

Original Article

Understanding crisis communications: Examining students' perceptions about campus notification systems

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Abstract Following the 2007 shootings at Virginia Tech, colleges and universities nationwide sought to install new emergency notification systems or overhaul existing systems to alert students in the event a similar incident took place on their campus. While researchers have begun to explore the effectiveness of such systems and how they are being employed, a noticeable gap exists in the literature in respect to how this technology is being utilized by members of the campus community. The present study, conducted at a large southwestern university, sought to fill this void by examining the perceptions and employment of the system by universities' largest segment of users – students. The findings provide continued support for the use of multimodal systems, but also indicate that more education and advertising is needed to increase student engagement with these systems. Limitations of the study, directions for future research, and related policy implications for universities also are discussed.

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Introduction

On 16 April 2007, a student at Virginia Tech carried out what remains the deadliest mass shooting to date, both in a school and in the United States. At approximately 7:15 a.m., the perpetrator entered the West Ambler Johnston Residential Hall (WAJ). He shot and killed freshman Emily Hilscher in her dorm room, as well as resident advisor Ryan Clark, who had responded to the shots fired. Nearly two and a half hours later, the shooter entered Norris Hall, located on the other side of the campus from the dormitory, chained three of the building's doors shut, and opened fire on the second floor. A total of 32 people – 27 students (including Hilscher and Clark) and five professors – were killed and an additional 23 were wounded in the attacks. The shooter committed suicide as law enforcement entered the building.

In response to the shootings, then-Governor Timothy Kaine established the Virginia Tech Review Panel [VTRP] (2007) to investigate the event. One of the areas of inquiry was the

emergency notification system and its role in alerting members of the Virginia Tech community, including students, faculty, and staff, about the events of 16 April. The shootings, however, had an even broader impact. As one university police chief noted, 'After Virginia Tech, colleges everywhere reprioritized the way they communicate emergencies' (in Hamblen, 2008, p. 1). The shootings also have led researchers to examine what went wrong in terms of emergency notification, and what needed to change for campuses in the event of a similar situation. Consideration has been paid to improving enrollment in both new and existing systems (Foster, 2007; Mark, 2008; Gulum and Murray, 2009), as well as improving transmission rates (Bambanek and Klus, 2008; Mastrodicasa, 2008; Halligan, 2009). Given the increasing number of universities implementing new or overhauling existing mass emergency notification systems (see Foster, 2007; Hamblen, 2008; Mark, 2008; Mastrodicasa, 2008; Gulum and Murray, 2009; Seo *et al*, 2012), such examinations are highly warranted.

Notably absent from this body of literature, however, is consideration of the users of these systems. In fact, only two studies (Gow *et al*, 2009; Gulum and Murray, 2009) have examined how members of the campus communities (for example, students, faculty, and staff) perceive these systems and their overall satisfaction with the technology. Yet, such an examination is particularly important given that individuals must understand the system in order to be able to use it effectively in times of crisis. As such, the present study seeks to fill this gap by exploring how university students perceive their campus' emergency notification system. A survey instrument was distributed at a large southwestern university during the Fall 2013 semester, and included questions about how students are using the technology and potential areas of improvement. The results of this survey are presented here.

Review of the Literature

Virginia Tech's emergency notification system

At the time of the shootings, the University was in the process of upgrading their existing notification system. Their system had included email alerts, notifications posted on the main website (www.vt.edu), a broadcast phone-mail system, and contacts with local television and radio stations. The overhaul included the addition of six outdoor loud speakers, four of which were operational on the day of the shootings, though they were deemed insignificant by the VTRP (2007) based on when the messages were transmitted. Notably absent, however, was the inclusion of text messages in the alert protocols. While the addition of these were part of the system upgrade, the equipment installation had not been completed by the day of the shootings, and therefore, could not be used to alert the campus community of the attacks.

Of the existing modes of emergency alerts in place on the day of the shootings, the email warning system arguably has been the most criticized. Despite that the VTRP (2007) acknowledged that an estimated 96 per cent ($N = 36\,000$) of students and faculty at Virginia Tech had computers and email addresses registered with the notification system, there were several limitations that created delays in transmitting information. First, despite the high rate of registration and portable computer ownership, emails transmitted by the University were not guaranteed to be read within minutes or even hours by every single user. In addition, the transmission rate of the emails itself may have been problematic. According to the VTRP (2007), the system in place disseminated 10 000 email messages per minute, meaning that it

would have taken over three and a half minutes to send notifications to all registered users. As the email about the Norris Hall shootings began sending at 9:50, and the shooter committed suicide 1 minute later, the alerts still took an additional 2 minute after he was down to complete transmission. Furthermore, this time did not guarantee that all messages were delivered to all intended recipients, let alone read.

Considerably more problematic, however, was who could authorize the sending of messages and when they could be sent. Before and on the day of the shootings, only the Virginia Tech Policy Group and the Chief of the Virginia Tech Police Department (VTPD) could authorize the transmission of emergency messages. Despite such authority, only two people – the Associate Vice President of University Relations and the Director of News and Information – had the necessary codes to access and initiate the transmission of messages. In addition, there were no pre-written messages, and all content had to be approved by the Policy Group before transmission, thus further delaying emergency alerts.

On the day of the shooting, the Policy Group was not convened until nearly 45 min after the shootings at WAJ, upon being notified by the VTPD Chief of the shooting. An additional 25 minute passed before a VTPD representative met with the Policy Group, and by the time the first emergency email notification about the shootings at WAJ was transmitted at 9:26, the shooter already was in the process of chaining the doors to Norris Hall shut. Besides the logistics issues that created the delays of transmitting the first notification, the VTPD, and by extension, the Policy Group, believed the shooting at WAJ to be a domestic incident, and thus isolated, rather than an active shooter scenario. By the time the second notification was sent at 9:50 alerting students of the active scene at Norris Hall, most, if not all, of the victims had been killed. Thus, one of the main criticisms stemming from this timeline of events was that, had the Policy Group sent the notification message about the WAJ shootings and locked the campus down earlier, the second shooting either may not have taken place, or the death toll may have been lowered considerably.

Lessons from Virginia Tech

Since the shootings and the VTRP's (2007) subsequent report, researchers have committed themselves to learning how to improve emergency notification systems and increasing effectiveness in similar situations. Nearly all of these researchers advocate for the need for a multimodal notification system in order to increase the delivery of messages to intended recipients (see Hamblen, 2008; Latimer, 2008; Mark, 2008; Mastrodicasa, 2008; Young, 2008; Gow *et al*, 2009; Gulum and Murray, 2009; Halligan, 2009; Kepner, 2010; Schneider, 2010; Stephens, Barrett, and Mahometa, 2013; Stephens *et al*, 2014). A multimodal system is one that encompasses many forms of communication that are used to simultaneously deliver a message (Kepner, 2010). Emergency notification systems should be redundant across a number of different modes (Schneider, 2010). This redundancy also helps to create a sense of urgency among recipients, which typically is not found among users when only one mode is used (Stephens *et al*, 2013).

As such, researchers have begun to explore which specific modalities are best to increase the effectiveness and reach of emergency notification systems.¹ A considerable portion of this research (see Bambanek and Klus, 2008; Foster, 2007; Hamblen, 2008; Latimer, 2008; Mark, 2008; Mastrodicasa, 2008) has focused on text messaging notifications, which, as

noted, were absent on the day of the shootings at Virginia Tech. Text messaging can be beneficial in that it can reach users wherever they are (provided that they have their phone with them), and upwards of 95 per cent of students typically own the devices (Mark, 2008; Mastrodicasa, 2008).

At the same time, there are a number of drawbacks to text messaging that must be considered (Foster, 2007; Latimer, 2008). Among such concerns are the requirement of voluntary participation among users – cell phone notifications usually require an opt-in membership, as most universities do not require these numbers on file (Foster, 2007; Latimer, 2008; Mastrodicasa, 2008; Johnson, 2012). Text messages are limited in the amount of information they can offer, with SMS alerts being limited to 160 characters (Bambanek and Klus, 2008; Latimer, 2008). Further, these alerts also can be slower than other modes to transmit, due to bandwidth limitations (Mastrodicasa, 2008). In some instances, text messages may be sent at a rate of 9000 messages per minute (Mark, 2008), meaning that it could take several minutes or even an hour when clogged to send to recipients at a university with a large enrollment, such as Virginia Tech (Bambanek and Klus, 2008; Hamblen, 2008). Email alerts, however, can transmit messages to the same number of people in a fraction of the time (Hamblen, 2008). Still, as Latimer (2008) points out, ‘rapid is not the same as reliable, and ease of use does not equate with robust’ (p. 84).

While email alerts can be useful in reaching a large number of individuals quickly and inexpensively, there are several concerns for this mode as well. Carnevale (2006) has indicated that students are checking their email accounts less often than they used to, which could lead to delayed reading of emergency messages (see also Mastrodicasa, 2008). Students also are discouraged from checking email while in class. Further, email messages can be sent to spam or junk folders, causing an individual to not receive the message. In addition, it is not uncommon for students to have another email account that is preferred over their university-affiliated account (Schneider, 2010).

Although researchers (for example, Salaway *et al*, 2007; Bambanek and Klus, 2008; Wu *et al*, 2008) have highlighted the benefits of text messages and emails to reach large numbers of people quickly, one mode, or even two, is not sufficiently effective for emergency notifications (Latimer, 2008; Stephens *et al*, 2013). As such, consideration must be given to other forms of technology that can supplement these primary modes of communications. Young (2008) suggests consideration of the use of outdoor sirens, which can be effective in transmitting audio messages over long-range distances (see also Latimer, 2008). Mastrodicasa (2008) notes that social networking sites, such as Facebook and Twitter, may be beneficial in reaching large groups, though the overall effectiveness of these platforms in times of crisis remains understudied (see also Ada *et al*, 2010).

In addition to understanding the individual modes of communication, consideration should be given to the available system packages and their relative costs, as there are a number of different providers for universities to choose from (see, generally, Foster, 2007; Hamblen, 2008; Mark, 2008; Gulum and Murray, 2009; Schneider, 2010). Consideration also must be given to the investment costs related to these notification systems. Foster (2007) notes that the University of Maryland’s text messaging system alone cost US\$60 000 for the first year, and approximately \$13 000 per year afterward. The MIR3 system has been estimated around \$30 000 per year and is used by over 150 universities nationwide, while Virginia Tech’s overhauled platform, VT Alerts, cost the University \$200 000 for only the first 3 years (Hamblen, 2008). VT Alerts was designed to send notifications to up to three



outlets, including text messages, emails, phone calls, or instant messages, of the user's choice (Hamblen, 2008). The purchase and installation of sirens also can be costly, averaging over \$100 000 for the initiation of a system (Young, 2008).

One final area of consideration for these systems should be the users themselves. To date, however, this remains understudied. Although limited, the research on user perceptions provides important insight into emergency notification systems, their use and opportunities for improvement. Gulum and Murray (2009) performed a two-stage test and follow-up of the Missouri University of Science and Technology's system. While the results indicated that users generally were satisfied with the campus' system, the researchers found confirmation rates, that is, responses to the alert to confirm enrollment, were low (Gulum and Murray, 2009). The low confirmation rates may be due, in part, to incorrect phone numbers being provided or messages being ignored (Gulum and Murray, 2009). Between tests, the University advertised the system through a number of outlets, which helped to increase the confirmation rates, albeit slightly (Gulum and Murray, 2009). Still, after the second test, confirmation rates had reached only 58 per cent, meaning that nearly half of the campus was not receiving potentially crucial information (Gulum and Murray, 2009).

Gow and colleagues (2009) also examined user perceptions of notification systems at three separate universities in Canada, and their study yielded a number of interesting considerations. When being notified of an active shooter situation on campus, respondents expressed that their main preferences of alert mode were sirens or public address systems, followed by text messaging (Gow *et al.*, 2009). Conversely, email alerts were overwhelmingly favored when being notified of severe weather (Gow *et al.*, 2009). These communication modality choices are especially reflective of the urgency of a particular situation, as both sirens and text messaging may appear more instantaneous, where email messages could be delayed in being read. When disaggregated by their role on campus, students expressed interest in receiving additional information, such as class cancellations or university-related events, through the emergency notification system, whereas faculty and staff did not (Gow *et al.*, 2009). In sum, both of these studies shed light on how users are interacting with emergency notification systems, and how their preferences can be integrated to increase adoption. Still, a lot remains to be learned about users' participatory habits with such notification systems, and how that may impact emergency response more broadly.

Methodology

Consistent with the findings of these previous studies, the University at which the present research was conducted utilizes a multimodal notification system. While text message and email alerts are the most commonly utilized modes of emergency notification, the campus also utilizes social media (specifically Facebook and Twitter), RSS feeds, the University website's home page, the University news hotline, an emergency siren system, and messages being sent to all on-campus voicemails and classroom tickers. University officials responsible for disseminating alerts also can take over all active computers with a warning screen. Information transmitted through the notification system may pertain to campus or weather-related emergency situations, as well as timely warnings about a less severe threat and requests for information.

Given these considerations and the potential opportunities for use of this technology by the University, the present study sought to examine how college students understand and

utilize their campus' emergency notification system. Specifically, this exploratory study was guided by three broad research questions. First, how do students perceive the current emergency notification system? Next, how is the current system being used by students? Finally, how do students believe this system should be used moving forward? Understanding how students perceive these systems and their overall satisfaction with the technology can help these potential users become more engaged and responsive to emergency notifications.

Data collection

In order to answer these research questions, data were collected from a sample of undergraduate students at a large, southwestern university. Upon receiving approval from the University's Institutional Review Board, paper-and-pencil surveys² were distributed by the study's researchers to classes in six of the University's largest schools and departments during the Fall 2013 semester.³ Questions in the survey assessed students' awareness and current use of the University's emergency notification system, as well as opinions of the technology in its present implementation and potential changes in the future. A total of 386 surveys were completed, and no student refused to participate.

Table 1 provides an overview of the demographics of the sample. As indicated, the majority (70 per cent) of respondents were female, which is higher than the University's undergraduate student body (55 per cent). Just under 81 per cent of respondents were under the age of 25, and the majority (56 per cent) were white. In respects to both age and race/ethnicity, the sample was especially reflective of the University's undergraduate population. Seniors (45 per cent) made up the largest proportion of the sample, followed by juniors (32 per cent). The majority of respondents (89 per cent) resided off-campus.

Analysis and Findings

In order to better understand students' overall perceptions of the emergency notification system at the participating university, it is important to examine them within the framework of each research question. Given the overrepresentation of both females and upperclassmen, analysis was conducted on the full sample before being split by gender and class standing.⁴

Perceptions of the current emergency notification system

The first step in assessing students' overall perceptions of the technology is determining their awareness of the campus' emergency notification system. Students were asked whether they were aware of the current emergency notification system in place on campus. An overwhelming majority – over 95 per cent of students surveyed – indicated that they were familiar with the alerting system. Yet, when asked whether they were aware of how to sign up to receive alerts, the response was not as favorable. In fact, just over 49 per cent of all respondents indicated that they did not know how to sign up to receive emergency communications transmitted by the University.

The questions analyzed in Table 2 may provide some insight as to the disparity in system awareness compared to its usage. Several interesting patterns emerge in the analysis. By and

Table 1: Descriptive statistics for respondents

<i>Variables</i>	<i>Sample (%)</i>	<i>University (%)</i>
<i>Gender</i>		
Female	69.5	55.3
Male	30.5	44.7
<i>Age^a</i>		
Under 25	80.9	83.7
25–29	11.4	9.4
30–34	4.0	3.3
35–39	1.3	1.5
40 and Older	2.4	0.9
<i>Race/Ethnicity</i>		
White	56.3	56.6
Black	6.0	7.3
Hispanic ^b	27.0	29.1
Other	10.7	7.0
<i>Class standing</i>		
Freshman	8.6	20.6
Sophomore	8.9	22.3
Junior	33.5	24.1
Senior	45.3	31.7
<i>Residence</i>		
On campus	10.8	17.5
Off campus	89.2	82.5

^aIn order to compare ages with the University's annual enrollment statistics, responses were collapsed into the categories presented here. Before collapse, responses ranged from 18 to 54, with a mean age of 22.8 years.

^bThe University surveyed was recently designated as a Hispanic-Serving Institution, meaning that at least 25 per cent of the student body is of Latino/a decent (Parker, 2011). Given the prevalence of respondents identifying as Hispanic, and the location of the University, this category was included in the analysis.

Table 2: Student perceptions of current system

	<i>Strongly disagree (%)</i>	<i>Disagree (%)</i>	<i>Neutral (%)</i>	<i>Agree (%)</i>	<i>Strongly agree (%)</i>
The University sends out too many messages through the emergency notification system	24.1	33.4	30.1	9.6	2.1
If fewer messages were sent, I would be more interested in what the messages say	29.3	33.7	17.9	11.4	7.0
The messages that are sent through the emergency notification system are vague	13.7	31.3	27.7	15.8	9.8
More information is needed in the messages about how I should respond	9.6	23.8	26.2	27.5	11.9
I know what to do in the event of an emergency on campus	21.5	22.3	29.8	17.1	8.3

large, students did not agree that too many messages were being sent by the University (58 per cent), nor that reducing the number of alerts would increase their interest (63 per cent). Further, while 45 per cent of all respondents did not agree that the messages were too vague, a considerable proportion (39 per cent) did acknowledge that more information about how to

respond was needed in the alerts. This latter finding is particularly important, since nearly 44 per cent of the total number of respondents expressed not knowing what to do in the event of an emergency on campus (see also Seo *et al*, 2012).

Bivariate correlations also were utilized to understand how these responses varied by both gender and class standing.⁵ Females ($r = -0.145$, $P < 0.05$), males ($r = -0.202$, $P < 0.05$), and upperclassmen ($r = -0.153$, $P < 0.01$) who reported stronger feelings of safety on campus expressed greater beliefs that the messages they received from the emergency notification system were vague. Similarly, both females ($r = -0.253$, $P < 0.001$) and upperclassmen ($r = -0.220$, $P < 0.0015$) conveyed greater agreement that more information was needed in the messages when expressing stronger beliefs about their perceived safety on campus. Increased feelings of safety also were positively correlated with females ($r = 0.156$, $P < 0.05$) and upperclassmen ($r = 0.162$, $P < 0.01$), with respondents reporting that they knew what to do in the event of an emergency. Males and underclassmen (freshmen and sophomores) did not differ in their beliefs about the need for information or their understanding of emergency response as it related to feelings of safety.

Consideration also was given to how the number of messages transmitted by the emergency notification system correlates with perceptions of its overall effectiveness. When disaggregated by gender and class standing, each group of respondents expressed more agreement that fewer messages would increase interest in their content when they believed too many messages were being sent (females: $r = 0.568$, $P < 0.001$; males: $r = 0.453$, $P < 0.001$; underclassmen: $r = 0.491$, $P < 0.001$; upperclassmen: $r = 0.534$, $P < 0.001$). Similarly, females ($r = 0.185$, $P < 0.001$), males ($r = 0.325$, $P < 0.001$), and upperclassmen ($r = 0.256$, $P < 0.001$) who expressed that too many messages were being sent also reported greater agreement that the content of the notifications were vague. Further, when messages were perceived as vague, respondents in each group expressed greater agreement that additional information was needed about how to respond (females: $r = 0.576$, $P < 0.001$; males: $r = 0.373$, $P < 0.001$; underclassmen: $r = 0.305$, $P < 0.05$; upperclassmen: $r = 0.530$, $P < 0.001$).

Current use of the system by students

Student respondents also were asked questions pertaining to their current use of the campus' emergency notification system. Specific focus was paid to the use of email and text messaging alerts, as these are the two most widely used modes for alerts *en masse* (Bambanek and Klus, 2008; Wu *et al*, 2008). Table 3 provides the responses to this series of questions.

Text messages

The first column provides the frequencies of responses to questions directly related to the use of cell phones with the University's notification system. Although nearly 99 per cent of students reported being able to receive incoming text messages on their cell phones, just over 30 per cent of the sample said that they are signed up to receive emergency alerts via this mode. This is slightly higher than the 25 per cent of the University's total student body who are registered to receive text message alerts. This finding may be due, in part, to the earlier finding that a large proportion of students were unaware of how to register for the system. Only a small fraction of those students who are signed up to receive text alerts report not reading them ever; overall, respondents expressed reading the messages at varying frequencies. It is important to

Table 3: Students' current usage of text messaging and email

	<i>Text messages (%)</i>	<i>Emails (%)</i>
Can receive general messages (either mode) on cell phone	98.7	87.5
Signed up to receive emergency notification messages	30.4	89.9
Can receive campus email on cell phone	—	72.7
Frequency of reading emergency notification messages ^a		
Never	6.4	2.3
Sometimes	12.1	24.9
Often	12.1	27.0
Always	69.5	45.8

^aFrequencies of text message readership presented only for respondents signed up to receive these notifications ($N = 141$).

Note: Frequency percentages may not total to 100 per cent due to rounding error.

note, however, that this question assess only *if* the alerts are read; it does not account for *how long* it takes from the time it is received until the time it is read.

An additional question (not included in Table 3) was asked regarding where students keep their cell phones when in class. Nearly 46 per cent identified keeping their phone directly on their person, while just under 35 per cent reported they stored their device in either a purse or backpack. A smaller fraction (18 per cent) stated that they kept their phones directly on their desk during class, which may, in part, reflect various instructors' classroom policies prohibiting the devices being out during lecture. Such information, however, is relevant in considering how fast messages will be read after receipt by a student.

Emails

The second column of Table 3 provides the responses to email-related questions. Nearly 88 per cent of respondents reported receiving any email on their cell phones, although a smaller percentage (73 per cent) had their campus email accounts linked to their devices. Unlike text messaging, the rate of enrollment to receive email messages is quite high. Just under 90 per cent of respondents identified that they are signed up to receive email alerts from the emergency notification system. Yet, the high rate of enrollment may be attributed to the campus' automatic enrollment of University-affiliated email addresses into the notification system's database. The system does not allow for students to opt-out of receiving notifications to their University email; therefore, the campus-wide enrollment rate for email is 100 per cent. Similar to text messaging, the majority of students reported reading email alerts with some frequency; only 2.3 per cent of respondents expressed that they never read these messages.

The frequency at which email accounts are checked also should be considered. A supplementary question (excluded from Table 3) was asked of respondents as to the frequency of checking their email. Nearly 60 per cent of these students identified that they check their email several times per day; an additional 17 per cent reported checking their accounts once per day, while roughly 8 per cent log in hourly. Less frequent checking of email accounts still was present. Just under 10 per cent of respondents said they check their accounts just several times per week, almost 3 per cent reported checking just once each

week, and over 2 per cent reported even less frequent logins (including never accessing their accounts).

The frequency of reading both text and email alerts transmitted by the emergency notification system also should be considered as it relates to perceptions about the usefulness of such messages. Both females ($r = -0.209, P < 0.001$) and upperclassmen ($r = -0.209, P < 0.001$) who reported reading text alerts more frequently expressed less agreement that the information provided was useful to them. On the other hand, these same groups found email messages to be more useful the more often they were read (females: $r = 0.271, P < 0.001$; upperclassmen: $r = 0.282, P < 0.001$). Interestingly, the use of one mode of alert translated to a significant difference in the use of the other. Specifically, females ($r = -0.162, P < 0.01$), males ($r = -0.197, P < 0.05$), and upperclassmen ($r = -0.187, P < 0.001$) who reported reading text alerts more frequently also reported significantly less readership of email notifications.

Moving the system forward

In addition to understanding how students currently are using the technology, it also is important to consider what changes they may be interested in having implemented to move the system forward. Students are the largest segment of users of the platform; therefore, identifying and meeting their needs could potentially lead to increased engagement.

Table 4 presents the responses to the first of these questions, which asked students how they preferred to receive emergency alerts. It is important to note that respondents were able to select more than one mode of preference. Collectively, the current findings mirror that of previous research (for example, Salaway *et al*, 2007; Bambanek and Klus, 2008; Wu *et al*, 2008), in that the two most preferred modes of alert are email (88 per cent) and text (72 per cent). Classroom tickers were the next closest preferred mode, but garnered nearly half the support as the former selections. Interestingly, social media, both collectively and across individual platforms, received very little support, comparatively (see also Stephens *et al*, 2014).

In addition, students were asked what types of situations they wished to be notified about. Nearly every respondent (99 per cent) expressed wanting to be notified about campus-related emergencies. A lesser proportion (82 per cent) identified that they would like to receive alerts related to the weather. When asked about wanting to receive notifications related to requests for information, only 26 per cent answered in the affirmative. A vast majority did not want to receive alert messages unless there was an actual emergency.

Finally, students were asked how useful a tiered notification system would be. A tiered notification system could offer a way in which students would be able to discern the severity of a particular threat or situation through a hierarchical organization scheme. Students were

Table 4: Preferred modes of future alerts

<i>Mode</i>	<i>Percentage</i>	<i>Mode</i>	<i>Percentage</i>
Email	88.3	Campus radio	14.0
Text messages	72.0	Twitter	12.4
Classroom tickers	49.7	Facebook	11.9
Campus website	37.6	Campus hotline	4.1
Campus television	15.8	Other social media	0.5

asked to rate the usefulness of such a system from 0 (not at all useful) to 10 (very useful). The mean response was 7.05, with 64 per cent of students selecting a usefulness rating of seven or higher. Just over 10 per cent of respondents selected a rating of four or less, while a score of 10 was the most popular selection, with over 20 per cent of student votes. In sum, the results indicate that students support the idea of implementing a tiered notification system at this particular university.

Discussion

In a post-Virginia Tech world, it simply is not enough to have an emergency notification system in place, but rather continued assessment, evaluation, and maintenance is required. This sentiment is particularly relevant to universities, which are faced with very different challenges of notifying students, as compared to primary and secondary schools. University students today are more hands-on, technologically savvy, and 'linked in'. These students also are more concerned with their safety on campus than ever before (Fischman and Foster, 2007). Therefore, it is important for universities to employ notification techniques that meet the needs of their users. Still, despite such a notion, the body of research indicates that actual users of emergency response systems rarely are consulted about their needs or evaluation of the technology (see, generally, Gow *et al.*, 2009; Gulum and Murray, 2009).

The present study sought to expand this research by examining how students perceive their university campus' notification system, how they are using the technology and how they would like it to be tailored to their preferences moving forward. Three specific questions were the focus of the research: (i) How do students perceive the current emergency notification system?; (ii) How is the system currently being used by students?; and (iii) How do students want to see the technology develop in the future? The information gleaned in the responses to these questions is important for universities to consider with regard to their emergency notification systems.

Consistent with prior research (for example, Gulum and Murray, 2009), students expressed an overall satisfaction with the University's current emergency notification system. Generally speaking, students agreed that there were enough messages being sent (but not too many), and that the content of the alerts was sufficient. At the same time, however, these respondents expressed that more information was needed in the messages, and that in the event of an emergency, they would not know how to respond (see also Seo *et al.*, 2012, who also found that university administrators did not believe their students would know the related protocols).

The last two points are particularly important, as they are highly interrelated. For many students, their understanding of how to respond in an emergency may be gleaned directly from the notification messages. As such, it is important that these messages contain information about the appropriate steps to take in the event of a crisis. One example of this would be in an active shooter scenario, such as Virginia Tech. The relayed messages, regardless of length, must include terminology such as 'shelter in place', letting students know what actions to take. In other types of emergencies, useful information, such as areas to take shelter or those to avoid, also may be transmitted to students.

Universities can address this concern, at least in part, by utilizing pre-written or 'canned' messages (Young, 2008). These messages can be written in advance to address a number of

scenarios, and can be tailored to include such details as how to respond or where to seek additional information (Young, 2008; Schneider, 2010). In extreme circumstances, these messages may be altered as needed in the moment, though this often is discouraged as there is a greater likelihood for basic errors, omissions of important information, or overly sensational details (Schneider, 2010).

Perhaps more noteworthy, however, are the findings related to students' familiarity and current use of the system. While the majority of students were aware that the University had a system in place, most were not aware of how to sign up to receive messages. This lack of awareness translated to text messages in particular, as just 30 per cent of students are signed up to receive text message alerts, despite a 99 per cent response rate to cell phone ownership. The rate of enrollment for emails was higher (90 per cent), which is not surprising, given that University-affiliated email accounts automatically are registered with the emergency notification system. Still, sending emergency alerts only to University email addresses may pose a challenge, as a lesser percentage (73 per cent) can access these accounts on their cell phone. Coupled with students checking their email accounts less frequently, an increased potential delay to receive and read emergency messages exists. It is important to note that when messages are received, either by email or text, students are more likely to report that they are reading them, but a clear gap exists in respect to getting the information into students' hands in the first place.

Moreover, when respondents' reported more frequent reading of emergency notifications by text message, they expressed that the information provided was less useful. On the contrary, more frequent readership of email alerts was correlated with greater beliefs that the content was beneficial. Such a finding may represent the general constraints of text messaging platforms. Utilizing a standard text protocol, such as SMS, to reach all cell phones, regardless of their level of technology or service provider, constrains messages to just 160 characters, forcing these alerts to be concise and often limited in information (Bamaneek and Klus, 2008; Latimer, 2008). Email, on the other hand, is limited only by the time it will take an individual to read the information presented; thus, messages, if needed, can be longer and provide greater detail. While it may be possible to utilize email as a supplement to text alerts, the finding that the increased use of one mode yields less interaction with the other leaves these technologies to seem as though they are mutually exclusive within the context of emergency notification systems.

Understanding how potential users would like to receive information may shed some insight into how best to address this gap. While students favored receiving future alerts by email and text messaging (see also Stephens *et al*, 2014), there are still students that preferred to be notified through other modes. As such, and consistent with prior research (for example, Hamblen, 2008; Latimer, 2008; Mark, 2008; Mastrodicasa, 2008; Young, 2008; Gow *et al*, 2009; Gulum and Murray, 2009; Halligan, 2009; Kepner, 2010; Schneider, 2010; Stephens *et al*, 2013, 2014), the findings provide added support for the use of a multimodal system. In this type of system, no single mode of communication is viewed as absolutely effective in every situation. Each is essential to the system as a whole, as multiple modes can increase the likelihood that individuals will receive the messages (Latimer, 2008).

Additional consideration should be given to what students want to be notified about. Nearly every student wanted to be notified about emergencies, though only a quarter of these individuals wanted to be alerted about requests for information. This latter finding is especially important for university officials to consider. Under the Jeanne Clery



Act (20 U.S.C. § 1092(f)), universities are required to deliver 'timely warnings' to the community regarding criminal offenses that present an ongoing threat. These warnings often include a statement asking for anyone with information to contact the local or campus police. At the University surveyed, these timely warnings are similar in delivery, design, and content to emergency notification alerts. Because of the similarities, it is likely that students cannot differentiate between emergency alerts and timely warnings, therefore increasing the number of incoming messages while simultaneously decreasing student interest and response. It then is likely that emergency alerts may lose their imminence simply because they are associated with requests for information. Students who are attempting to elude requests for information are likely to avoid signing up for voluntary portions of the emergency notification system (for example, text messages), discontinue participation in the system, or ignore messages.

One possible way to satisfy both the Clery Act requirements simultaneously with students' desires not to be bombarded with requests for information would be the use of a tiered notification system, which students expressed support for. A tiered notification system can provide an organizational mechanism for the delivery of information, which allows users to identify the degree of severity associated with messages immediately. The variation in alerts also can enhance response and attentiveness to commands contained in notifications. Users are able to glance at a message and instantly know what level of attention it requires (for example, it needs to be viewed immediately or it can wait until after class).

In addition, universities can deliver information on a variety of different emergency incidents (of varying seriousness) without compromising the legitimacy of the system. For instance, in a traditional emergency notification system, all messages are delivered with a similar subject or first line (for example, alert, emergency, attention, and so on), when, in reality, not all messages require an immediate response. The messages, with varying degrees of priority, sent under one generic label can cause students to disregard the immediacy associated with the system because it has lost some measure of legitimacy. In order for messages to be taken seriously, the notification system must be seen as credible (Latimer, 2008). A tiered messaging system will allow students to recognize the urgency associated with higher level threats and still receive other emergency alerts at a later time, without compromising the legitimacy of the system.

These findings, while providing directions for overhauling existing or implementing new systems, also provide several important policy implications for universities that warrant discussion. For example, when considering a multimodal notification system, it is likely that certain communication outlets will not function or operate properly when needed (Schneider, 2010). A number of incidents historically have occurred where one mode of communication has failed, and another had to be relied upon to notify a university community of an emergency. During Hurricane Katrina, for instance, Louisiana State University (LSU) and Tulane University had to resort to non-preferred modes of communication as a result of the storm (Mastrodicasa, 2008). Specifically, LSU relied on their campus radio station to broadcast emergency notifications when cell phone towers and landlines were destroyed by the storm, while Tulane communicated through their University homepage because their email server went down (Mastrodicasa, 2008). These examples illustrate that any single mode of communication, regardless of how advanced, is vulnerable to failure (Schneider, 2010). The fact that certain modes of communication can be limited or unavailable during an emergency situation again highlights the benefits of adopting a multimodal notification system.

This has led to colleges and universities to combine high- and low-tech methods to ensure messages can be delivered despite failure of more advanced systems (Foster, 2007). Schneider (2010) suggests that universities have two parallel systems of modalities. The first set aggressively communicates a message without requiring the recipient to do anything, such as intercoms, loudspeakers, display boards, or sirens. The second set communicates through personal devices and are selective in who they reach. These modes include emails, text messages, and social networking sites. Combined, the use of these two parallel systems of modalities will ensure that a larger number of students are notified because messages are delivered simultaneously.

Further, improving the overall operations of the emergency notification system is crucial. Students need to be better educated about how the system works, but also how to sign up to receive messages (see also Johnson, 2012, for discussion about the benefits of related marketing campaigns). In order to increase responsiveness from users, this may include informing students of how to add their university email account to their cell phone, as well as educating students on the need to provide their most used/alternate email address for the purposes of notification. To increase the number of alerts reaching students, universities can request cell phone numbers be kept on file and added to the opt-out system, rather than waiting for the user-initiated registration required in an opt-in system (see, generally, Johnson, 2012). Efforts, however, must be made to ensure that the information retained in the notification system is current. One potential way this may be accomplished is by requesting students verify their contact information each semester during registration to ensure the most current information is on file (see Halligan, 2009; Schneider, 2010).

In addition, similar to the need for redundancy across notification modes (Stephens *et al*, 2013), education about the system also must be multifaceted and interdisciplinary to reach the majority of students through different channels and educational tools. One way is to educate students on emergency response as part of their University orientation. As one crisis management training provider noted, 'I can foresee the day when freshman orientation includes a video on the campus emergency-response plan, as well as training' (in Sander, 2008, p. 26). New student orientation provides an opportunity not only to engage these individuals, but also their parents. Similar presentations of information could be made to on-campus students in their residence halls or through various student organizations on campus.

Another potential solution is the creation of a campus Community Emergency Response Team (CERT) or the implementation of some other training program (Halligan, 2009). The CERT program aims to educate individuals regarding disaster preparedness for hazards that may impact their area. In addition, the program provides training in basic disaster response skills, such as fire safety, search and rescue, Incident Command System (ICS),⁶ and disaster medical operations. Santa Fe Community College in New Mexico, for example, has instituted a student club that aims to increase safety and security throughout the college's campus (Halligan, 2009).

Students also can be provided with a variety of materials that outline the expected response in a number of situations. Therefore, universities must make student response manuals and information readily available (Schneider, 2010). These materials should be provided digitally and easily downloadable from a number of on the University website. Resources and information also can be delivered in more appealing formats such as videos, skits, and campaigns. It is not enough for students to be aware of what to do in an emergency; they also must have opportunities to practice the response plan (Sander, 2008). This can be



achieved by conducting drills and/or exercises that include students. Such drills raise awareness about safety and security, as well as instill confidence in response practices when a real situation arises (Halligan, 2009). The more involved students are in safety and security, the more likely they are to take ownership and spread the word.

While the findings of the present study mirror, at least in part, the previous research (Gow *et al.*, 2009; Gulum and Murray, 2009), it is important to note that this assessment was conducted at a single university. Although, broadly, the findings and subsequent recommendations presented here may be generalizable beyond this campus, it would be best to replicate the study at other campuses around the nation. In addition, this expansion should consider colleges and universities of different enrollment sizes, as this variability likely translates into different needs for campus' community members. Incorporating schools in different locations, including urban and rural universities, also would be fruitful, as each will not have the same availability to outside resources, which may be considered when choosing the best technology for the campus.

Further, it is important to acknowledge that while students arguably make up the largest proportion of users of the emergency notification system at the participating university, they are not the only opinions that should be considered. It is equally as beneficial to consider the perceptions of both faculty (including instructors of record) and staff as they relate to the universities' current emergency notification systems and future directives. As such, it will be beneficial to replicate the present research with members of these groups as well in order to understand the best way to reach faculty and staff with the same relevant emergency notification information. Doing so will provide a more complete and robust picture of how the system is perceived and what changes may be necessary to reach the greatest number of intended consumers. In turn, this will provide universities with an even greater breadth of information that can help continue move their emergency notification systems forward, and provide a framework for future assessment and evaluation of the system and its users.

Notes

- 1 For a general discussion of strengths and weaknesses by mode, see Schneider (2010).
- 2 The survey was titled 'Emergency Notification System Survey' in order for students to identify the topic of inquiry without potentially biasing the responses. Instructions provided to the respondents did not include information about the survey's content also to avoid possible bias.
- 3 Classes surveyed came from the departments/schools of Anthropology, Consumer Affairs, Criminal Justice, Fashion Merchandising, Nutrition, and Social Work. Several introductory level courses were surveyed within these departments, capturing majors from Business (including Accounting, Finance, Management and Marketing), Computer Information Systems, Education, English, Fine Arts (including Art History and Dance), Geography, Health Professions, Natural Sciences (including Aquatic Biology, Biology, Environmental Studies and Microbiology), Psychology, Social Work, and Sociology. Non-degree seeking students also were included in the sample. Emails were sent to the instructors of one large introductory class in each school requesting their participation. Each instructor also was asked if the researchers could survey their upper division courses as well. Further, these individuals were asked to pass the request to survey to their departmental colleagues to secure an additional upper level course in the discipline.
- 4 Lower-division students (freshmen and sophomores) responses were compared against upperclassmen (junior and senior standing).
- 5 Because of space constraints, the additional models are not presented in table form. Copies of these are available upon request.
- 6 The ICS is a standardized, on-scene, all-hazards incident management approach that operates within a common organizational structure, coordinates response among various jurisdictions, and utilizes a common process for

planning and managing resources. The system is flexible and can be used for incidents of any type, scope and complexity (Federal Emergency Management Agency, 2014).

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