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Research paper

Exploring facebook affordances in natural disaster: case study of the 2018 dead sea flash floods in Jordan

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Abstract

This study observes the use of Facebook in the complex social phenomenon, natural disasters. By adopting an affordance perspective, this study emphasizes on how local Jordanian communities harness the power of Facebook during the 2018 Dead Sea flash flood. Through using an interpretive approach, three affordances of Facebook were identified, namely, disaster warning, volunteer mobilization, and the coordination of response and recovery. Then, the researchers examined how these affordances helped the Jordanian communities to respond to disaster situations and achieve social outcomes during the floods. Based on the data analysis, it has been noticed that Facebook changed the way individuals; organizations, activists, and governments respond and act to the challenges posed by a disaster. This study contributes to the emerging literature on the use of Facebook in natural disasters in the Jordanian context. There is a hope that this research could inspire more researchers about the use of emerging digital technologies in examining a variety of natural disasters.

Keywords: *Affordances; Facebook; Dead Sea Flash Floods; Natural Disaster.*

1. Introduction

Social media technologies (SMTs) such as Facebook, Twitter and blogs, have opened up unprecedented expansion of possibilities to address a wide-range of social issues such as inequality, poverty, unemployment, illiteracy, underdevelopment, crime, and climate change etc [1]. Among all the difficult challenges facing the Jordanian society, natural disasters pose one of the most serious challenges that bring about devastating consequences on the Jordanian society. Over the past decades, Jordan has been stricken by both natural and human-created disasters, such as terrorist attack, flash floods, droughts, and heat waves. According to Dottori et al., the incidence of natural disasters and armed conflict worldwide has steadily increased over the years in general and in the Middle East in particular [2]. With the frequent occurrence of various natural disasters, developing countries will fare worse than industrialized countries because of poor infrastructure (roads, telephone and inadequate health facilities), absence of preparation, and inadequate emergency response during disaster [3]. Since natural disasters are unavoidable, it is important to minimize their disastrous consequences on the local affected communities of developing countries in general, and in Jordan in particular. Due to the higher frequency of disasters worldwide, SMTs have become valuable tools for governments and citizens in supporting information and organizing resources for disaster management in order to either mitigate the negative consequences of disasters or to prevent them. Overview in recent years, different kinds of overlay SMTs have emerged as a popular medium for providing new sources of information and broadcasting messages to communities in times of crisis [4]. While traditional media (such as newspapers and television) mainly facilitates one-way information dissemination, social media (e.g. Facebook, Twitter, YouTube) generates opportunities for real-time two-way dialogue and interaction between emergency organisations and the general public [5]. Therefore, SMTs have become readily available alternative information channel to traditional media during crisis. Social media can be defined as websites that allow individuals to connect with family and friends, share photos, music, videos, and other personal details with either select group of friends or a wider group of individuals based on shared or common interests [5]. Because of its communicative abilities and efficacy in coordinating and social interactions, the use of social media in time of crisis has become a new worldwide phenomenon. For example, during the 2011 Brisbane and Southeast Queensland floods, the locals used social media platforms such as Facebook and Twitter as early warning system to share first-hand footage of the flash floods in their local areas [1]. In the 2015 Myanmar flood, citizens used Facebook to send warnings, share disaster scenes, request help, and connect to friends and families [3].

Though social media technologies have been proved to be an exclusive information source during crisis in recent years, it remains unclear how precisely social media affect individuals' way of doing actions and activities, and their relationships. This paper undertakes an analysis of the uses made of social media in general, and Facebook in particular, during the October 2018 Dead Sea flash floods in Jordan. Review of the literature shows that there is still a dearth of empirical research on social media usage in crisis response from social affordance perspective. The idea of social affordance is expanded to socio-technical affordances (STAs). This concept (SATs) presents a relational approach to explaining how users interact with various forms of technology [6]. In this regard, STA is a powerful concept that can be applied in the analysis of socio-cultural technological phenomena [7]. It is also noteworthy that this concept is a new area of research within the

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developing country context in general, and in Jordan in particular [3], [8]. Using the case of the October 2018 Jordan's Dead Sea flash floods – one of the most fatal incidents in living memory involving school children, the current study attempts to address this gap by studying the STAs that social media can provide to individuals to effectively and smoothly deal with such disaster. The current study aims to study how Facebook was applied by the users in responding to disaster situations and accomplishing possible social impact and outcomes. Due to a lack of knowledge about the phenomenon of interest, this study is conducted to answer the following research questions: How does Facebook facilitate disaster response among Jordanian during the Dead Sea flash flood? How do Facebook affordances influence the Jordanian users' interactions in times of the Dead Sea flash flood?

2. Literature review

2.1. Disaster response and social media

Disaster management has confirmed to be an area of communication where modern usages of social media have begun to have a considerable influence on an individual's behavior, especially during disasters and emergencies [9]. Recently, there has been growing interest in studying the role of social media in disaster response [3], [4], [6], [10], [11]. With the rapid deployment of online communities applications such as Facebook, Twitter, Instagram etc., social networking sites have become one of the most important technology for disaster management due to their immediate connectivity and interactivity [12].

Much of the previous research has studied the role of social media in disaster management from various perspectives such as how social media helps individuals to implement aid activities [11], how social media connected citizens during disasters [13], the phenomenon of virtual volunteerism [14], the role of social media usage for information exchange during emergency events [15]. However, most of the literature has focused on social aspects such as social structure and communications among individuals, and outcome behavior. Palen & Hughes , for example, examined how social media facilitated social convergence behavior in times of disaster [4]. Stephenson, Vaganay, Coon, Cameron, & Hewitt observed the use of Facebook and Twitter as organisational interaction mediums in relation to flood disaster in Northern Ireland [16]. Finau et al., studied how Facebook & Twitter were used during Tropical Cyclone Winston in Fiji during February 2016 [16].

Another body of research has observed the technological implications of social media tools for disaster preparedness. For example, Mortensen, Hull, & Boling examined the features of 1,078 Twitter photos shared by professional media outlets and nonprofessional tweeters during the 2015 South Carolina Flood [18]. Their study found that the users of social media were the most common negative in terms of sharing the disaster sides of the flood more frequently than the recovery aspects. Stokes & Senkbeil compared between the use of Facebook and Twitter during the 2011 Tuscaloosa tornado [19]. They found that Facebook was used ubiquitously in the recovery phase by respondents, while Twitter was used for obtaining rapid information updates after the tornado. Rainear, Lachlan, Oeldorf-Hirsch, & DeVoss observed the content of Twitter messages during Hurricane Joaquin and found that when agencies involved in interactions, they were declarative (as opposed to imperative), textual (as opposed to graphical), and primarily informational (as opposed to affective) [20]. They concluded their study with the fact that social media sites are very useful tools for distributing information about weather warning and are also significant for examination by researchers as well.

Other researchers were more interested in exploring the language use through social media sites. Kamran & Mansoor, for example, observed the written comments of Pakistani students on the Facebook in order to examine their English language proficiency and social networking systems of students and its implications for language policy in education [21]. Chiluwa did a sociolinguistic study to examine the discourse of posts on Facebook in the 'occupy Nigeria' fuel subsidy removal protests, and he found that social media enhances not only online activities but can as well initiate and sustain offline events [22]. Banikalef & Bataineh conducted a study to analyze the types of speech acts in the status updates posted by young Jordanian Facebook users, and they concluded their study that the cultural norms and religious background have strong effects on the participants' linguistic choices in their native language [23]. Banikalef, similarly, studied the differences between male and female Facebook users in terms of the paralinguistic features of emotional expression and highlighted that women experience and express emotions more often than men in general [24].

Although there exists plenty of research on social media usage for disaster response, there is no deeper investigation of the characteristics of the STAs in relation to the social action of users. This knowledge is significant for both government and the community that need a better understanding of how social media is being perceived and used by the publics and how these could probably facilitate better disaster preparedness for future crises. Consequently, the concept of STAs offer a theoretical lens to look beyond technology characteristics and examine how and why different users appropriate and interpret the features of social media through social communications, in light of their values and goals. It also provides the basis required for a better understanding of the interactions between various technologies and the language functions [25]. The next section will briefly discuss the use of affordances in language research.

2.2. The theory of affordances

The term affordances in relation to technology was first coined by Gibson and defined as "whatever it about the environment that contributes to the kind of interaction that occurs" [26], [27], . He described affordances as an action opportunity available in the environment. Majchrzak & Markus , on the other hand, defined affordances as "what an individual or organization with a particular purpose can do with a technology" [28]. It is understood as a relational notion such that possible interactions between individuals and technology, rather than properties of either individuals or technology.

Previous studies have generally focused on identifying and describing functional affordances (e.g., action potentials) of a specific technology such as social media affordances allowed community organizing [8]), and knowledge sharing [29]; affordances of information and communications technology in teaching and learning [30]. Whereas recent research studied affordances in the context of enterprise organizations, only a few researchers have highlighted the affordance notion in observing the role of SMTs in addressing complex social challenges [31]. For example, the abilities of mobile phones in the development of social capital among refugees in South Africa [32], and the role of social media in the Arab world uprisings [33], [34] .

The theory of affordance serves as an appropriate lens for the current study as it enables the researchers to go beyond the nature of technology and allows them to investigate the online linguistic and communicative practices and how they have been affected by social media [35]. In line with Gibson [35], Lu & Hampton [36] argue that this theory is particularly suited for observing the role of an emerging online technologies (e.g. social media) because it sheds light on important issues like how social media becomes perceived and used in similar and different ways across various social challenges. Accordingly, Leonardi [37] states that " one technology can support multiple affordances, and, consequently, that each member of the same social group can enact a different affordance or set of affordances when using the same technology" (p.751). He distinguished between three types of affordances: individualized affordance (IA), shared affordance (SA), and collective affordance (CF). Table 1. Illustrates detailed classification of each type of affordances.

Table 1: Types of Affordances [37]

Types	Description
IA	An affordance that allows the user to do something with a particular feature of technology that other users cannot do and will benefit from it
SA	An affordance that is shared by all members of a group and shows similar use of the technology's features by all users, for a common goal
CF	An affordance that is collectively made by a group's members. Thus, it offers the all members to do something collectively that it could not otherwise complete. This can be the result of pooled individual affordances in the form of differential feature use, to realize the group level goal.

The current study adopts this theoretical framework because it proposes that neither technology nor user is adequate to describe technology use [8], and advocates concentrating on relational actions that occur among individuals and technologies [38]. Finally, to the best of researcher's knowledge, up to now there has been no similar study in the Jordanian context concerning examining the virtual properties of social media that provide different users with various possibilities of action, and how these properties can lead to different outcomes. This study attempts to bridge this research gap by using the concept of affordances to study the distinctive features of social media, the possibilities for action, and the relevant outcomes it provides in particular societal challenge related to natural disaster.

3. Research methodology

3.1. Research context

Jordan is considered as one of the poorest countries in the Middle East with an official population of 10 million [39]. Since 2004, the Jordanian telecommunications sector has witnessed exponential growth in the number of subscribers, mainly due to the liberalization and privatization processes in this sector. The report, published in 2018 by the Telecommunications Regulatory Commission of Jordan (TRC), revealed that, mobile phone penetration has reached 120% by the end of the third quarter of 2016. It showed also that the number of mobile subscribers has increased from 7.465 million to 15.35 million between 2011 and 2016. With the increasing availability of smartphones and growing access to the Internet, Facebook has become one of the most popular medium of communication among the Jordanians because it is the only platform that produces a lot of local news [23]. Reportedly, Jordan had 2 million Facebook users in 2012 and increased to 5.80 million in 2018. The 2018 Dead Sea flash flood was one of the most catastrophic disasters in the history of Jordan. During the disaster, social media played an important role as a communication channel among Jordanians. This disaster offers a unique opportunity to observe how Jordanian individuals participated in its growing information society and the societal impacts associated with greater social media usage in time of disaster.

3.2. Case description

On ٢٥October 2018, Jordan suffered one of the worst episodes of flooding in decades. Heavy rains caused flash floods and landslides in several parts of Jordan in general and near Jordan's shore of the Dead Sea, in particular. On Thursday afternoon, 37 students and seven teachers were on a bus trip to the Zarqa Ma'in hot springs area, some eating lunch, when sudden torrential rains unleashed a flood surge, which swept them into the Jordan valley in the Dead Sea which is considered the lowest point on earth. The Zarqa Ma'in area is prone to flash flooding when rain water rushes down from the adjacent hills. At least 22 people, mainly schoolchildren and teachers, were killed by the flood. Despite the emergency situation, the Jordanian government failed to release timely details on the extent of the catastrophe. Due to the lack of early warning system and protective measures, the government admitted its 'weak' response to the floods. The Jordanian government used to deliver uniform messages through either broadcasting on television and radio stations or publishing information using official websites. However, the government's response to the Dead Sea disaster was a glaring example of failures or lack of preparedness and response to handle any sudden and unusual emergency. In fact, the Jordanian people had little trust and confidence in the current government's ability to deal with the disaster and turned their attentions to social media. Consequently, many of them were able to monitor the flood situation and share information (e.g. flood scenes, damages caused by the flood, road or traffic conditions, etc.) on Facebook. The Dead Sea flash flood revealed how the social movement momentum was taking off in Jordan through utilizing the power of social media in general and Facebook in particular.

3.3. Research design

In view of the information required, in-depth exploratory research was conducted using a multi-method and longitudinal design. This type of analysis is especially fruitful when dealing with a novel area that is not yet structured and needs initial understanding [40]. The case study research, moreover, provides a rich sources of data that can be useful in this study [41]. It can help the researchers with real-time information, experiences, and different perspectives of social media usage in society during a disaster. In order to investigate how social media enable Jordanian community to respond to the disaster of the Dead Sea flash floods, the interpretive approach is adopted [42], [43]. This approach provides an opportunity not only to learn the social construction of reality but also to assist in developing a theoretical statements from the empirical data [43], [44]. The technology affordance perspective highlights the sense of different user's view of social media usage during a disaster.

The data in this study were collected from in-depth interviews and longitudinal Facebook posts shared by Jordanian users during the Dead Sea flash floods. The interviewees were recruited using a convenience and snowball sampling techniques, which is an acceptable approach in disaster research [45]. In total, 10 participants were interviewed from affected areas and families in Zarqa Ma'in (n = 4), Victoria College School in Amman (n=3) and officials spokesmen (n = 3).

3.4. Data collection and analysis

Data collection was started on Oct. 25, 2018 after the Dead Sea flash flood occurred. In the first stage of data collection, archival data (e.g., posts, comments, videos, photos) were gathered from Facebook. Several popular Facebook accounts and pages were monitored to screening user-generated content of the most influential posts, based on the number of shares and likes. In order to gain more understanding about the flooding event, additional secondary data were gathered from local newspapers (e.g., Jordan times), government websites (e.g., General Directorate of Civil Defense), and other online media such as CNN, BBC and Al Jazeera English. Through using convenience and snowball sampling techniques, the second stage started on Oct. 26, 2018. During this stage, key players were recognized through primary contacts such as mayor of a municipality, government officials and prominent public figures who experienced responses to serious events of floods using Facebook. A number of field visits began on October 29, 2018 through using semi-structured interviews. Ten interviews in total were executed in approximately 2 weeks during the field visit. The interviews were all open-ended and conducted in Arabic. Each interview usually lasted between 10 and 20 minutes. With permission from the interviewees, all the interviews were audio-recorded, and then transcribed manually. To manage the huge amount of empirical data, the researchers made a narrative describing the sequence of events and activities that occurred during the flood.

4. Case analysis and findings

The current study tries to put its focus on the technology of social network sites in general, and Facebook in particular, because it is the most dominant social media tool in Jordan at the time of the 2018 Dead Sea flash flood. Data showed that Facebook has three types of affordances, namely, disaster warning, volunteer mobilization, and the coordination of response and recovery. The next subsections treat each of these affordances in greater detail.

4.1. Affordance in disaster warning

The world of social media in general, and Facebook in particular, offers people access to rich and up-to-date sources of information [46]. Facebook allows users to create personal profiles in order to communicate with other users mainly via mcroblogging. Mcroblogging allows users to share text-based messages (e.g. status updates) about their thoughts, emotions, and activities they care about with other users every time. The data analysis showed that Facebook allows users in Jordanian society to play a part in crisis response by sharing warnings in order to have timely and sufficient reactions to deal with the flood disaster. It has been noted that this evidence (disaster warning) provides every user with the ability to contribute and get flood information individually, using a specific feature of Facebook (e.g. status update, photo), and thus allowing an individualized affordance.

The following examples explained the Facebook user's perceptions and actions at the time of the flood. At the beginning of the disaster, the flood first hit several areas of Jordan. In the worst hit area of the Dead Sea, the school bus was carrying 37 students and seven members of staff to the Zarqa-Maeen hot springs area when it was washed away [47]. A local citizen described how Facebook helped to spread emergency information and receive assistance. "One of the local Dead Sea citizens posted a video on Facebook showing that there were several students trapped by the flash flooding. Within hours the video has gone viral on Facebook and reached to the prime minister. Soon a civil defense search team successfully rescued and sent the students to the hospital and delivered aids to them" (Ahmed A, volunteer). As stated before, Facebook offers microblogging service through the user status update function [48]. This feature helps users to share relevant and timely information: links, videos, music, etc., to their friends. Facebook's instant distribution of current information allowed users to connect with required resources quickly, and emergency authorities to more easily discover flood victims than in the past.

During the peak of the disaster, false information and rumors were widely circulated on Facebook, particularly about the condition of the Wadi Zarqa-Maeen dam. There was inaccurate reports claimed that the Ministry of Water and Irrigation (MWI) opened the gates of the dam to prevent it from falling apart [49]. Facebook was used to correct misinformation by MWI. The dam's supervisor responded to the public by uploading the status and photos about the dam conditions on Facebook. The dam has no floodgates and the dam was totally empty of any water prior to the day of the disaster (Edris Hababseh, engineer). Leveraging the Facebook's functionality for useful information distribution and with his dedicated role to counter the rumor, he took an action that eventually dismissed the rumors and mitigated the fear of the inhabitants. These statements show that Facebook afforded real-time distribution of emergency information that made awareness of what natural disaster people are likely to face in their own areas, which in turn led to shape individual social action, in terms of moral support (messages conveying emotion and solidarity), informational support (messages that expressed calls for safety, situation update), and materials and financial support (relief supplies, monetary fund).

4.2 Affordance in Volunteer Mobilization and Organization

Facebook allow users to create and participate in digital communities where they provide functions of interacting, publishing, communicating, sharing, and managing with the general public [50], [51]. It has the ability to connect individuals and publish interactively real-time information and real-life events interactively [24]. Therefore, it can be used to mobilize and organize users to achieve different objectives and provide the users with the most current information, which might not be available through other traditional channels [52]. This is due to certain features and functions of Facebook that emerged from the data analysis. One of these features is communication (e.g., live video streaming, voice call, video call, status updates, and check-in). Facebook users perceived and interpreted this feature as affording opportunities for facilitating and organizing the responding of individuals during the emergency relief operations. Moreover, the data shows that Facebook affords volunteer mobilization and organization. For example, it has been noticed that Facebook has the ability to organize individuals and resources by facilitating dynamic communication among the affected communities. A volunteer described the use of live-streaming video on Facebook as an efficient communication channel for distribution relief aids to the affected areas. "We extensively used 'Facebook Live' because it allowed us not only to interact within other members anytime and anywhere but also to directly send these scenes of the flood-affected areas to the official Facebook page of The General Directorate of Jordan Civil Defense (Abo Salh, volunteer). This example demonstrates that Facebook facilitates two-way public communication channels (TWCCs) because it allowed members to provide feedback and insights of their own, alongside receiving real-time information and dynamic instructions. This affordance of Facebook (TWCCs) enables users to publish up-to-date informational support (e.g., flood relief information) and material support (distribution of aids), and thus led to achieve relevant social outcomes.

4.3. Affordance in coordination of response and recovery

Facebook allows individuals to create connections and link with other users. This type of digital connectivity may be made around personal relationships, shared common interests, or local weather conditions [53]. There are particular features that make Facebook unique from other social media platforms. Findings showed that relief coordination feature plays an important role in establishing connection and facilitating coordination among users based on their shared interests (e.g., humanitarian aids). Through using some features of Facebook (e.g., tag, microbloging), such affordance allows users to join together for a common goal (e.g. blood donations), and thus creating a shared affordance.

Until midnight October 25, 2018, several students were still missing. Volunteers teamed up on Facebook in organizing relief efforts. For example, two volunteers described how Facebook turned them into online volunteers in technology communities. I connected with my friends to organize blood donation drives for the victims of the disaster. We collected more than thirty blood donors within an hour and recruited other volunteers for packaging and delivery through our Facebook accounts ((Mona, school teacher). "Sharing documents, video, and photos of relief operations (e.g. list of missing people) makes relief efforts more open and more transparent which attracts more people to contribute" (Dr. Mammoud, disaster risk management specialist). These excerpts showed that Facebook provides users with the ability to organize relief coordination, and achieve relevant social outcomes, in terms of material support (monetary fund, blood donation), and informational support (warning others in the affected area). In summary, three types of Facebook affordances were emerged from analysis of the data. Table 2 summarizes these affordances.

Table 2: Summary of Facebook Affordances

Types	Facebook affordances type	Description
IA	Affordance in Disaster Warning	Through using Facebook status update, users were able to contribute and get flood information individually.
SA	Affordance in Volunteer	Facebook facilitates two-way public communication channels which allow users to publish up-

	Mobilization and Organization	to-date informational support (e.g., flood relief information).
CF	Affordance in Coordination of Response and Recovery	Through using some features of Facebook (e.g., tag, microbloging), such affordance allows users to join together for a common goal (e.g. blood donations), and thus creating a shared affordance.

5. Conclusion

This research contributes to the emerging literature on the use of Facebook in natural disasters in the Jordanian context. An empirical examination of the 2018 Dead Sea flash flood from the affordance perspective enriches the existing disaster management research that mainly gives more attention to either technological or social perspective by adopting a relational view of social actions of people to recognize the affordances of social media in general, and Facebook in particular. From a theoretical perspective, this study is one of the first that describes how affordances are created in the online Arabic communities, and thus it contributes to the affordances literature of communication research. The findings of this study can be utilized to clarify why organizations and government agencies should use Facebook for disaster management. Understanding how the characteristics of the Jordanian people influence their perception and reaction to disaster response through Facebook will help policy makers to use Facebook for facilitating interactions between government and local communities, thus, to better prepare for future disasters. With respect to technology design, identifying particular features of Facebook that are relevant to disaster response activities will assist social media designers to create new features or improve existing features of their platforms. For example, building an automatic warning system that offers emergency information such as the weather notification and aid distribution channel would be useful in times of disaster. The generalizability of the study's results may be limited due to the explanatory nature of this study and the selection of one disaster type (Dead Sea flash floods) and one social media technology (Facebook). Future research can extend on identification and modeling of Facebook affordances in other disaster preparedness (e.g. disaster recovery) or in other disaster situations as well as verification of these affordances in other settings and contexts. Such research would also offer an opportunity for comparing affordances across a wide range of technological and social contexts, which is important to create a research stream on affordances [54]. There is a hope, therefore, that this research could inspire more researchers about the use of emerging digital technologies in examining a variety of natural disasters, and thus will enrich the literature on information systems research. Future research can also examine the use of data mining and intelligent search techniques on analyzing Facebook data to understand the behavior of people on social media during disaster situations.

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