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Designing societal safety: A study of the Swedish crisis management system

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Abstract: Design is an activity aimed at solving an unsolved problem or improving an existing solution. In the area of societal safety, there are many activities that could be classified as design activities. For example when different actors are implementing measures to mitigate certain risk scenarios or when they are considering actions that could improve their capability to respond to various crises. We provide a descriptive study of how design problems are dealt with in the Swedish crisis management system. Our focus is on the risk and vulnerability analyses that are conducted annually by most Swedish authorities, and on efforts to improve various actors' command and control capability. Within these two areas, both highly relevant for societal safety, we analyse how the actors address design problem using a framework inspired by design science. We present the results from a content analysis of all risk and vulnerability analyses (RVA:s) performed by the county administrative boards (regional level) in 2010 (there are 21 such boards in Sweden) and from 14 semi-structured interviews with representatives for various local and regional authorities in Sweden conducted in 2011. We conclude that when measures to reduce risk or improve crisis management capability are suggested in the RVA:s the context in which the measures are supposed to be useful in are not always described (including description of scenarios). Moreover, the effect of implementing the suggested measures are not explicitly described in any of the RVA:s. The results from the interview study indicates that leaving out or not describing important information explicitly when conducting design activities is not a phenomenon isolated to RVA:s but is also present when, for example, suggesting measures to improve command and control capability.

Keywords: Design, risk and vulnerability analysis, command and control, capability

1. INTRODUCTION

Many risks facing societies today can be described as "systemic risks", i.e. they are threatening to affect the "systems on which society depends – health, transport, environment, telecommunications, etc." [1]. Such risks have the potential of causing widespread consequences with ripple effects spilling over both functional and geographical boundaries. Due to the nature of these risks the management of them needs to be holistic in nature including many stakeholders sharing the responsibility to prepare for and respond to potential unwanted events [1, 2]. In Sweden and other countries, such as the Netherlands and the United Kingdom [3], comprehensive systems to manage risks have been established to provide such a holistic framework. An important part of the Swedish system involves risk and vulnerability analysis (RVA). Authorities on every level of society (local, regional and national) in Sweden are required by law [4, 5] to perform a RVA. One important purpose of these analyses is to reduce risks and increase the society's capability to deal with disruptive events (see for example [6], p. 89). To accomplish that the analyses should, among other things, be used as a basis for planning and implementing measures that can reduce risk and increase society's capacity to deal with possible unwanted events. Moreover, in recent regulations [7, 8] the actors performing the RVA:s are required to describe measures that they have implemented, measures that they plan to implement, and provide an assessment of the need for further measures given the result of the RVA:s. Thus, the legislation highlights the need to use a systematic approach in trying to reduce risk and increase the society's capability to deal with various events that have the potential to cause serious disruptions.

In the present paper we are focusing on how the crisis management system in Sweden, i.e. all actors contributing to the mitigation of, preparation for, response to or recovery from various disruptive events, deal with analysing and suggesting measures to reduce risk and increase crisis management capability. More specifically, we use two sets of empirical data. One is a content analysis of all 21 county administrative boards' (regional level) risk and vulnerability analyses from 2010. The other is an interview study with 14 respondents conducted in the fall of 2011 focusing on, among other things, how various actors deal with

analysing and motivating measures to improve their crisis management capability. The respondents represented actors such as the police, the rescue services, the Swedish civil contingencies agency, the county administrative boards, etc.

Suggesting measures to reduce risk and improve the capability to deal with various disturbances and crises is a design activity. Here, design can be defined as "do or plan (something) with a specific purpose in mind" (Oxford dictionary). As a point of departure for our analysis of how various actors within the Swedish crisis management system design for reducing risk we use ideas from design research (or design science). Design research has been defined as a "…systematic inquiry whose goal is knowledge of, or in, the embodiment of configuration, composition, structure, purpose, value, and meaning in man-made things and systems." [9]. The measures to reduce risk that are suggested and implemented within the crisis management system are man made and therefore the design approach is suitable.

The paper is structured as follows. First we provide a short description of the Swedish crisis management system with a particular focus on the part that deals with risk and vulnerability analysis. Secondly we highlight some of the main aspects of design research that we use in our analysis. Thirdly, we present the content analysis of the 21 risk and vulnerability analyses. Fourthly, we present the interview study along with the results from it. And lastly, we draw some conclusions from the material and offer some suggestions for how one could improve the current procedures in Sweden and other countries.

2.   THE SWEDISH CRISIS MANAGEMENT SYSTEM

Crisis management in Sweden depends on cooperation among various actors, both public and private. In the present paper, however, we are only focusing on the public ones. There are three principles that are central for the management of crises in Sweden. First of all, an actor that has a certain responsibility during non-crisis conditions will also have that responsibility in a crisis situation. Secondly, in a crisis situation public service functions shall, to the extent possible, be delivered in the same way as in non-crisis conditions. And finally, a crisis should be dealt with where it occurs by those immediately affected, which usually means that it is the local municipalities that respond first to any crisis situation. Since the responsibility for various societal functions are the same in a crisis condition as it is in normal conditions cooperation among different actors becomes very important. Thus, there is no "crisis management agency" that will have the mandate to manage the other actors in the system if a crisis should occur.

Another aspect of the crisis management system that implies a need for cooperation among the various actors is the fact that some actors have a so called "geographical responsibility" and other actors have "functional responsibilities". For example, the local municipalities have a geographical responsibility concerning crisis management in the area covered by their municipality. On the regional level, the county administrative boards have a geographic responsibility for the region in question. Thus, these responsibilities are overlapping, i.e. the regions are made up of many local municipalities. Moreover, there are also authorities that have functional responsibility concerning crisis management. They might for example be responsible for maintaining the railroads, providing health care, etc. Since such functions are carried out within the geographic area of local municipalities (and regions) there is also an overlap between geographical responsibility and functional responsibility. From a mitigation and preparedness perspective this means that information needs to be shared between the various actors and the most important way of achieving such sharing is within the framework of risk and vulnerability analyses.

All Swedish authorities are obliged to conduct risk and vulnerability analyses. The local municipalities (local level) are supposed to provide the county administrative boards (regional level) with information from their analyses and the county administrative boards are sending their analyses to the Swedish civil contingencies agency (MSB) and the Governmental offices. Moreover, each national authority shall also conduct risk and vulnerability analyses and send them to the Governmental offices as well as to MSB. Thus, information sharing among authorities is important and the risks and vulnerability analyses are the main source of that information. One of the purposes of introducing the RVA-system was to provide a basis for planning so that one can implement measures that ultimately lead to a reduction of risk (see page 89 [6]). Here, we investigate how various actors within the Swedish crisis management system do when they suggest measures to reduce risk and increase the crisis management capability, or in other words how they design societal safety. We limit our focus to the risk and vulnerability analyses that are performed by the county

administrative boards. The county administrative boards are suitable in the present context since they represent the regional level, which incorporates information both from the local level and the central national level. Furthermore, since there are only 21 county administrative boards in Sweden (compared to 290 local municipalities), the task of performing a content analysis of all 21 analyses can be completed in a relatively short time period. Furthermore, we complement the analysis of the RVA:s with 14 interviews conducted with persons that work with command and control (C2) issues during emergencies at different actors within the crisis management system.

The two data sets employed here represent two different perspectives on design issues in crisis management. The scope of the RVA documents is broad including risk identification, vulnerability assessment, capability assessment, etc. The 14 interviews have a narrower scope focusing on C2 issues. The RVA documents are produced before crises, trying to anticipate and prepare for future events. The interviews were also concerned with how different actors prepare for various events. However, significant parts of the interviews were also devoted to the actual response to crises and evaluations after such events. The RVA documents represents a formal document that is regulated by laws whereas the interviews dealt with issues in a more informal manner where the respondents could provide more elaborated descriptions of how they work and what their opinions are. Thus, the documents and the interviews have different perspectives on crisis management. However, there is a significant connection between the two perspectives. All RVA documents are supposed to contain a capability assessment (crisis management capability). This assessment involves to a large extent assessment of C2 capability. Furthermore, even though the focus of the interviews was on C2 issues the respondents also talked about more general crisis management issues.

Due to these different, but sometimes overlapping perspectives, we believe that the two data sets complement each other in a suitable way that allows for a comprehensive analysis of how design issues are dealt with in the Swedish crisis management system. To support us in the analysis we employ a framework inspired by design science.

3. DESIGN SCIENCE

Many authors have highlighted the difference between research aimed at providing explanations to various phenomena and research aimed at providing utility to someone according to some measure; see for example [10-14]. This is the key difference between "traditional" or explanatory science and design science. Design science research is conducted through systematically building and using one or more artefacts that contributes to our understanding of a specific design problem and its solutions [15]. In the present context an artefact might be a new technical device that helps to reduce risk and improve crisis management capability, but it might also be a method for risk assessment or a procedure for how to manage an organisation in case of a crises. Thus, the term artefact is used not only for physical objects but refers to anything that is man made. Although there have been suggestions of methods for how to evaluate crisis management capability, see for example [16-18], not much of that type of research has been conducted in a manner that use insights from design science. For example, in design science research the process of building and evaluating the artefact in question is central. However, many of the previously presented methods for analysing crisis management capability lacks a clear and systematic description of how, and why, the method was constructed in the way it was. This is also true for the methods used by the authorities in Sweden to conduct risk and vulnerability analyses today. Although these methods might seem reasonable, they have not been designed in a way that explicitly describes the purpose(s) of them and how that purpose is fulfilled by the methods in question. Furthermore, they have not been evaluated using a systematic approach to determine whether the application of them fulfils their purpose. Nevertheless there are examples of the use of design science in a context similar to the present one. See for example [19], [20] and [21].

In the present paper we do not aim at designing a new method (a normative approach) for how one should analyse risk reduction or crisis management capability. Instead we study how design activities are conducted in the Swedish crisis management system, i.e. a descriptive approach. Our focus is on how various actors design artefacts, i.e. all man made things including for example organisations and procedures, to reduce risk and improve their crisis management capability. Although their design activities might not be design research in themselves, they can still be studied using scientific methods (compare to [22], p. 16). When studying these activities ideas from design science research are used to provide a framework for our analysis. More specifically we use the concepts of *context description*, *level of abstraction*, and *design criteria* in our

analysis. However, the names of these concepts are not commonly accepted and therefore we provide a short description of what we mean here.

3.1. Context description

Most artefacts are designed to be used in specific contexts. The contexts are either general, e.g. an artefact might be useful in any crisis situation, or specific. An example of a measure designed to be useful in a specific context are buoys to detect tsunamis. They are only useful for a very limited set of scenarios, those following a tsunami. The key point from a design science perspective is that when we are suggesting a new or improved artefact we need to provide a description of the context in which we claim it to be useful. Sometimes this is also called the "outer system" as compared to the "inner system" of the artefact itself, see for example [11]. Without a description of the context in which the artefact in question is supposed to function other researchers or practitioners will have difficulties validating the claims of its effectiveness.

3.2. Level of abstraction

Any artefact can be analysed using different levels of abstractions. This is captured in Rasmussen's abstraction hierarchy [23] that forms the basis for the logic of design. Brehmer and Jensen [24-27] have previously argued for the usefulness of employing such a framework when analyzing C2 and C2 systems, and it has also been employed when analysing community resilience [28] and risk and vulnerability analyses [19]. Here we use a simplified version of the original abstraction hierarchy. The original has five levels but we use only three in our model which is the same as the one described by Brehmer [29]. The levels are associated with questions used to describe the artefact from different perspectives. The highest level is the Purpose-level. The purpose of an artefact answers the question "Why?". Why was it constructed or why should it be constructed. The next level is the Function-level and the question associated with that level is "What?". What does the system or artefact need to do in order to fulfil the purpose? The final level is the Form-level where the question "How?" is answered. How is the artefact constructed so that the functions on the previous level are performed? We use the abstraction hierarchy as a tool when we study how measures to reduce risk and improve crisis management capability are motivated in the RVA documents. We investigate, for example, if the documents explain the purpose of the suggested artefacts, the functions that they are supposed to perform, and the concrete form that they should have. We also use the hierarchy in a similar way when analysing the interviews focusing on how the respondents describe the current procedure of evaluating various measures.

3.3. Design criteria

Building and evaluating are two important activities in design science (see for example [15, 30]). Building implies the construction of the artefact itself. Evaluation means that one evaluates if the artefact fulfils the purpose of it (if we are focusing on completely new artefacts) or if it fulfils the purpose to a greater extent than previous artefacts (if we are improving something). To determine whether an artefact fulfils a specific purpose one needs to specify design criteria (requirements and constraints are two other terms that have been used with similar meaning [10, 11]). These criteria can then be used to evaluate whether a specific artefact fulfils the purpose. Thus, they are a concrete way of describing what one wants to achieve by using the artefact. Van Aken argues that the typical research output in design science is "a chunk of general knowledge, linking an intervention or an artefact with a desired outcome or performance in a certain field of application" [12]. He also argues that the logic of the knowledge is of the form "if you want to achieve Y in situation Z, then perform action A" [12]. Design criteria are related to the "Y" in the quote, i.e. what it is that one wants to achieve. If one cannot specify that, then it is not possible to know if a specific artefact fulfils its purpose and actually provides what one wants. Moreover, if you cannot describe how a specific measure aimed at improving crisis management capability actually accomplishes that, you will have difficulties convincing others that the measure is a good one. In the present study we use the concept of design criteria when we evaluate the RVA:s by analysing how measures for reducing risk or improving capability are dealt with there. We study, for example, if the documents describe what it is that one wants to achieve by introducing the measures. If such information is not provided anyone reading the document, for example someone that is supposed to make a decision based on the document, will have difficulties to determine whether the suggested measure is sensible or not.

4. CONTENT ANALYSIS OF RISK AND VULNERABILITY ANALYSES

The first empirical data set used in the present paper is a content analysis of all 21 county administrative boards RVA:s from 2010. Each RVA is between 22 and 135 pages long including appendixes. The content analysis was performed by reading through the analyses looking for sections and sentences where suggestions of measures to reduce risk and improve crisis management capability are discussed. Since the documents were retrieved electronically we also searched for key words to help in the identification of the relevant sections. In most of the documents it was not difficult to identify the relevant sections since they were specifically mentioned in the content sections of the documents. When reading the documents we also realised that suggestions of measures to improve C2 capability are not dealt with differently than suggestions of any other measures. Therefore, the results from the analysis are valid for all types of measures to reduce risk and improve capability.

Using the three aspects (*context description*, *level of abstraction*, and *design criteria*) we classified the RVA:s based on how they dealt with suggesting measures. In general, the measures suggested in the RVA:s are described on a concrete level, i.e. the documents describe how the measure in question should be implemented. However, the documents seldom relate the form (how?) of the measure to the functions (what?) or the purposes (why?) of the artefact. Moreover, the context descriptions often seem to be missing or given by providing a general description of a scenario in which the measure in question is useful. For example, if a suggestion of a measure to increase the crisis management capability is "install backup power generators in all homes for elderly people" then the context description could be given by describing what could happen if a serious electric power outage should occur.

After reading through the RVA:s and analysing the content we decided to use four categories to capture differences between the RVA:s with respect to the three aspects described above. The four categories are: (1) No description of context, (2) Descriptions of risk areas, (3) Descriptions of scenarios without design criteria, (4) Descriptions of scenarios with design criteria. The first category, (1) No description of context, means that the RVA in question only provides a description of the measures but no description of the context in which they are supposed to be useful. The second category, (2) Descriptions of risk area, means that the RVA in question describes the suggested measures and that it also provides a general description of the type of context the measure is useful in. Usually this is accomplished by describing various "risk types" (e.g. flood) and then suggesting measures associated with each risk type. Even though the RVA:s in this category associates the measures with specific risk types (or associates them with all identified risks) they do not provide a description of what might actually happen if a crisis or emergency should occur. Thus, they do not explicitly discuss scenarios. The third category is called (3) Descriptions of scenarios without design criteria and it implies that the RVA in question describes the measures, associates them with specific risk types, and also describes scenarios representing those risk types. The difference compared to the second category is thus whether scenarios are used or not. The final class, (4) Descriptions of scenarios with design criteria, is the same as the third class except that the RVA:s also include an explicit description of how the suggested measures are estimated to improve things if one or several specific types of scenarios should occur. This involves the use of design criteria, explicitly or implicitly.

To exemplify how descriptions of measures could look like in the different categories a hypothetical example is used. Assume that one RVA identifies floods as a risk in the geographic area of concern. The description of a suggested measure in a RVA classified as "(1) No description of context" could for example be "We suggest that the local municipality Z invests in mobile communication devices". This type of suggestion are usually given in a section of the document called something like "Suggested measures" without reference to any specific risks or scenarios. Thus one cannot determine for which type of risks that the measure in question is useful according to the authors of the RVA. Even if it is "obvious" that the artefact is useful for many scenarios, as the example above, if it is not stated explicitly it complicates the use of the information for decision making. This is similar to the problem of *implicit design decisions*. Such decisions are "choices made by previous generations of designers" [31] (p. 381) that are inherited by the present designer through copying large parts of previous artefacts (the form level) without questioning whether the old artefacts are useful in the new context. That is also the case if a measure that supposedly reduces risk or increase crisis management capability is suggested without specifying the context in which it is useful. In many specific cases it might be ok to do so and the suggested artefact is probably useful. However, the key point is not whether a specific measure is useful or not in the specific case, it is the fact that important information is lost

that makes it more difficult for others to determine whether the suggested artefact is suitable. A description of a measure found in a RVA classified as "(2) Descriptions of risk areas" on the other hand distinguishes itself from the first type by including a general description of types of risks and associated with each such description is a set of suggested measures. An example is "The river X flowing through the local municipality Z pose a serious risk to the society. In recent years buildings and other infrastructures have been built in the near vicinity of the river which means that they are vulnerable. Therefore, we suggest that local municipality Z invests in mobile flood protection devises". If this instead would have been a RVA classified as "(3) Descriptions of scenarios without design criteria" the description in the RVA might have looked like this "The river X flowing through the local municipality Z pose a serious risk to the society. One scenario that might occur is that the water may rise due to, for example, heavy rainfall and flow over the levees. Should that occur, area 1 will be flooded. Therefore, we suggest that local municipality Z invests in mobile flood protection devises". The difference compared to the second category is that a scenario, i.e. a description of what may happen, is explicitly described and associated with the measure. Admittedly, the scenario description in the example is very general but in the real RVA:s they are usually more elaborated. Despite the fact that the RVA:s in this category explicitly describe scenarios in which the suggested measures are useful they do not provide a description of how the measure would influence the outcome of the scenarios. Supposedly a measure is suggested because it has some effect in case an unwanted event occurs. If that effect is not explicitly described, the reader of the RVA is left wondering why the measure is a good one. This is again a case of implicit design decisions described above. However, if a RVA provides a description of a measure along with the context in which it is supposed to be useful using scenarios and also provides a description of the effect that the measure will have, then it is categorised as "(4) Descriptions of scenarios with design criteria". An example of how such a measure could be described is the following "The river X flowing through the local municipality Z pose a serious risk to the society. One scenario that might occur is that the water may rise due to, for example, heavy rainfall and flow over the levees. Should that occur, area 1 will be flooded. If the local municipality invest in mobile flood protection devices they will most likely be able to protect area 1 in case of such a flood. Therefore, we suggest that local municipality Z invests in mobile flood protection devises". This is again a very general description that probably lacks a lot of information, for example concerning how often the scenario is expected to occur. Nevertheless, it exemplifies the key difference between category 3 and 4 which is related to whether the RVA describes the effect of introducing the measure or not.

4.1. Results

A summary of the results from the content analysis is presented in Table 1. There one can see that a majority of the county administrative boards use a description of scenarios without design criteria when suggesting measures to reduce risk and improve crisis management capability. There are also a couple of counties who describes the measures without providing any contextual information at all, thus severely limiting the possibility of determining whether the suggested measures are useful or not. Moreover, there are no RVA documents that are classified in the fourth category. This means that no RVA document describes the effect of the suggested measures.

Table 1. A summary of the results from the content analysis of the RVA documents.

Category	Number of counties
(1) No description of context	4
(2) Descriptions of risk areas	5
(3) Descriptions of scenarios without design criteria	12
(4) Descriptions of scenarios with design criteria	0

5. INTERVIEW STUDY

In the fall of 2011 the authors conducted an interview study that focused on what different actors in the Swedish crisis management system perceive as important indicators of C2 capability in an organisation. The ability to command and control is a very important aspect of an actor's crisis management capability. Furthermore, in the RVA legislation it is explicitly mentioned that the actors are supposed to perform crisis management capability assessments. Included in these assessments are analyses of the actors' C2 ability (see appendix in [7, 8]). Thus, the interview study complements the analysis of the RVA documents by focusing on how the respondents describe the way they work and how they perceive positive and negative aspects of

the currently used procedures. Here we focus on the part of the interviews that explicitly dealt with design issues related to crisis management. For example how the various respondents describe the way they evaluate potential improvements to crisis management capability.

The respondents of the study were purposefully selected based on the fact that they represented various organisations in the Swedish crisis management system that have important roles in the preparation for and the response to crises. Moreover, we also selected respondents that had specific knowledge of C2 issues. Thus, one cannot say that they are representative of people within the organisations in general. Most likely the persons included in our study have had the opportunity to work with and think critically about issues related to crisis management to a greater extent that the average person in their respective organisations. 14 persons from 10 different organisations were included in the study (2 from different county administrative boards, 4 from the Swedish civil contingencies agency (MSB), 1 from a county council, 1 from the National board of health and welfare, 1 from the Governmental offices, 2 from different fire brigades, 1 from the Police, and 2 from the Swedish armed forces).

The interviews were semi-structured. As a point of departure we used a list of pre-formulated questions covering various themes related to C2. For example, the respondents were asked how their organisations do when they evaluate measures to improve their C2 capability and what the respondents perceived as challenging in doing so. However, the interviews were allowed to deviate from the pre-formulated questions and the interviewers asked other questions based on what the respondents said. The interviews lasted for between one and one and a half hour. During the interviews several themes emerged from the respondents' answers. However, only three of them are deemed relevant in the present paper. Below follows a short description of them. A more elaborated description of the interviews and the results from them can be found in [32].

5.1. Results

First of all, several of the respondents expressed that it is very important that the criteria, or indicators, one use to evaluate C2 (before and after an event) are related to whether the organisation actually accomplish(ed) something (their tasks) and not only to whether they follow(ed) procedures. The respondents also expressed that presently this is not always the case and that there are occasions when the management of a crisis is evaluated only based on whether the procedures were followed or not. Secondly, the indicators that one use to evaluate C2 capability cannot be too general; they must indicate something meaningful and useful. The indicators need to be related to something that one can perceive, e.g. how fast an organisation can gather important recourses, and not to general value statements, e.g. if an organisation's capability to gather important resources is good or bad. For example, today crisis management capability is assessed by all organisations performing RVA:s. Those assessments are conducted using a self-assessment procedure where the organisations use an ordinal scale with four categories to express their capability. In a recently conducted interview study with respondents from 15 local municipalities, 5 county administrative boards and 5 national authorities (not the same as in the present study) the assessments were criticised for their lack of meaning and transparency (see [33]). As a consequence it is difficult to draw conclusions concerning various actors' crisis management capability based on the assessments. Similarly, our respondents express that it is important to find more specific indicators of crisis management capability that are measurable. Furthermore, they mean that self-assessment procedures such as the one described above need to be complemented by descriptions of why the capability is judged to be good or bad. Thirdly, several of the respondents said that when one problem related to C2 is fixed by changing something, e.g. a procedure, it often seems as if the change creates other problems. They indicated that one reason for this is the lack of a holistic perspective when addressing changes with respect to C2. One often focus on isolated parts, for example, improving one function at a time and not considering how other functions interact in achieving a good C2 capability.

6. DISCUSSION

Although the two studies reported in the present paper are limited considering the extent of the Swedish crisis management system, we believe that they indicate a fundamental problem when designing societal safety in Sweden and perhaps elsewhere. One reason for this is that we have investigated all RVA:s produced by the county administrative boards in 2010 and none of them describe or motivate their suggested measures. Admittedly, it is not explicitly stated in the law that they should do so. However, since one of the

major purposes of the legislation in the present context is to contribute to reducing risk and increasing crisis management capability it seems reasonable that measures are evaluated with respect to if and how they contribute to that purpose. Otherwise the use of the RVA:s as a basis for decisions (which is another purpose explicitly stated in the legislation) can be questioned. Moreover, one could claim that our sample is too limited to be valid for the whole crisis management system. However, we argue that it is likely that the county administrative boards' RVA:s are more developed than the average analysis in Sweden. The county administrative boards started producing RVA:s several years before the local municipalities and they are required to perform them annually whereas the local municipalities are only required to produce them once every term (4 years). Also, in a recent study of the local, regional and national level [33] the variation in terms of methods, procedures and results with respect to RVA were greater among the local municipalities and the national authorities than among the county administrative boards.

Another reason why we believe that the results in the present paper indicate a fundamental problem in the Swedish crisis management system is the fact that we discovered the same type of tendency to analyse and suggest measures without using explicit design criteria or indicators during the interviews. Although there is an overlap in focus between the content analysis of the RVA:s and interviews (see above), they still represent two different contexts within the crisis management system. The RVA:s are usually conducted by persons working solely with mitigation and preparedness issues whereas the persons that participated in the interviews have a stronger focus on response issues. Thus, the problem is not limited to the mitigation or preparedness issues (e.g. RVA:s) but extend also to response issues (e.g. C2).

In light of the results from our two studies we suggest some normative recommendations for how to improve the current practice of design in the area of societal safety. First of all, when suggesting measures to reduce risk and improve crisis management capability it is important to describe the context in which the suggested measure is supposed to be useful. If the measure is supposed to have effect when responding to a crisis, it is especially important to describe in which types of scenarios it is useful. Admittedly, this can be difficult since many measures are useful in a great variety of scenario. Nevertheless, it is important to state that explicitly since that information can be important for others to understand the benefits of a specific measure. Moreover, it is also important to address uncertainty in one way or another when describing the context, e.g. for which scenarios is the measure useful and how likely are they. Secondly, it is important to explicitly describe the design criteria one use to evaluate the effect of the suggested measures. One should note that the selection of design criteria depends on the purpose of the artefact (measure) in question. Thus, different individuals might provide different design criteria for the same measure. Therefore, it is important to explicitly describe the criteria so that others can understand the rationale for suggesting the measure in question. Thirdly, to show the effect of introducing the suggested artefact one should describe how the artefact will influence the design criteria. Thus, one describes the effect of introducing the artefact by comparing the design criteria before and after the introduction of the artefact. Unless these three aspects are explicitly addressed when suggesting measures to reduce risk and improve crisis management capability it is likely that several design decisions become implicit which will limit others' ability to determine the usefulness of the measure in question. Moreover, it will also increase the likelihood that future design decisions are based on the fact that similar artefacts have been used in comparable contexts before, and not on evaluations of the actual effect of introducing the artefact in terms of fulfilment of functions and purposes. This can ultimately lead to a less transparent system for designing societal safety, i.e. it becomes more difficult to tell why specific measures was introduced or should be introduced.

7. CONCLUSION

The present paper deals with how design activities are conducted within the Swedish crisis management system. Our focus is on how measures to reduce risk or improve the society's crisis management capability are evaluated. We conclude that the suggested measures described in the county administrative boards' RVA:s from 2010 sometimes lack a description of the context in which they are supposed to be effective. Moreover, none of the 21 boards' explicitly describe the effects that the suggested measures are supposed to result in. From a design perspective this has serious consequences since the value of the documents as a basis for decisions are reduced. In short, it is difficult to use the RVA documents to determine the usefulness of the suggested measures.

Also the respondents in the interview study describe similar tendencies to conduct design activities without explicitly describing the effects that the suggested measures are supposed to result in. Even though the focus there is on C2 issues and crisis management capability, three of the themes that emerged during the interviews (see above) have clear connections to the analysis of the RVA documents. When evaluating crisis management capability (or only C2) the respondents express that they believe that it is important to use indicators that actually measures whether an organization succeeds in conducting their tasks and not focus on whether plans and procedures were followed. Moreover, they also express that the indicators that are used to evaluate capability should not be too general, they need to measure something relevant to the organization in question. Thus, if a measure to improve C2 or crisis management capability is suggested then it should be evaluated based on indicators that are measurable and relevant to the tasks and objectives of the organization in question. However, the respondents also indicate that such is not often the case today.

Taken together the two sets of empirical data indicates that design activities within the Swedish crisis management system are not always conducted according to good practice in design science. More specifically, we mean that when various actors design, i.e. "do or plan (something) with a specific purpose in mind" (Oxford dictionary), with respect to societal safety they often do not explicitly describe the context (including descriptions of scenarios) in which the intervention or artefact is supposed to have effect. Moreover, they often do not describe what kind of effect the suggested artefact (measure) is supposed to have.

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