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Affordance for municipal crisis management

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Abstract. This paper presents findings from ethnographic studies on situation rooms in municipalities. The purpose has been to visualize affordance for the practice pf crisis management. The study argues that organizational and material dimensions are affecting the perceived affordance. The organizational dimension needs to be have a good leadership in the situation room, be scalable, and well trained in order to infuse trust in the staff. From the dimension of materiality, it is also important with trust in the infrastructure and that they are able to handle the tools required in work. Furthermore, materiality needs to be editable, visible and scalable.

Keywords: crisis management, affordance, work-practice, control room.

1   Introduction

In the White House there is a room, a situation room allowing the American leadership unprecedented access to situational awareness regarding a range of critical geo-political events [1]. Such settings seem no longer be exclusive to the global political leaders but also a reality for a range of organizations involved in crisis response and civil security. Local authorities with responsibility for crisis response or societal civil security within a defined area are during crisis activating a temporal organization with responsibility for crisis management and response, are often lead from a situation room. Situation rooms, control rooms and operation rooms are synonyms, and share common characteristics due to their common focus of a continuous need of achieving overview supporting the management and response of the crisis. The contextual settings of interest in this article are the situation room that is activated during crisis and in which the municipality is organizing its work to manage upcoming crisis. In this article we claim that the situation room studied in this research differs from the similar studies in e.g. the CSCW field, which have focused on more traditional control rooms, or dispatch centrals, as the Swedish national emergency centre [2], in control rooms in London underground [3], urban traffic control [4], in command and control rooms [5].

However, there is very little to find about the kind of situation room in which a local authority is organizing them self and working during a crisis.

In literature you do not find much work about the work practice in operation rooms, except [6, 7]. On the other hand there are research that indicate the need to better design (in this case) emergency operation centers for efficient crisis and disaster management [8] but also an identified need to have the capacity of planning in emergency operation centres [9]. You rather find research within the crisis management domain that have

focused on testing or developing certain technologies within the operation room as e.g. [10, 11]. Fayard and Weeks [12] claim that rather than observing the characteristics of the technology or the environment, we should apply a holistic approach and observe affordance for practice. By looking at affordance as both relational and dispositional it becomes possible to explain the need of the practice as a whole, rather than selecting a deterministic focus that would result in looking at the artefact in isolation or the social aspect [12]. With this as a background, it is a challenge to understand the practice as a whole, and not only emphasize single parts. Understanding what it is that makes the work in itself possible is what is important, and not what technical or physical artefacts are found in the room. By creating an understanding of the practice of crisis management within the municipal situation room, this study aims to clarify what affords the different activities of the situation room. This in turn will provide valuable insights for those designing situation rooms. It will also serve as input for those designing exercise scenarios and support systems for this type of work. This is a study of the practice of crisis management, looking at what provides affordance to the five activities that, according to Landgren and Bergstrand [7], are carried out during crisis management; assembling, monitoring, exploring, converging and consolidating. Affordance for practice makes it possible to illustrating the needs of the practice in action. This way, the study will not be limited to the interaction between human and a specific artefact, but rather focus on the practice as a whole. The primary purpose of this study is to understand the work in the situation room, and what affords those activities carried out in the situation room.

2 Theory

Practice is the context of actions. It is principles, knowledge, abilities, tasks, activities, and shared rules that constitute the practice [13]. The practice decides which activities are performed and link these to a shared practice. Thereby, the practices and their activities can be considered to form the union of the actions and the object used in the action [14]. This is why it is important to understand the practice and what is required for its creation. One way of viewing interaction between human and surrounding environment during activities, is viewing it from the perspective of affordance. The concept has its origin in ecological psychology and was coined by Gibson (1977); it implies that the environment provides the user with opportunities. Gibson studied nature and how animals and humans perceive the environment, and how this perception is connected to the actions enabled. Gibson concluded that there is a clear connection between affordance and perception, how we understand opportunities for actions based on a specific object in our surroundings. Van Dijk and Rietveld [15] argue that affordance always depends on the context. The actions of a person are controlled by what is provided by the environment. That is when a person enters an environment, s/he will form an understanding of what are possible actions in this environment. Affordance contributes to indicating possible actions in the environment, even if it does not determine the actions [12], they call this view of affordance a dispositional perspective.

Affordance can also be considered limiting [16]. Whether something is believed to provide opportunities or limitations is based on the relationship between the object in question and the human, as well as the intention, perception and ability of the individual [17]. "[A]ffordances are functional and relational aspects which frame, while not determining, the possibilities for agentic action in relation to an object. In this way technologies can be understood as artefacts which may be both shaped by and shaping of the practices of human use in interaction with, around and through them" [18]. Affordance can be viewed in perspective of the user and the sociocultural context, for example communication takes place in the relationship between the user and a number of available technologies, the user will compare the technologies and based on the comparison make a choice [19]. Fayard and Weeks [12] call this aspect of affordance relational. Fayard and Weeks [12] consider their view of affordance for practice a combination of the dispositional and relational perspective. They argue that affordance channels behaviours in a certain direction, but can never decide if a behaviour will be carried out. The decision is based on the relationship to the individual, his or her intention and context. They argue that "space needs to be explained as a place where certain things are expected to happen" [12]. In addition, they argue that in sociotechnical environments, affordance is perceived as compared to other contextual possibilities.

3   Method

3.1   The study object

The municipalities in Sweden are responsible for coordination and management of collaboration between agencies during a crisis [20]. This work is performed by a crisis management team. A team that is temporally constructed in order to do work activities that the individuals do not perform in everyday work, with people they do not necessarily work with on a daily basis. The focus of interest in this article are the situation room that is activated during crisis and in which the municipality crisis management team is organizing to manage the crisis. The situation room used at municipalities are common conference rooms, not set up to be a room prepared for analyze and strategic management during crisis.

3.2   Data collection

As crises tend to be irregular, exercises are a good option for gathering information about the challenges of crisis management. This study has collected data from five exercise, two table-top exercises, and three full-scale exercises. All exercises included multi-actors such as municipalities, the police, the rescue services, and water management companies. Two of the full-scale exercises also included cross-border collaboration. In addition to the exercises, 10 different municipalities have been interviewed for an overview of how municipalities plan to manage a crisis, se Table 1 for an overview. The interviewees were members of the municipality crisis management team as either

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chief-of-staff, chief-of-communication or chief-of-security. The focus of the observations has been on individuals involved in the exercises and their activity in the room. Documentation consisted of photos taken with a smartphone, and field notes. The notes were typed out by the researcher each evening and completed with personal notes. Interviews were recorded with the consent of the respondents and transcribed by the researcher.

Table 1: Overview of data collection

DATASOURCE	TYPE OF DATA
INTERVIEWS	Semi-structured interviews (10 interviewees á 60 – 75 minutes)
OBSERVATIONS	Field notes from table-top exercise, 4 hours times 4 Field notes from table-top exercise, 4 hours Field notes from full-scale field exercise, 6 hours Field notes from full-scale field exercise, 8 hours Field notes from full-scale field exercise, 24 hours Informal conversations with participants Field notes from observation of rescue management, 100 hours Informal conversations with rescue officers Pictures of material and textual artefacts

The material was repeatedly read and then coded using F4analyze software. During coding the focus was on interaction with digital and analogue resources during what could be seen as activities defined by Landgren and Bergstrand [7]. The citations has been chosen to describe the materiality interaction during these actions.

4   Findings

Illustrating findings from the field a scenario of possible flooding is being used. Scenarios during exercises has shifted but the way of working stays the same. The key actions performed can be recognized regardless the scenario that has been in focus during exercise.

4.1   The practice of assembling

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Given the circumstances and weather forecast, the head of the
municipality initiates to assembly the crisis management team
[hereafter CMT] by sending texts and calling the members according
to a previously drawn up alarm list. Meanwhile the fire-chief-in-
command initiate the crisis management work by searching neces-
sary templates and plans for action.
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Many municipalities choose to collaborate with the rescue services and use the fire-chief-in-command as first receiver of any alarm involving the municipality, "*because they are always staffed, unlike municipal officers who don't have any standby-duty*". Other municipalities choosing to use their own officers making sure there is always

someone standing by in the event of a crisis. Regardless of how the first line is staffed, routines and alarm lists are important for the initiation of the crisis management to be as smooth as possible. "*Training is important so that we are able to trust the organisation assembled to solve it all, and so that you are able to trust your own ability in your role*".

Using multiple channels to summon the CMT is considered a safety precaution. It facilitates quickly reaching those intended, while at the same time having multiple channels serves as a backup in case one or more are out of order.

The nature and size of the event determines how the municipalities choose to assemble the CMT. To "*start out small staffing basic positions and then scale up as needed*" is one working practice. Others have selected the opposite approach, and start out with a complete group, reducing as necessary. "*It is better start out big and then call it off [...] It's like an exercise. The more we use it, practice like this, the better it will be.*". Just like the number of people is determined based on the event, the use of artefacts is based on the number of people in the room. When there are few people in the CMT, fewer visualization artefacts are used. Making it important that material resources are scalable, to make scaling up quick and easy, if the crisis escalates.

4.2   The practice of monitoring

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Chief-of-staff: What's the water level right now? What limits do
we need to track?
Karl: I'm not sure but I'll check with the dam owner.
Chief-of-staff: Good. Could you also check the forecast for the
next few hours with SMHI¹?
Karl: On it.
[Karl moves to the whiteboard. During the call, Karl jots down
the information he receives on the board.]
Stina: If the water takes this way [points on map] we'll have to
evacuate the kids at this school.
Chief-of-staff: How many kids? Can we get a hold of all custodi-
ans?
Stina: I'll call the headmaster, find out the number of kids and
get the custodians' details.
Lisa: There's a lot of questions on Facebook about what'll hap-
pen to the animals. What should I say?
Chief-of-staff: Ask the fire-chief-in-command; they'll know
about evacuation of animals.
```

What information is needed is closely connected to the nature of the event. The above is an example of a sequence where the chief-of-staff decides what information is needed together with the group, while distributing the task of gathering information. As the work is time critical, being able to speak to people directly becomes an important source when gathering information, making the mobile phone an important tool.

"In an emergency, when finding information is urgent, I would prefer making a call. Otherwise, it'd feel like an extra step, for example emailing if you need information

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quickly. In that case, the problem is that you have to be asking the right questions, or it might lead to more questions etc.".

According to this respondent, emailing is perceived as too slow and a channel that requires complete questions for complete answers. Time to word questions and follow-up questions is considered lacking during crisis management. This way of communicating is rather used when it is of less importance at what time information is delivered. In interviews, digital competence and experience are mentioned as reasons why some users choose to not use digital tools. "It´s important to become comfortable with using the gadgets". Just like it is important to be comfortable in the organisation used for crisis management, it is important to feel comfortable using the tools available.

As several people are involved in gathering information that everyone in the room need in one way or another, a collective memory visualized in the room is needed. The collective memory should be easy to edit, and everyone in the room should have access to both edit and read it.

4.3   The practice of exploring

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Work in the situation room is carried out in small teams focusing
on different parts of the crisis management.
Emil: Is there a map? I need to have a look at it to know what
to do next.
[Emil and fire-chief-in-command moves to the white screen where
the GIS map is projected. Fire-chief-in-command turns to Greg
and asks him to add a layer showing how far the water is esti-
mated to reach.]
Fire-chief-in-command: According to the flooding map it'll look
like this [points to the map where the water will flood roads].
Emil: Uh-huh, but then this bridge will disappear. This unit
will be completely isolated. That's where I have to start. What
about time? How long before the water reaches this point?
Fire-chief-in-command: According to calculations, we've got un-
til about one p.m. until this bridge will impassable [fire-
chief-in-command points to the map to show where]. These are the
time estimations for the water flow. [Fire-chief-in-command
takes out the dam accident plan and based on the information in
the plan he makes some notes on the project image, including
calculated points in time when the water flow is expected to
move from the dam and through the municipality.]
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Dividing into teams during crisis management requires space in the room, or a room nearby. In the exploration phase, the teams form an understanding of the consequences from the perspective of that particular team. Simultaneously, they all work as a unit towards a complete picture of the situation. Added to the visualized map showing overflow levels are handwritten notes with time estimations for a possible flood. This way, one team's ideas about the flooding and times will be visible to all teams by watching the visualized map and the notes.

The artefacts are given multimodal purposes, as they serve as a sounding board when main points can be jotted down on a board while the team carries on working to make sense of what the combination of information means. The artefacts will be assigned a

new role, and become memory carriers, when the team has agreed on the meaning and the information has been rewritten as units carrying information available to everyone in the room.

A timeline serves as an aggregated information structure visualizing both the points in time and course of events. Organizing information improves the overview. The visualized information can thereby serve as sensegivers, while the group tries to figure out what the information as a whole means.

4.4   The practice of converging and consolidating

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Chief-of-staff: Listen up! Let's have a briefing now, so that
we're done before the collaboration meeting at 15:00.
The buzz of the room decreases but it doesn't go completely
quiet. There is some activity in the teams, but one or a couple
in each group turn their focus to the chief-of-staff.
Chief-of-staff: The fire-chief-in-command can start because he's
off to another meeting.
The fire-chief-in-command gives a short report on the status.
The rescue services are planning to evacuate livestock in the
next few hours.
Chief-of-staff: Thanks. We'll add the information about the ani-
mals on the media board [points to the whiteboard designated for
information to convey to the media]. So. What's the status?
What's been done? What are you doing? What are the plans?
One representative from each team gives an overview of the situ-
ation from their perspective. The communication team points out
that there is a great pressure from the public, and that they
need information to publish on different channels. The chief-of-
staff closes the meeting by asking everyone to plan for a shift
change in preparation for a long operation. [At the same time,
the chief-of-staff points to a whiteboard indicating where he
wants the information to be accessed.]
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In the interviews, it has been revealed that a skilled and trained chief-of-staff is important for successful work in the situation room. "*A talented chief-of-staff is what's most important*" (I10). To have access to a trained chief-of-staff, especially for lengthy events requiring shift changes, there needs to be several people in the organization who have trained to be chief-of-staff. "*We've lost four chiefs of staff in less, or about a year. There's no one left [...] but me [...] So that's another aspect, you need access to exercises and chief-of-staff education and training*"

A structured activity in crisis management are the briefings. This study shows that successful crisis management in an organisation not only requires a talented chief-of-staff, but also a good team work between the administrations to make everyone collaborate. The study also shows that established networks and trust in actors are important for successful collaboration between actors in crisis management.

"*a daily exchange with many of our actors. That's extremely important. For example, we have weekly meetings where we at least talk to all actors in the network. And that's super important. You know, that you know who's there on the other side. And*

that you've had some sort of exchange before. Maybe you've been to the same exercise. It's hugely important. It could be crucial in many ways actually. In that first stage and the first information you get. It makes a lot of difference.".

During the briefings with other actors and in cases where the mediating tool is a conference telephone, the actors have to trust their verbal skills to express their view. Unlike collaboration meetings, where digital mediating tools such as Skype or video conferences are used, and where the tool has features that allows sharing documentation.

"See, collaboration meetings, either just between organisations in the municipality or a neighbouring municipality or why not the meetings the county administrative board calls to every once in a while, [...]. Today they're done over Skype. Which means that you can both see and hear each other and it's quite easy to share documentation"

Visualization tools serve as a sensegiver in discussions. By referring to information that has been visualized, verbal claims are enhanced and clarified in discussions, together creating an overview of the situation handled by the municipality. The empirical selection for this study has not uncovered any differences in affordance for converging and consolidating.

5 Discussion

Managing a crisis involves the management of a great deal of information, as well making decisions based on this information in collaboration with others in an unpredictable situation causing a lot of pressure [20]. This study does not differentiate between physical and digital resources; here, they are both considered as materiality. A materiality that is a part of an intense exchange contributing to the practice of crisis management. It is clear that there is a significant difference in terms of materiality between the municipalities, i.e. with what resources they have equipped their facilities. However, the study has aimed to move beyond the material aspects and to provide a holistic perspective. When considering the practice as a whole this study argues that affordance in crisis management practice can be considered in two dimensions: organizational and material.

5.1 Organizational dimension

The organizational affordance identified in this study embraces all five activities studied. Leonardi [14] argues that the activities and the close relationship between the objects used in the execution of the activities are what make up the practice where they occur. Checklists, routines, and templates guide the crisis management team (CMT) as they start their work and helps them initiate the work as smooth as possible. Since the scenario of the event sets different demands on the CMT plans of actions helps to further guide the work. The event also affects who, as well as how many, should be part of the CMT. The option of scaling the staff based on the incident is important for the actors taking part in this study. The study shows that this scaling could be based on full staffing or based on basic positions and then scale up as needed. Regardless of the starting point, the municipalities choose to adjust the size of the staff based on the type of

incident and its progress. This requires individuals to be flexible, as it involves regrouping while simultaneously managing the incident. This makes it important for the municipality to be flexible when scaling the team to manage the event. This also implies that the physical room where the CMT are gathered needs to be flexible and scalable.

The results show that being able to feel trust in the organization is of great importance as a foundation for the employees. Schatzki [13] argues that a practice includes knowledge, abilities, and tasks. To have an understanding of the practice there is a need for education and training of these knowledge, abilities, and tasks included in the practice. The municipality is an organization with quite a turnover of personnel, which requires that exercise of new employees in the field of crisis management is done with care. This argues for a solid plan for education and training of the organization. A stable basic staffing of the group contributes to the feeling of trust. This study also shows that the leadership in the situation room are of the essence. In the words of one of the interviewees "A talented chief-of-staff is what's most important". This study offers no definition of what constitutes a "talented chief-of-staff". During the observations, it was observed that the chief-of-staff structured the work within the room both how materiality in the room should be used as well as what information was needed. Once more training is of the essence to create the best possible conditions for the chief-of-staff. Making him/her confident in the role. A chief-of-staff that is considered to be a good one infuses a sense of trust in the CMT.

It has been shown that managers' and officials' dedication and enthusiasm, and a close discussion with political representatives are important for the organization. Knowledge and a keen interest in handling this type of issue also provide a sense of trust. Being able to carry on a close discussion with political representatives requires an organization that provides this possibility, be it in physical or digital arenas. The respondents from interviews also emphasized the importance of being a team player, willing to solve the situation as a whole and not just their own area of responsibility.

To be able to trust the network of multi-agencies participating in the crisis management are also of importance. Knowing the people included in the network is known as an important factor. The study also identifies knowledge about function as important to feel able to trust the network, both externally as well as internally. "I definitely feel that it helps. (…) In a municipal organization, people are replaced on a fairly regular basis. This makes knowledge about functions important". Knowledge about function, to be informed about what task a certain function in an organization has and what knowledge it possesses, is to some extent the same as knowledge about people, but less fragile.

5.2   Material dimension

Space should be explained as a location where certain actions take place [22], as it is the individual who interprets what space affords [21, 22]. In the empirical selection of the study, the municipal space for management is defined as a conference room in everyday work. The standard equipment consists of table and chairs, and equipment that can be used for online meetings; as for the rest, it varies between the municipalities. According to Fayard and Weeks [22], people would initially interpret the room as a conference room, and already have an idea about the design of the room and its purpose.

While according to Gibson's (1979) theory about affordance, people base their idea of how the physical environment is perceived on what type of affordance a specific environment offers. When the alarm sounds and the management group is called in, each person has to redefine the space and the activities space allows. This study shows that as the number of people in the CMT is scalable depending on the event so are the use of tools used during the event. Thereby the material setting should be constructed so it also may be scalable.

Work in the staff room is carried out under stressful circumstances. For this reason, the use of the material equipment should require as little effort from the user as possible. In such cases where digital resources are used, digital literacy is a requirement to be able to use the tool. The study shows that trusting your own ability when using available tools is considered of great importance by the actors. A number of respondents mention exercise as important to feel a sense of trust. Other actors choose to place external staff with broad IT skills in the room when needed, to serve as support to the management group. "It can't all come tumbling down just because a system is down and we suddenly don't know what to do. That's why there's always someone from IT in the room when we're running large-scale exercises and during large-scale incidents". Or if there are people who know how to use a specific tool "Well, of course, the GIS, I'll ask for a GIS engineer[…] or a couple of firemen to handle RAKEL".

Writing on a whiteboard or flipchart facilitates sensorimotor interaction with the information, as the medium allows a type of handling that information projected on a screen or displayed on a TV-screen does not. This sensorimotor interaction brings the individual closer to the information. The level of ease when it comes to editing has been shown to be of importance: "[the whiteboards] are more convenient because you can erase. As needed really, to write things down and discuss things with each other".

It is through teamwork discussions that the team forms a picture during exploring and consolidating activities in crisis management. During the work, visualization tools are frequently used to aid the teams to make sense of the information collected and to decide on actions based on this knowledge. This means that the placement of material recourses is important to consider when designing rooms. Visualization tools need to be accessible and visible to the whole CMT. There has to be room for teams to gather in front of material equipment and thereby perceive the proximity to the information, update and interact by pointing to important facts.

The material equipment used is multifaceted in that their purpose can shift over time and depend on the user. The equipment can be used as a carrier of information over time, which aids shift change. They can also inform different actors in different ways. For example, a whiteboard can be used to write down information that has been communicated or is going to be communicated to the media. A communication officer can use the board to see what to publish in social media to ease public concerns, while the chief-of-staff could use the same information to confirm what has been communicated and done. What determines what becomes important to someone is the practice in which the person currently works. Because the information visualized by the material equipment is used by a number of different individuals and teams at the same time, it is important that they are placed in such way that provides the best possible visibility.

The actors involved in the crisis management decide what mediating channel to use in contact with other actors who are not physically present in the room. Gaver [21] argues that users always compare what various technologies can offer, such as phone calls, emailing or text messaging. Time is of the essence for the respondent; the aim is to retrieve the information necessary as quickly as possible. What is considered quick varies between different technologies; the definition of a quick response is connected to the medium selected. What technologies are available for contact affects how a person chooses to use them to contact others [21]. Also, Hutchby [18] argues that the interpretation of what is possible, what an object affords, depends on the materiality of the object, which in turn shapes the social actions. In other words, the object can be limiting in social actions. A slow medium that is difficult to use, or that has tended not to work is unlikely to be used. In his study, Gaver [21] noted that the use of email depends on bandwidth, that is, the infrastructure facilitating different types of social interaction. The respondents in this study mention robust infrastructure as crucial for creating trust in the system and ability to connect to their network. The study shows how a conscious choice not to use the national information system (henceforth WIS) was based on the perception that the system is difficult to use, which steals time from other communication tasks.

The collaboration meetings initiated by the county administrative board can be mediated via a number of different channels. It is the county administrative board that chooses the mediating channel. Since there is no mutual work done on what channels should be used there is a significant difference in terms of materiality between the municipalities. A number of municipalities are currently working on introducing technology to facilitate meetings without travel. Respondents express a wish for guidelines; "We´ve tried to find something in the recommendations for technology but we can´t find any recommendations. […] It would be nice with a mutual protocol for communication within the county".

6 Conclusion

Affordance for crisis management practice are viewed in two dimensions: organizational and material, in this study. The crisis management organisation should be structured to be flexible and scalable and to infuse as sense of trust in: the organisation, the individual's working role, and the user's knowledge about how to use tools. Exercises are repeatedly mentioned as an important activity to gain knowledge and trust. Hence, time and opportunity for exercises are vital for a robust crisis management. In terms of materiality, a structure is needed that makes it possible to work in teams. Different types of tools may be used depending on the timescale for information needed. Robustness is mentioned as an important factor, to be able to trust that the infrastructure developed is stable and useful. Also, actors need a back-up structure that works when power, telephones and the internet are not available. Tools selected need to be placed in a way that facilitates access and editing. Also, the ease that these tools can be used with is of essence in this time critical practice. In addition, these tools need to be designed and placed so that they can serve as carriers of information over time in the room. When

designing the room, it is important to consider the effect of the choice of tool on the affordance offered to the user. Analogue and digital choices affect function, but also how trust is perceived and a person's belief in his or her own ability.

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