Thumbs up? Attitudes of Emergency Managers to Proposed Masters Programs in EM With an IS Focus

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ABSTRACT

Information Systems (IS) increasingly are used in Emergency Management (EM), so it is prudent to include IS study in EM education. This paper presents the results of analyzing the responses to a survey that proposed potential courses for programs at the master's level. The survey was completed by 373 practitioners, academics and/or researchers with EM experience. All proposed courses were rated above 4 on a 7-point scale for how essential they are to the curriculum. However, there were disagreements. Qualitative analysis of volunteered comments indicate that some low ratings were due to disagreement with the content of the course as described, or with the need for an entire course to cover the topic. An unexpected finding was that a substantial number of respondents spontaneously expressed opposition to the use of IS for EM in general. The findings are discussed and a preliminary curriculum is proposed.

KEYWORDS

Emergency Management Education; Master's curricula;

INTRODUCTION

Emergency management (EM) is a crucial and growing profession, thus it is important that higher education institutions provide degree programs that will prepare students to take responsible positions in the field. Since the terrorist attacks of September 11, 2001 in the USA and in other places such as London and Paris, governments worldwide have invested considerable resources in the writing of emergency response plans and the training of emergency responders. In addition, climate change has produced an increase in natural disasters, necessitating further planning and response activities from emergency managers. Particularly in the United States, the federal government has created new homeland security organizations and urged state and local governments to appoint official emergency response agencies and draw up plans for a variety of disaster scenarios (Perry and Lindell, 2003). In Europe, the DITAC (Disaster Training Curriculum) project has identified deficiencies in current responder training approaches and analyzed the characteristics and content required for a new, standardized European course in disaster management and emergencies (Manesh-Khorram et al. 2015).

As Lucus-McEwen (2011) points out, "Emergency management … is projected to continue growing at a rate of 20 percent or more." That growth is reflected in the large and increasing number of higher education programs offering degrees or certificates in emergency management (http://www.training.fema.gov/hiedu/collegelist). There are more undergraduate programs listed in Emergency Management (50) than master's programs (42 as of December 2016). In addition to the EM master's degrees, there were 44 masters' programs listed in the related field of Homeland Security. When one looks at the curricula for the degrees, there are generally few, if any, courses in Information Systems, even in the Homeland Security programs which one would think would include

cyber-security. Given that technology is becoming more ubiquitously used in emergency management, this is a gap that needs to be addressed.

There have been calls for standard curricula guidelines for EM for some time. For instance, Alexander (2003) discussed the possible future role of standards in assuring the quality and content of programs for educating and training people in the fields of emergency planning and management. Due to the complex and multi- disciplinary nature of EM, it has been a challenge for higher education institutions to incorporate all the necessary knowledge within the curriculum (Perdikou et al., 2014). A second identified challenge is a lack of flexibility of formal education institutions to provide rapid responses to the dynamic requirements of practitioners and EM organizations, and to their need for continued lifelong learning (Thayaparan et al., 2015).

As active participants in the more than decade-old ISCRAM association (Information Systems for Crisis Response and Management), the authors' premise is that knowledge and use of information systems is a key part of emergency management today and in the future, and ought to be included in masters' programs (Turoff, 2014). Therefore, with the support of ISCRAM, an education committee was formed and subsequently designed and carried out a survey of EM scholars and practitioners aimed at developing master's level curricula for EM in general, and for Information Systems (IS) master's programs with a concentration in EM. To our knowledge, this is the first investigation into which IS courses need to be included in master's level EM programs. The first round of circulation of the survey went to participants in the ISCRAM 2015 conference, and others to whom they may have passed on the link. The preliminary quantitative results of that survey, with 111 respondents, were presented at ISCRAM 2016 (Plotnick et al., 2016). Subsequently, with the cooperation of IAEM (the International Association of Emergency Managers), the invitation to participate was circulated much more widely, resulting in 373 total responses, including many more responses from practitioners. Many of the questions had comment boxes as well as fixed responses. A preliminary look at some of the themes raised in these comments appeared in (Turoff et al., 2017). This paper presents a comprehensive overview of the final quantitative and qualitative results of the study.

After reviewing the methods employed, we present first, the final quantitative results of the survey, including an exploration of characteristics of respondents that were related to differences of opinion on courses in the suggested curricula. Next, we discuss the results of a rigorous content analysis of free text responses for four of the courses. In addition, we provide examples of an unanticipated result that surfaced spontaneously in text comments to a variety of questions: the importance of any place in EM for Information Systems. The paper ends with a Discussion and Conclusions section, including limitations of the study and suggested future research.

METHOD

Higher Education (university) programs may have one or more foci (e.g. general study, policy). The survey had questions about general EM courses that should be included in all EM programs (*general EM courses for all EM programs category)*, regardless of the program focus; courses related to IS in EM that would be included in programs for which a focus is EMIS (*EMIS courses for programs focused on IS for EM* category), and courses related to IS in EM that would be included in all programs not focused on IS for EM (*EMIS courses for all EM programs* category). The survey included rating scale questions with descriptions of proposed courses for the curriculum (courses to be included in the EM program), placed in the three categories, for which the respondent was asked to rate the course on a scale from 1 (should not be in the curriculum) to 7 (essential to the curriculum). Each course in the general EM category and EMIS courses for programs focused on IS had an open-ended question for respondent comments following the rating scale item. Additional open-ended questions were available to respondents to comment on each category of courses and the research. Demographic data were also collected through nominal question items. The complete list of courses and descriptions is in Appendix A.

An initial deployment of the survey resulted in 110 usable responses. The description of the participant recruitment method, participants, and quantitative analysis of the rating scale question responses is reported in (Plotnick et al., 2016). After further distribution of the survey the total number of responses increased to 558. The data for respondents who just began the survey but terminated it before answering any questions were deleted from the analysis. This resulted in a total data set of responses from 373 participants. Turoff et al. (2017), in their review of comments, note that the full data set of 373 were responses from a more diverse group of respondents than represented by the initial set of respondents.

This paper reports on results of quantitative analysis of the full set of quantitative data (semantic differential item responses) using SPSS 24®, and a systematic content analysis of selected qualitative data (responses to open-ended questions) using the online coding application Dedoose (dedoose.com). For the quantitative data analysis, tests included: tests of normality of continuous data, means, frequencies, and nonparametric tests (Mann-Whitney U, Kruskal Wallis) to determine the statistical significance of differences. Nonparametric tests

were used because the data were not normally distributed. For the qualitative data analysis, initially axial coding was used and then open-coding. First, a set of codes was developed based upon the focus of questions, the quantitative results, and review of the comments described in (Turoff et al., 2017). A "thought" (which could be a phrase, a sentence, or multiple sentences as long as the segment represented a single thought) was used as the unit of coding. For example, the single word response of "elective" was determined to constitute a thought, as was the phrase, "This is the future", the sentence, "Media management is a minimal part of the EM curricula", and the multi-sentence paragraph, "Simply put, SM is not going away any time soon. In order to control the misinformation that is put out there on SM, we have to buy into the program, plain and simple.".

Consistency in coding between the different researchers was ensured by working jointly on comments, renaming codes to ensure clarity, and cross-checking coding results by calculating the intercoder reliability measure. Once adequate inter-coder reliability was established (first measured at under .5, finally measured at .78), the passages were divided between the researchers for coding.

RESULTS OF THE QUANTITATIVE DATA ANALYSIS

Characteristics of the Survey Respondents

Demographic information was collected from the respondents about the number of years the respondent has worked as a practitioner, academic, and/or researcher; the highest academic degree earned; the country in which the respondent has done most of his/her EM work; and whether the respondent is a member of an EM association (IAEM, ISCRAM, TIEMS, and/or other). Not all respondents answered all questions. Almost half of those who answered the question about academic degree (42%) hold a master's degree, but not a doctorate, and 18% have earned a doctorate. Fifty-four percent of the respondents belong to at least one professional organization. The highest frequency was for membership in an organization other than the ones noted in the survey (295). For the organizations listed in the survey, the highest frequency was for membership in IAEM (169) followed by TIEMS (22) and ISCRAM (16). The "other" organizations were diverse and included international, regional and state organizations. Many of the respondents are members of more than one professional organization.

The diversity of respondents is also clear from the demographic data regarding primary location and types of EM work. 266 respondents reported at least some experience as a practitioner; 143 have had experience in academia; and 128 have had research experience. Over half of the respondents who indicated years of work as a practitioner, academic, and/or researcher (57%) have, in their careers, served in more than one of those roles. The primary professional location is mostly in the United States (60%).

From these results, we conclude that our respondents are well-educated, active in the EM domain, represent international perspectives on EM, and have engaged in a diverse set of professional EM activities.

Ratings of Courses

Means were taken for ratings (from 1 – should not be in the curriculum, to 7 – essential to the curriculum) of each course (see Tables 1 through 3 below). Responses of "no opinion" were not included in the analysis.

GENERAL EM COURSES FOR ALL PROGRAMS			
Course	**N**	**Mean**	**Std. Deviation**
Professional Characteristics and Organizational Practices for EM	367	6.41	1.02
Planning Foresight, and Risk Analysis and difficulties of the recovery effort	369	6.31	1.12
Case Studies of Failures in Emergency Management	369	6.26	1.14
Disaster Types and Characteristics	370	6.11	1.30
Critical Infrastructures and Their Interactions	368	6.07	1.18
Legal, Ethical, and Policy Concerns	371	6.02	1.24
Security and Terrorism Characteristics and Situations	368	5.40	1.44
Public Health and Medical Services	367	5.38	1.47
Emergencies in Developing Countries	365	4.77	1.58
Fire Fighting Characteristics and Situations	365	4.25	1.74

Table 1. Ratings of general EM courses for all EM programs

EMIS COURSES FOR PROGRAMS FOCUSED ON INFORMATION SYSTEMS IN EM			
Course	**N**	**Mean**	**Std. Deviation**
Social Media for EMIS	344	5.89	1.33
Decision Support Systems for Emergency Management	339	5.75	1.45
Requirements for Emergency Management Information Systems (EMIS)	336	5.61	1.44
Collaborative Problem Solving Using EMIS	340	5.50	1.50
A Master's Thesis	333	5.44	1.63
Advanced Topics in IS for EM	334	5.38	1.56
Participatory Databases for EMIS	339	5.27	1.50
Information Systems Evaluation	333	5.17	1.54
Human Computer Interface (HCI) Design for EMIS	336	5.10	1.59
Sensor and Network Systems for EMIS	333	5.02	1.53

Table 2. Ratings of EMIS courses for programs focusing on information systems for EM

EMIS COURSES FOR ALL EM PROGRAMS			
Course	**N**	**Mean**	**Std. Deviation**
Social Media for EMIS	313	5.57	1.48
Collaborative Problem Solving Using EMIS	311	5.30	1.45
Decision Support Systems for Emergency Management	308	5.28	1.50
Requirements for Emergency Management Information Systems (EMIS)	310	5.07	1.62
Advanced Topics in IS for EM	310	4.97	1.65
Participatory Databases for EMIS	310	4.88	1.57
Digitizing a paper world	311	4.84	1.70
Information Systems Evaluation	310	4.75	1.65
Sensor and Network Systems for EMIS	310	4.63	1.61
Human Computer Interface (HCI) Design for EMIS	309	4.59	1.66

Table 3. Ratings of EMIS courses all EM programs

All the courses in the categories of *General EM* courses and *EMIS courses for IS focused programs* were highly rated ($\mu>5$) as being essential to the curriculum. While there were no courses in the *EMIS courses for all EM programs* category that had means below 4 on the 7-point scale, there were several courses that were rated between 4 and 5. This result is notable and is explored in the qualitative data analysis described later in the paper. Although the larger data set analyzed here were results from a more diverse set of respondents, the top-rated courses in each category are the same as those rated most essential by the initial group of respondents (Plotnick et al., 2016). This suggests that all proposed courses are valuable for EM students pursuing a diverse set of professional careers. The top four rated courses in both the *EMIS courses for IS focused programs* and the *EMIS courses for all programs* were the same, albeit not in the same rank order. This suggests that these four are core IS courses for any program.

Next, we report on the results of testing whether the ratings are significantly different based upon respondent characteristics. The .05 level of significance was used to identify significant results.

Comparison of ratings by respondent role

We have noted that most respondents have, in their careers, acted in more than one EM role (practitioner, academic, researcher). Whether role differences affected perceptions of how essential courses are was assessed first by asking if the respondent had any experience as a practitioner, and then by the range of roles reported. Most the respondents (N=266) reported that they had some experience as a practitioner. Therefore, we tested, using Mann-Whitney U tests, whether there was a significant difference in course ratings by those with practitioner experience, and those without it. There was a significant difference for two courses: Collaborative Problem Solving in the category of courses for IS focused EM programs ($z=-2.1$, $p=.035$) and HCI for all EM programs ($z= -1.99$, $p = .047$). For these two courses, the respondents without practitioner experience rated the course as significantly more essential than did the respondents with practitioner experience.

Since many respondents have served in multiple roles, a finer grained analysis was then performed. Three hundred of the respondents reported the number of years they served as a Practitioner ($\mu = 14.25$), Academic ($\mu = 8.08$) and Researcher ($\mu = 7.4$). The distribution across those roles is shown in Table 4 below.

ROLE	FREQUENCY
Practitioner Only	113
Academic Only	3
Researcher Only	13
Practitioner & Academic	52
Practitioner & Researcher	34
Academic and Researcher	19
Practitioner, Academic, & Researcher	66

Table 4. Frequencies of respondent reported roles

Grouping responses by the 7 role combinations shown in Table 4 and comparing the ratings of the groups (Kruskal-Wallis tests) did not uncover any statistical differences in course ratings. The results of the two approaches suggest that, in general, respondents with diverse types of EM experience similarly perceive the importance of the courses. Where there are differences, the critical factor is whether the respondent has had experience as a practitioner.

Comparison of ratings by highest degree earned

Kruskal-Wallis tests were performed to assess whether the ratings of courses differed by the highest degree earned by the respondent. For courses in the *General Courses for EM* category, two significant differences were found: Fire Fighting Characteristics and Situations was rated significantly more essential by those with Associates (2-year undergraduate) degrees than by those with Masters Degrees (X^2 = 18.18. p = .003) and Security and Terrorism Characteristics and Situations (X^2 = 13.44, p = .02) was rated as significantly more essential by those with Bachelor's Degrees than by those with Doctoral Degrees. There were no significant differences by highest degree earned in ratings of courses in the *EMIS courses for IS focused programs* category. One course in the *EMIS courses for all EM programs* category was rated significantly differently by respondents with different levels of education: Digitizing a Paper World (X^2 = 18.72, p = .002) was rated significantly more essential by respondents with Bachelor's Degrees than by those with Doctoral degrees and significantly more essential by those with Masters Degrees than those with Doctoral degrees. The Kruskal-Wallis test did not indicate significant differences for this course between other comparisons of groups (e.g. Bachelors vs. Masters).

In summary, there were few differences by degrees, suggesting that the level of respondent education has little to no effect on perceptions of the need for the proposed courses.

Differences in ratings by the number of years' experience in a role

Means were calculated for the number of years of experience in the each of the roles: practitioner, academic, and researcher. Respondents were separated into two groups (Less Experience and More Experience groups) for each of the roles of practitioner, academic, and researcher such that the Less Experience group had years of experience below the mean and the More Experience group had years' experience at or above the mean. Course ratings then were compared (Mann Whitney U tests) for the two groups for each role. There were only two courses for which any significant differences were found. In the *General EM Courses* category, the Professional Characteristics and Organizational Practices for EM course (z = -2.57, p = .01) was significantly rated as more essential to the program by respondents with more experience in academia than by those with less experience in academia. In the *EMIS courses for all EM programs* category of courses, the Collaborative Problem Solving course (z = -2.046, p = .041) was perceived as significantly more essential by those with more academic experience than by those with less academic experience.

In summary, across all proposed courses, neither role nor the number of years the respondent has been in the EM discipline is an important factor in forming perceptions of the usefulness of the proposed courses.

Differences in ratings by primary location of EM activity

The respondents were a diverse global group of EM professionals. For analysis, we separated the respondents into four groups: U.S., English Speaking British Commonwealth, Other Europe, and Other. Kruskal-Wallis tests were performed to ascertain if there were significant differences in the course ratings by those groups.

For the ratings of courses in the *General EM courses* category, four courses were found to have significantly different ratings by groups: Planning, Foresight, and Risk Analysis (X^2=9.89, p=.02), Public Health and Medical Services (X^2= 22.82, p <.001), Security and Terrorism Characteristics and Situations (X^2=25.51, p <.001), and Emergencies in Developing Countries (X^2 = 9.07, p = .028). Non-parametric Kruskal-Wallis tests do not show

where the differences lie when they are detected. Therefore, we then ran ANOVA tests with Tukey's Post-Hoc tests. However, ANOVA, a parametric test, is less sensitive on data that are not normally distributed, so may not detect significant differences that do exist (and are detected by the non-parametric tests). The ANOVA tests did not detect the differences for two of the above-mentioned courses: Planning, Foresight, and Risk Analysis and Emergencies in Developing Countries. However, the tests revealed significant differences by groups for the other two courses. The Public Health and Medical Services course was rated as more essential by U.S. respondents than respondents from English Speaking British Commonwealth countries; the respondents in the Other group rated it more essential than those in the Other Europe group; and respondents in the Other group rated it as more essential than respondents in the English Speaking British Commonwealth group. Other group comparisons (e.g. Other vs. U.S.) were not revealed to have significantly different ratings.

The Kruskal-Wallis tests detected significant differences in ratings by country group for three courses in the *EMIS courses for IS focused programs* category: Decision Support Systems for Emergency Management (X^2 = 9.42, p = .024), Sensor and Network Systems for EMIS (X^2 = 8.70, p = .034), and A Master's Thesis (X^2 = 10.43, p = .015). Anova tests did not detect these differences. Note that this does not suggest that there are no significant differences, just that we cannot determine where the differences lie.

Tests by grouping of the courses in the *EMIS courses for all EM programs* category revealed significant differences for five courses: Decision Support Systems for Emergency Management (X^2 = 12.05, p = .007), Sensor and Network Systems for EMIS (X^2 = 15.65, p = .001), Participatory Databases for EMIS (X^2 = 12.44, p = .006), Information Systems Evaluation (X^2 = 10.59, p = .014), and Digitizing a Paper World (X^2 = 8.17, p = .043). For the course, Decision Support Systems for Emergency Management, ANOVA detected a significant difference (F = 2.82, p = .039) but the Tukey's Post-Hoc test did not reveal where the difference lay. The ratings of the Sensor and Network Systems for EMIS course were significantly higher for the Other group than the U.S. group and significantly higher for the Other group than the English Speaking British Commonwealth group. The Participatory Databases for EMIS was similarly rated higher by the Other group than the U.S. group and rated higher by the Other group than the Other Europe group. The ANOVA tests did not detect significant differences in ratings by group for the other two courses.

To summarize, there are differences among groups of countries related to several of the courses. However, our sample sizes for countries other than the U.S. are not large enough to identify consistent patterns in these differences.

RESULTS OF THE QUALITATIVE DATA ANALYSIS

Qualitative analysis of comments of selected course data

Space was provided for respondents to comment on courses in two of the course categories. We content coded the comments associated with the highest and lowest rated courses in each category. The highest rated course in the *General EM Courses* category was Professional Characteristics and Organizational Practices for EM (μ = 6.41), while the lowest rated course was Fire Fighting Characteristics and Situations (μ=4.25). In the *EMIS Courses for IS-Focused Programs* category, the highest rated course was Social Media for EM (μ=5.89) and the lowest rated course was Sensor and Network Systems for EMIS (μ=5.02). Table 5 shows the frequency count for each code as applied to "thoughts" in the comments for each course. Note that some code segments ("thoughts") may have more than one code applied to them. Therefore, the totals of codes applied in a course may not be equal to the number of "thoughts" coded.

	Fire Fighting N = 88	Professional Characteristics N = 60	Social Media N = 36	Sensor and Network Systems N = 23	TOTAL
Ambivalent about course	2	1	1	0	4
Content or course focus	22	26	8	5	61
Dismissive (subcode of negative about the course)	1	0	0	0	1
Elective	18	0	3	4	25
Include content in other course	17	6	4	1	28
Negative about course	4	2	2	1	9
Negative about IS	0	0	1	2	3
Not relevant - do not include course	19	1	0	2	22
Offer to undergrads only	1	3	0	1	5
Other	3	1	0	0	4
Overall Curriculum Consideration (general comment about EM programs)	0	4	2	0	6
Positive about course	4	12	15	6	37
Positive about IS	0	0	1	3	4
Required	1	4	4	0	9
Survey Feedback	0	1	0	0	1
Totals	92	61	41	25	219

Table 5. Frequency of Application of Codes (N = number of "thoughts" per course coded)

For the **Professional Characteristics and Organizational Practices for EM** course, the respondents had many suggestions about what content should include. A sampling of comments is:

- *This is important to understand the organizational set up in a specific country …..*
- *A key aspect would be the inter-organizational collaboration.*
- *Will be important to emphasize the difference between emergency responders and emergency managers*
- *Good to offer the breadth of possible EM positions.*

That the course was well received (highly rated) is echoed in comments such as:

- *This is the key to effective EM.*
- *An understanding of this is necessary for all EM students*
- *To omit this would seem inconceivable*
- *I would consider this to be a core topic in any EM master's curriculum.*

However, there were a few comments that suggested that the content should already be known by Master's level students, underscoring the need to develop entrance criteria for a graduate level program. E.g.:

- *At the Bachelor's and Certificate [non-degree] levels this may be appropriate*
- *At the Master's level this basic understanding should already be in place*

Fire Fighting Characteristics and Situation was the lowest rated course in the *General EM Courses* category. While some respondents thought that it would be valuable "to provide overview for EMs" and that "A basic understanding of this is necessary for all EM students", many more respondents had concerns that it should not be included in an EM program because, as one respondent who had experience as a Practitioner and as a Researcher, put it, "Fire-fighting is NOT EM". A sampling of similar concerns includes:

- *Fire-fighting is a specific skill and not needed in an emergency management degree.*
- *Better added to a Fire Academy curriculum*
- *Emergency managers or planners are not firefighters*
- *Not something the PEM [professional emergency manager] needs to know*
- *Why? Isn't this degree set at a higher, broader, more strategic-level than fire-fighting?*

One respondent was dismissive in commenting, "You can define fire types (and resources) in a 2-page pamphlet." Yet, some respondents did see value in the course content proposed. The 18 suggestions that it be offered as an elective included: "Great elective, but not essential to the core component of an emergency manager." and "Really only where the student intends to take a fire focus in their career". Others suggested that, in an EM program, it could be covered as part of another course (e.g.: "Not an entire course. Maybe a couple of chapters."). Yet respondents who generally rated the course highly had positive comments about the course and suggested additional content (e.g.: "Especially talk about wildfires." and "The focus of this course should be on how Emergency Managers 'interact' with firefighters …"). The disparate perceptions of respondents to this course may be explained, in part, by a respondent with experience both as a Practitioner and Researcher: "*The fire service is an all-hazards response entity that has, in my opinion, not been fully integrated into the EM community. Fire department response capabilities need to be seriously addressed …".*

The responses to this course suggest that, when developing curricula, the scope of the curricula and a working definition of EM must be first defined.

Social Media for EM was the highest rated course in the *EMIS Courses for IS-Focused Programs* category**.** Respondents noted that Social Media is an important topic for emergency managers and is essential to the curriculum. A sampling of comments is:

- *A must have*
- *Currently a driving context for EM*
- *Absolutely essential*
- *Social media will either make or break an EM organization. Very important to have training in this.*
- *There is nothing worse than seeing a county fail to utilize Social Media during crisis. It's low hanging fruit.*
- *The wave of the future*

However, there were concerns about both the inclusion of the course and the use of Social Media in EM. Some respondents noted that, while Social Media is needed in emergency management, the emergency manager would not be the one managing the platform and so the course as described (an EMIS course) should instead focus more on policy and use rather than the technical aspects (e.g. That using Social Media is important even though the emergency manager may not actually be the one to access it, and a suggestion that the course should be included as a general EM course and focus less on the technical aspects and more on the policies). However, generally the comments were positive about the course. There were recommendations made that included having a more general communications course in which Social Media is a topic or offering the course as an elective. Suggestions included making certain that content addressed concerns about "How to use/how to control/ how to restrict the disclosure of privacy or sensitive information…" and how to contend with false information

Thus, there is general agreement that the importance of Social Media in emergency management is growing with some concerns about who in the EM domain needs to study the topic, and what topics are necessary for the course. This, again, is an issue of defining scope.

Sensor and Network Systems for EMIS was the lowest rated course in the *EMIS Courses for IS-Focused Programs* category. There were positive comments (e.g. "Now this has potential", "This is very important") and some suggestions that it be offered only as an elective "for those interested in designing systems" or as an important course "if Information Systems is the focus of the program". This course did provoke several comments that were negative about IS (e.g. "Don't rely on technologies"). A few recommendations for content were made: "This course needs to discuss the reality of IS in disasters …" and "Sensor is important, but really look at teaching how network protocols work, new technology in this area, and how it changes the fundamentals of disaster IS design [sic]", and "This could be more than sensors and field devices. It could be considered [as] non-traditional devices, including automated aerial vehicles (drones)".

The Elephant in the Room: Attitudes towards IS in EM

We did not have an explicit question about whether Information Systems courses should be included in masters' level curricula to prepare Emergency Managers. We had just assumed that "everybody" would share our conviction that now and in the future, EMs would need to have substantial understanding of IS and their application in their profession. However, although there was no specific question on this topic, participants voiced opinions that were negative or positive about IS in general in response to many different questions that were nominally about a specific course or another topic. Overall, there were 33 comments that were positive about IS in general, and 47 that were negative.

Looking first at the positive comments, they tend to echo our own pre-suppositions, e.g.:

- *Computer and internet based support make the emergency efforts and activities far more effective, smooth and swift.*
- *Computer systems are improving on an exponential scale for use and capabilities. Computers and systems are ubiquitous to society and therefore their use must be figured into emergency management programs.*
- *Essential - this element is only going to get stronger in EM practice.*
- *With advancements in technology this is very important for the educational process.*
- *Without IS no emergency efforts can totally be fruitful and effective*.

The total number of positive comments made about IS in general were about evenly divided between those who were practitioners only (16) and those who had other roles or a combination of practitioner and academic and/or research roles.

Looking at the negative comments, there are two main themes that emerge: distrust in the reliability of computer systems, and a dismissive attitude towards the use of computers rather than relying on human skills; sometimes these themes overlap.

Here are some examples of a lack of trust in being able to count on the use of IS during emergencies:

- *While this is good for more efficient management, during disasters, many Emergency Management Information Systems fail to function as designed and EMs must revert to manual systems to function. How would an emergency manager and the EM program operate when these systems aren't functioning?*
- *Computers are great until it's T+60 and your generator is out. Learn paper & pencil!*
- *The problem with computers in a disaster is that they do not always work and to concentrate on them solely is doing no good.*

There were far more comments about the second theme, which is a dismissive attitude towards computer systems in general and an opinion that the emphasis in training should be on human thinking and decision making:

- *Don't rely on technologies. Boots on the ground are always better for accurate information.*
- *Needs to emphasize the human decision-making element with IS as an enhancement thereof.*
- *...while a nice convenience to have in response, it should never become a critical need placed over effective training, situational awareness or critical thinking.*
- *Don't over emphasize computer systems. They are only a tool. Make sure they know the paper and pencil systems.*
- *I am skeptical of most investments in these tools.*

Surprisingly to us, most of the comments that are dismissive of the use of IS in EM are not from those who are practitioners only (13 of the negative comments) but from those who have some research and/or academic experience or did not specify their role (34 negative comments). As exemplified in the comment, “What if your IT section goes down?”, some respondents feared that use of IS would replace, rather than assist, emergency managers in their work or that education about IS requires removing from curricula traditional EM educational skills. This surprising result is a call for better informing the community of the role of technology in EM.

DISCUSSION AND CONCLUSIONS

A limitation of the results of this research is that not all respondents answered all questions. The demographic questions were at the end of the survey and 73 respondents did not answer all of them. Thus, we were unable to capture a complete picture of differences in perceptions of course utility by characteristics of the respondents. Also, the survey did not include any questions that would reveal the level of IS experience of the respondents. While membership in ISCRAM can be a rough indicator of whether the respondent had experience in IS, it is not a strong enough indicator as not all ISCRAM members have IS experience and not all respondents who may have IS experience are members of ISCRAM. Future research instruments should include the collection of this data. The sample sizes for groups of respondents from countries other than the U.S. were small. Additional data need to be collected from EM professionals outside of the U.S. to ascertain if curricula need to be markedly different for different geographic and political regions.

In reaching conclusions from the data analyses, the researchers reviewed all quantitative and qualitative analysis results and synthesized them into coherent observations and conclusions.

Some of the differences in course ratings between practitioners and academics/researchers may be because practitioners who have no research or academic experience are likely to be mostly focused on the disasters that occur in their location; respondents with academic and/or research experience likely take a more global view and think more about how some disasters can have far reaching effects (e.g. volcanic activity affecting air traffic). We also note that public health issues have not been generally recognized as a concern beyond the medical field. This is troublesome given the potential for major problems in the disaster e-health domain with, for example, electronic health records, telehealth, RFID, etc. Recent events (e.g. the Zika problem) and the increasing need to have access to online medical records are likely to broaden the understanding of the EM nature of health crises. Work is underway to define an e-Health roadmap for education and training in disaster management (Norris et al., 2015).

The analysis of the qualitative data has uncovered a schism in attitudes towards IS and the inclusion of EMIS content in EM programs. Some of the emergent expressions of resistance to IS in EM may have been a result of respondents not having had experience with well-designed collaborative IS that would improve outcomes of their activities. There were those who were hostile to technology, those who embraced it and understood the need for it in EM, and those who accepted it albeit with some trepidation. This suggests that emergency management is an evolving field and that programs must be flexible and sensitive to both the needs for the future and the attitudes and perceptions from the past. One respondent, in addressing the course on Sensors and Network Systems for EMIS, wrote, "Should help EM professionals ask intelligent questions of consultants and determine the validity of the claims made about products under consideration." This comment is insightful because, even if an emergency manager will not be personally interacting with technology, the use of technology is here to stay and an effective manager will need to understand it. The resistance expressed by some respondents may have many root causes such as a fear of displacement of the human role and actual experience with currently developed IS that do not work well on the ground in real situations. This is our challenge: it is not sufficient to develop a curriculum to prepare the emergency managers of the future; we must also understand and be sensitive to the perceptions of current emergency managers, educate them to overcome misconceptions about the role of IS in EM that lead to resistance to the use of IS, and include outreach to systems designers in our efforts.

The spontaneous comments highlight the debate on the overall importance of information systems for emergency management and suggest that this is a topic that deserves further research. A next step in understanding would be to interview practitioners to drill down and further explicate the resistance to, and concerns about, IS in EM. Understanding the experiences practitioners have had, both positive and negative, with IS in their work is concomitantly critical. An additional survey with questions that allow for statistical analysis that can control for this misunderstanding, would also be helpful to tease out the true value to the profession of proposed courses.

Until this deeper understanding is reached, it is not prudent to propose a full curriculum. The General EM course ratings are unlikely to be affected by resistance to EMIS. Additionally, the highest rated EMIS courses had mean ratings high enough to suggest that they would need to be core to a master's program (focused on IS or other focus). Therefore, the following preliminary, and incomplete, curriculum of required courses is proposed, leaving room for electives:

CORE GENERAL EM COURSES	**CORE EMIS COURSES**
Professional Characteristics and Organizational Practices for EM	Social Media for EMIS
Planning Foresight, and Risk Analysis and difficulties of the recovery effort	Decision Support Systems for Emergency Management
Case Studies of Failures in Emergency Management	Requirements for Emergency Management Information Systems (EMIS)
Disaster Types and Characteristics	Collaborative Problem Solving Using EMIS

Table 6. Preliminary Curriculum Recommendations

Overall, the qualitative and quantitative data gathered suggest that the proposed courses are appropriate but that flexibility be designed into curricula to meet the varied and changing needs in emergency management.

The emergent comments related to resistance to IS in EM are also a call to ISCRAM and other professional organizations, to engage in outreach to inform EM professionals of the usefulness, and inevitability, of using IS

in EM. More importantly, communities such as ISCRAM fundamentally need to **listen** to EM professionals to be able to understand the reality of disaster situations and how IS can be designed to effectively serve emergency managers. The professionals, and students, need to be reassured that IS will not replace, but rather augment professional activities and decision-making. Outreach ideas include: white papers published in professional organizations' newsletters and web sites, workshops conducted at professional meetings, etc. For this to be effective, organizations need to collaborate and prepare joint activities. In essence, we need to work together on tangible problems in order to break down the barriers between the communities and form a joint approach to IS for emergency management. This is a call to ISCRAM to reach out to other organizations (e.g. IAEM, TIEMS) and lead this effort.

This resistance also suggests that when IS is developed for EM, the developers must include as part of the team, or as active stakeholders in the process, members from the EM community so that the systems meet the stakeholders' needs and the stakeholders can be comfortable with the system functionality.

The tasks before the ISCRAM Education Committee, and all in the EM community, are many. This research and the recommendations emerging from it are a good foundation for collaborative work that has the potential to make EM education, and therefore practice, more effective, more responsive, and better able to play an active role in determining the direction for moving into the technological age.

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APPENDIX A: DESCRIPTIONS OF COURSES

General EM Courses	
Course Name	**Description**
Professional Characteristics and Organizational Practices for EM	Included topics will be the responsibility of Emergency Managers in various government agencies and nongovernmental organizations, the functions of the various EM agencies, business continuity, and the phases of emergency management from planning through recovery.
Disaster Types and Characteristics	With a focus on both natural and manmade disasters, this course will focus on the disasters most likely in the country or region where the course is taught. The content will include challenges and necessary responses for specific types of disasters. Disasters in other areas will also be more briefly addressed to inform those who move to new locations.
Planning, Foresight, and Risk Analysis	This course focuses on planning, risk analysis, and mitigation options to make responses more effective and to reduce the size and difficulties of the recovery effort. The course also addresses how to evaluate the effectiveness of the human and system performance. Included would be analyses of approaches to similar disasters in other locations. This course may need to be modified periodically based upon new findings and advances.
Public Health and Medical Services	Topics in this course will include the characteristics of medical facilities in various types of locations and their ability to respond to various types of disasters. Requirements for responding to different types of disasters (e.g. pandemics, release of poisonous materials) will be included in the course. Public Health courses addressing pandemics that may cross international boundaries will require an international treatment.
Fire Fighting Characteristics and Situations	Study of the range of fire types and what resources are needed to respond to them. What are the desirable mitigation factors which will reduce the likelihood of fires? How does one assess the needed resources and the desirable training for the fire fighters to handle an increasing range of possible emergencies? This course is for information and analysis purposes and is not intended to provide the physical training needed by firefighters.
Security and Terrorism Characteristics and Situations	Study of the involvement of Emergency managers in terrorist activity, especially that which has a wide impact (e.g. dirty bomb) or high casualties (e.g. explosion)
Emergencies in Developing Countries	A focus on understanding the difficulties that developing countries have in responding to a wide range of disaster types and how they can best manage to cope with such situations. Other topics include the operations of humanitarian organizations and the problems inherent in the movement of large numbers of refugees
Case Studies of Failures in Emergency Management	Learning from failures in EM has provided for significant improvements and changes in response and recovery practices. Reports and books on prior disasters will be discussed to provide useful insights and an understanding of prior experiences.
Critical Infrastructures and Their Interactions	Understand all of the critical infrastructures that service a populated area is critical for effective response and planning. Disasters often cause unexpected interactions between these infrastructures which makes response more difficult. In the United States the aging of the infrastructure is an additional critical problem which adds to the potential and complexity of failures and disasters.
Legal, Ethical, and Policy Concerns	Topics covered include the legal and ethical (e.g. privacy) issues Emergency Managers face in the development of procedures and policies and their implementations. The primary focus will be on the issues in the location served by the institution with some comparisons with concerns in other locations as well.

EMIS Focused Courses	
Course Name	**Description**
Requirements for Emergency Management Information Systems (EMIS)	A focus on the functions a computer system must be able to perform to assist humans in dealing with emergency situations most effectively and efficiently.
Decision Support Systems for Emergency Management	This course, requiring the proposed course on Requirements for Emergency Management Information Systems as a prerequisite, will focus on the support IS can provide for decision making in all phases of an emergency. It will address individual and group decision processes and how an IS can support them (e.g. the types of information needed, mitigating possible biases through feedback and analysis). All decision makers will be considered. Review of the literature and case studies will uncover ways IS can be improved to better support decision making.
Human Computer Interface (HCI) Design for EMIS	The properties of a computer and information interface that allow humans, as individuals and groups, to focus on complex situations and gather necessary information to determine timely solutions to difficult and rapidly changing events. The similarities and differences in HCI requirements for different systems (e.g. Command and Control, mobile devices deployed in the field) will also be discussed.
Sensor and Network Systems for EMIS	The use of sensors and other field devices to gather timely information about a given situation in order to respond quickly to crisis will be addressed. Both hardware sensors and computing devices used by responders, other professionals, and citizens will be discussed.
Social Media for EMIS	As a communication medium, Social Media is currently used, and has the potential for use, for dissemination and collection of information between government agencies, public entities, and a mixture of the two. Each paradigm has both challenges and opportunities in all phases of Emergency Management. Use by official organizations (e.g. government, NGOs) as well as the public and the benefits and risks of integrating the two will be addressed in the context of processes, procedures, policies, technical requirements, and attitudes.
Participatory Databases for EMIS	Databases that people can contribute to and can extract useful information from as well as engage in topical discussions are the topic of this course. Many of these databases will have public access and/or will be geographically oriented. Being able to set up and administer these databases and applications will be a requirement for many Emergency Managers. A basic understanding of the necessary roles and activities in database management is the goal of this course.
Collaborative Problem Solving Using EMIS	The focus of this course is to be able to evaluate systems and tools that provide for dynamic collaborative solving methods and process in emergency management. As any crisis, or potential crisis, is of mutual interest to different professionals, they need the support of tools that will allow a quick collaborative response to unexpected response problems.
Information Systems Evaluation	Overview and practice with qualitative and quantitative methods for involving users to obtain feedback on usability and usefulness of a system. Includes interviews, "thinking out loud" protocols, surveys and experiments.
Advanced Topics in IS for EM	A survey course to examine the newest trends in IS for Emergency Management. A basic understanding of such systems and tools as modeling and simulation, geographical information systems (GIS), and analytic tools will be discussed. Each semester another topic or type of system can be the focus of the semester. Institutions may choose topics that are especially germaine to their constituency and location.
A Master's Thesis	(Programs with focus on EMIS only) A one or two semester course with representation on the committee from a computing sciences department if possible. Departments are encouraged to hold regular seminars for all master's students at which practitioners will be invited to speak about their real world experience. The regularity and ability of a department to do this will depend upon many factors such as the size of the department.
Digitizing a Paper World	(General EM Master program only) This elective would provide guidance for moving from paper based to electronic based records. Included would be descriptions of different types of systems and applications, processes for transitioning, and training techniques. This course would be more basic than the Requirements for Emergency Management EMIS course and would have more of a practitioner and process focus.