people themselves (Kirk, 2010). Such beliefs may help alleviate stress even when there is no evidence that these beliefs would prevent the two governments from escalating their military altercations.

A crisis acutely upsets the normalcy of the information seeker's comfort with their level of knowledge. This not knowing presents itself in stress or anxiety and is the impetus to begin a search for

information (Marchionini, 1998, p. 36). On the day of the bombing, the people of South Korea were presented with the task of seeking information about what was transpiring on the island and whether the event would result in serious military escalation, or even war. The initial reaction was one of confusion as to what prompted North Korea to bomb Yeonpyeong Island. On the island there was the immediate fear for safety. "I thought I would die … I was really, really terrified", said Lee Chun-ok, an islander who was watching television at home when the shelling began (Kim, H. & Kim K., 2010, para. 5). The citizens of Seoul shared their fear of impending war with postings on Twitter such as, "I pray for peace in Korea --- for the people of the whole Korean peninsula of course #prayforkorea #Koreapeace ONE KOREA" (Malcolm, 2011, para. 16). After the initial shock, people began expressing anger toward both the North Korean and the South Korean governments.

Throughout the day, South Koreans relied on news agencies and official websites for information. At the same time they were spontaneously creating their own information systems to help complete the limited information available through the formal systems. Employing social networking sites, they communicated live video and eyewitness accounts of the bombing as it occurred. They also debated various possible outcomes and expressed emotional opinions on the event and the two countries' governments. This reflects behavior that occurred during the shootings on Virginia Polytechnic Institute and State University in Blacksburg's (Virginia Tech) campus in 2007 and the southern California wildfires of the same year. In the case of the Virginia Tech shootings, an undergraduate student gunned down dozens of students and professors. Students immediately began networking on Facebook and determined whom the victims were well before the official release of the names (Winerman, 2009). In two counties, Santa Barbara and San Diego, 20 wild fires destroyed over 1,500 homes. Because people were unable to locate information specific to the individual fire that was affecting their community, they utilized the local National Public Radio station website. Concerned Internet users provided information to pin point fire locations and supplied eyewitness reports of the conditions at those sites "to coordinate actions to help victims of the crisis" (Winerman, 2009). During all three crises, information seekers were able to implement simple filtering procedures to help ensure a fair degree of accuracy of the incoming

information; these included, but were not limited to, asking for clarification of vague postings, requiring posters to identify themselves (Winerman, 2009), and that eyewitness updates or news re-postings include precise time and date stamps in an attempt to maintain order (Yoo Eun, 2010).

All three situations demonstrate how the seeker's anxiety about a situation intensified the information seeking process, expanded the seeker's habitual pattern of information seeking (Valentino, Hutchings, Banks, & Davis, 2008), and acted as a catalyst on a community's collectivism. This subordination of the individual to the group, turned individual focus and searching into an informal group effort conducted for the benefit of the whole. Marchionini's (1998) theory expounds the importance of devising user controlled search systems, but his model was limited to the technology of the time, therefore he limited his discussion to group efforts which involved formal work environments (p. 49). With the advent of social media, people are now able to efficiently conduct searches electronically that reflect the human tendency of involving group discussion and individual information input to arrive at a conclusion. Humans have always employed these tactics through face-to-face communication, by phone, or even through written correspondence; now this form is greatly enhanced by the Internet, allowing for unlimited communication from anywhere on the globe at almost real time delivery.

The role of the search system during the crisis

While this paper evaluates how Marchionini's information seeker searches for information in electronic environments, an examination of the two main types of systems that exist today helps to understand why seekers choose to search where they do. Formal systems, those systems that are controlled by a government agency or an entity such as academic institution, are seen as having expertise in the domain in which they are based (Marchionini, 1998, p. 7). The second type of system is informal; systems that are based on naïve users informal seeking strategies, exist for the users personal gathering and distribution of information, and are not restricted to expertise in a particular domain (p. 85). Formal search systems are prearranged presentations of information in which the proprietor determines both what information is available and when it becomes accessible within the system. In crisis situations, these systems fall short of ideally serving the seeker's needs.

Crisis situations often require sources to provide answers to questions that, until the crisis occurs, held little foreseen value to anyone or were unique to that moment in time, such as how many people were on the island when the bombing began. This type of information must be gathered after the fact and, in most cases, authenticated and analyzed before it is released. This delay can be perceived as critical to the seeker at a time when stress is intensifying their demand for instantaneous information. Secondly, traditional news media (e.g., newspapers, radio, and television) becomes susceptible during this time as pressure to report breaking information can cause standard information vetting procedures to be by-passed. This occurred when *CNN* television news ran images claiming to be of the island bombing taken and posted by a United States soldier; they were actually re-posted images of Baghdad during the initial days of the United States invasion in 2003 (Kim, C., 2010). Also, because news reports have limited resources and space, they tend to focus on the perceived overall picture of the situation and are unable to provide the range of information that a seeker may require. Furthermore, the formal systems that are designed specifically for crises situations, such as government emergency web sites, fail as the sudden increase in demand often overloads the system (Winerman, 2009, p. 377). This physical failure obstructs Marchionini's tranquil information seeking process by denying access to preferred information systems**.**

Finally, crises can cause formal search systems to intensify their distortion of the information they release. In the bombing of Yeonpyeong Island, the distortion took various forms from South Korean officials threatening retaliation if North Korea continued provocation (Kim, H. & Kim, K., 2010) to attempts to downgrade events to minimize damage to the system (Malcolm, 2010). Four days after the attack, the East Asian Institute and Hankook Research's (EAIHR) monthly Public Opinion Barometer surveyed eight hundred people in South Korea. The results showed the majority of respondents had a high level of distrust in their government based on their evaluation of Seoul's response to the incident; 36.5% felt confusion due to the lack of a crisis management system while 23.8% felt Seoul exhibited a weak military response (Lee, N. & Jeong, H., 2011, pp. 1-3). This incident, combined with the current South Korean administration's response to the sinking of the *Cheonan*, diminished the value of what would otherwise have been considered a reliable source of information.

These shortcomings in formal systems are magnified during a crisis as the seeker's heighten state of emotions causes them to mentally degrade the acceptance of the overall quality, quantity, and timeliness of the information provided. Conversely, informal search systems post date Marchionini's publication of his model and offer the seeker options previously unaccounted for in an electronic search system. These systems are online public forums that allow the user to participate in the exchange of ideas and information with anyone that has access to the site. Because they are designed for naïve users, information literacy is not as important as when Marchionini stated that a successful search outcome is dependent on the seeker's level of information literacy (p 55).

Marchionini acknowledges that people prefer obtaining information from human rather than from formal sources (p. 52). Social media meets the psychological need of people to communicate on a personal level, while allowing the seeker to obtain real time information on problems confronting them during a crisis. Its highly interactive interface bridges human–computer–interaction (HCI) to human–human interaction. HCI is communication or interface based on people's complex cognitive and behavioral processes (p. 18). Based on studies of formal systems, Marchionini's theory briefly mentions users can control some systems (p. 42). However, Marchionini's model could not have anticipated the changes in system–designs that could approximate his goal of having a system reflecting the intricacies of human–human interaction and be as closely as possible part of the seeker's personal information infrastructure. Ideal in crisis situations that don't require highly scientific or academic analysis, by utilizing a large community of people, social media encourages the pooling of fragments of information in order to obtain a clearer picture of the situation. In all three situations, these systems reduced seekers' stress caused by the lack of pertinent information available in formal sources. They also served as venues to help alleviate some of the emotional stress caused by the situation as when many South Koreans posted messages on Twitter about possible repercussions, escalation of war projections, calls to action, and news updates (Malcolm, 2010) while others posted requests to stop hoarding food (Yoo Eun, 2010).

During the bombing of Yeonpyeong Island, as well as the other two crises, stress may have altered the hierarchy of sources and rearranged the priority of information seeking factors (i.e., time over

authenticity of information), but stress did not change the seeker's framework to obtain information. Seekers still identified the problem, planned and executed their search, and evaluated and used the information they found.

Conclusions and Recommendations

Marchionini's model is a useful, logical, iterative, top-down process to explain seekers' cognitive and behavioral problem-solving processes. As with all models, it is not applicable in every instance. Analyzing information seeking behaviors in a crisis situation such as the Yeonpyeong Island incident, as well as the other crises, demonstrates the information seeker's response in a crisis is affected by stress although high information literacy helped negate stress' affect on the actual information seeking process. Marchionini understood that an electronic environment's design must maximize interactivity. Given today's advance electronic systems, consideration could be given to expand the model to realize social media's full potential of interactivity. Although not always credible, social media's design matches a culture's collective, bottom-up, communication style and is the preferred information source to obtain immediate answers. Its low cost and flexibility could facilitate communication and organization during a crisis. The new model could have two filters: one channels personal posts expressing stress, etc. to one message board while the other channels news or time sensitive information to another board. This is important because the information source will only be valuable to the seeker if it is perceived to provide specific and timely information.

One possible solution proposed by Shneiderman and Preece (2007) (as cited in Winerman, 2009) is a "web-based 'community response grid' that would combine social networking with government and emergency response systems" (p. 376). The premise is that a website is able to draw upon more servers as the crisis peaks, averting traffic from overwhelming formal systems or incurring additional personnel costs. In addition, by combining resources, current information critical to the situation will be available with an information gatekeeper function, automatic tagging of posts to better organize information for the end-user. This will enable the community to connect with family and friends, determine the actual risk, what action to take, coordinate action and participate in the resolution of the problem thereby reducing

stress (Winerman, 2009). The new model returns information seeking to a personal level with the

flexibility to accommodate chaotic, as well as global, and instantaneous searches.

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