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# Networked resilience – living with unorganisable uncertainty

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**Abstract**
In this paper, we explore how unforeseen crises in local communities can be conceptualised as events with substantial uncertainty with respect to the tasks, solutions and volumes for a local community, and how largely non-formalised qualities represent a significant potential for *networked resilience*. These dimensions are closely linked to the social fabric of local communities, and to the ability to couple formal crisis management resources with these intangible attributes of with civil societies. Networked resilience is exemplified and discussed in light of crises and events that have challenged societal safety.
While structured and organised dimensions of community resilience draw on many of the principles of professionalised bureaucracy, these dimensions fall short when challenges are not characterised by the preconditions for well-functioning bureaucracies; known tasks, known solutions, known volumes. Schiefloe's Pentagon model for analysing formal and informal dimensions of organisations highlights both structural and material factors on the formal side, and cultural, interactional and relational factors on the informal side.
In the paper, we discuss a theoretical and practical perspective on networked community resilience and show how it can be used to analyse the interplay between actors in the face of different types of crises. The paper's perspective on networked resilience implies a dynamic capability base, where informal social structures and corresponding social capital constitute the kind of dynamic, shared and negotiated capacities for dealing with the unforeseen and uncertainties that buffers like planned, physical resources and fixed organisational structures alone can not afford.

*Keywords*: Networked resilience, Complex adaptive systems, Uncertainty, Crisis management, Informal resources

## 1. Introduction

In a research paper discussing the contribution of part-time firefighters to community resilience in rural Norway (Almklov et al., 2026), the organisation of fire and rescue services are described as almost inseparable from the local community itself. And indeed, resilience, by definition, is a 'communal' phenomenon. Inherited as it is from ecology (Holling, 1973), the idea of resilience is inextricably linked to ecologic perspectives, with so many of the mechanisms of ecosystems; feedback mechanisms, homeostasis

and adaptation to mention a few. Resilience of complex adaptive systems (Holland, 2006) relies on the same mechanisms, but since concepts, terminology, language and metaphors in life sciences and the social sciences are not identical nor aligned, careful translation may be needed when exploring resilience in different social contexts.

In this paper, we explore *networked resilience*; the meaning, the mechanisms, the limitations and how it relates to scale. Different crises and events are used to illustrate the concept. Resilience comes with a lot of baggage, both from diverse academic disciplines and common usage in everyday life. We will work with a few of the many concepts from the broad literature on resilience that are most useful for this project and papers.

One common result found in multiple areas of work on resilient systems is their adaptive capacity. In nature, survival strategies are not governed by rules. The patterns that arise result from adaptations in the short and long term. Short-term adaptation in complex adaptive systems translates to behaviours ranging from minimal divergence from norms and common protocols to full improvisation. Long-term, lasting adaptations involve the larger system selectively incorporating short-term adaptations into the fabric of normal operations, more akin to ideas of evolution. Both of these processes can be directed at managing disturbances and seeking opportunity, the latter in the 'social world' typically thought of as innovation (Satalkina & Steiner, 2025).

## 2. Theory

### *2.1 Formal principles of organising*

The Norwegian model for organisation of emergency preparedness and crisis management is closely associated with the bureaucratic principles guiding other municipal (and national) policy areas. It is based on a clear division of labour and specialisation, and guided by clear rules and procedures (Weber, 2019). Risk and vulnerability analyses lay the basis for orienting and dimensioning the preparedness, and exercises facilitate competence building and learning (see e.g. Trondheim kommune, 2026).

One of the great advantages with the bureaucratic model of organisation, is that it is highly effective for executing tasks that are predictable in three dimensions: the type of problem, the solution, and the volume. When these variables are known, one knows exactly what kind of standardised knowledge and competence is needed, and what is the required volume of human and other resources.

Principles for societal safety have been developed and described by national authorities, and these are meant to guide the work both for preparedness and crisis management. The principles are (Samfunnssikkerhetsintruksen, 2017):

1. The Principle of Responsibility
The organization that is responsible for a sector or area of activity under normal circumstances also holds responsibility for necessary emergency preparedness measures and for managing extraordinary events within that area.
2. The Principle of Similarity
The organizations and crises structures mirror everyday operations to reduce confusion and leverage from existing expertise.
3. The Principle of Proximity
Crises should be managed at the lowest possible organizational level closest to the event. This prioritises local knowledge and rapid response with higher levels of government providing support and coordination as needed.
4. The Principle of Cooperation and Coordination
Authorities, organizations, and agencies have an independent responsibility to ensure effective cooperation and coordination with relevant public, private and voluntary actors and organizations in crisis management. This highlights the importance of shared understanding, communication and collaborative activities.

The origin of these principles is unclear, but there are no indications that they are informed by research literature on crisis management. Rather they appear as having developed over time as a somewhat generic specification of how the division of labour and responsibility should be operationalised during crises.

Finally, self-preparedness is encouraged for individuals and households with the purpose to help them to manage short-term disruptions independently. These principles and self-preparedness constitute the backbone of Norway's "Total preparedness" approach to enhance societal resilience against a wide array of

threats. While risk and vulnerability analyses are prepared for counties and municipalities, self-preparedness guidance is developed by national authorities for the entire country. A recent study involving several European countries highlighted the need to adapt self-preparedness measures to local context and needs (Swedish Civil Contingencies Agency, 2025).

### *2.2 Nuancing the conditions for organising*

While the bureaucratic model of organisation is tailormade for standardised, neutral and unbiased solutions of problems with the particular characteristics mentioned above, other understandings of how problems are addressed and resolved can be found in the organisational literature. Mintzberg (1993) distinguishes between different ways of organising based on different types of organisations and products. He describes five archetypical organising configurations: simple structure, machine bureaucracy, professional bureaucracy, divisionalised form and adhocracy. Each of these forms are favoured by different types of organisations and products – one size does not fit all. Based on the environmental conditions of the organisation – with respect to stability and complexity – the main coordination mechanism may be any of the following: standardisation of work processes, standardisation of outputs, standardisation of skills, direct supervision or mutual adjustment.

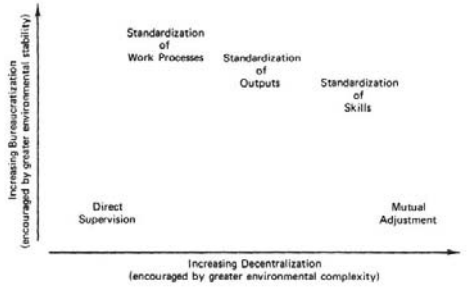


Figure 1. Coordination mechanisms based on decentralization and bureaucratization (from Mintzberg, 1993)

### *2.3 Paying attention to the organisational dimensions*

Different models for organisation and management are suitable for highlighting different aspects. While Weber's bureaucracy and Mintzberg's structures of five are useful for addressing structures and coordination mechanisms, none of these are tailored to understand the *informal* dimensions of organisational life and coordination. While formal structures and technological/material conditions provide important constraints and opportunities for organisations, how organisations work and perform is according to sociological theory even more contingent on informal factors. En passant, contingency theory states that the ideal organisational configuration and work form does not exist but is situationally contingent.

Many characteristics of an organisation can be *decided*, but these by are by definition limited to the formal dimension of the organisation. But as we all know, organisational life consists of far more than formal characteristics, far more than the rules and procedures, far more than the technostructure. Schiefloe's (2025) model for analysis of organisations distinguishes between formal and informal dimensions, and in addition to the formal factors of structure and technology/materiality, he highlights the importance in many organisations of informal factors of culture, interactions and relations.

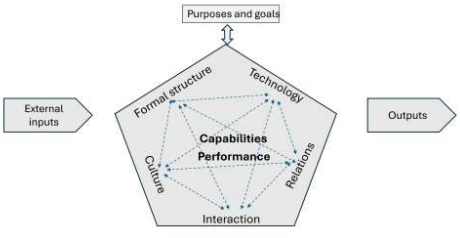


Figure 2. The Pentagon model for organisational analysis (Schiefloe, 2025).

The culture(s) existing in an organisation, the relations between participants, and the patterns of interaction, are of great importance for both the inner life of an organisation, and for its functionality in an external environment. You can decide rules and procedures, and you can decide on an IT system, but you cannot decide in detail the way people communicate and work, the informal power relations that develop, or who collaborates with who. All the articulation work (Haavik, 2010; Schmidt & Bannon, 1992; Suchman, 1996) that binds together otherwise in in certain situations characterized by inadequate

or dysfunctional procedures, are contingent on such informal factors, and the less leeway allowed for them, the more rigid and less adaptive will the functioning of an organisation be. This may be effective under predictable conditions, but not so when complexity and uncertainty in the environment rises.

Organisational analyses based on Schiefloe's Pentagon model (Schiefloe, 2025) explicitly addresses that challenges in complex organizations seldom relate to a single factor. The model proposes two interdependent dimensions, one formal (can be managed and decided) and one informal (can only be supported and developed) dimensions. Each of the five factors could be addressed in light of suitable theories. For example, Mintzberg's theory on organisational structures can be used to elaborate on the structural dimension, while e.g. Schein's theories, can be used to elaborate on the cultural dimension. Pentagon analyses are particularly useful for analysing the interplay between formalised qualities, such as rules and procedures, and informal qualities like organisational culture and social relations – as such dimensions mutually create conditions for each other.

### *2.4 Organising for resilience*

Specialised organisations operating in well-defined environments may succeed well through stabilisation and robustness. However, when complexity and uncertainty is high, adaptability is favoured over static stability and robustness. What we see is that foundational preconditions for the modern bureaucracy – known tasks, known solutions, known volumes – and foundational principles for organising – division of labour, and coordination – are supplemented by *networked resilience* configurations that typically emerge when communities with limited resources are faced with abrupt, unforeseen crises.

Principles of resilience are scalable. When mechanisms in contexts of situated work processes in micro-contexts and organisational life and are scaled up to a societal context, they are highly recognizable as resilience characteristics:

- Crisis are seen as complex environments in which outcomes arise through emergence, shaped by interactions that cannot be reduced to single factors. Acknowledge that small variations can lead to disproportionate effects, embracing variability and adjustments as necessary for everyday performance and a shared understanding that not all dynamics are fully predictable or understood, therefore a need of continuous proactive adaptations and learning.
- Diverse trade-offs shape performance and describe tensions that organisations balance to adapt and coordinate across scales such as Efficiency-thoroughness trade-offs allow capacities to be released by processes of re-prioritisation. Crises affect the 'importance hierarchy' of tasks, and the expectations of those in need of them. Concentrated vs distributed action trade-off, while one reduces ability to account for important interdependencies the other increases costs of managing coordination (Hollnagel, 2009).
- Functional resonance makes possible substantial achievements with limited resources, if these are synchronised[a]. At a societal scale, trust and cultural dimensions (like ethics and norms) function as informal coordination mechanisms.
- No community can prepare for everything that might happen, but a resilient community will look for and deploy resources outside the defined response networks like first responders and formal resource bases. Woods (2015) denotes such kind of system stretching to cope with acute and short-term crises 'graceful extensibility'.
- To ensure that there is both ability and capacity for graceful extensibility, not only as a situational resort, but as a trustworthy capability for long-term adaptation and change to accommodate unforeseen crises, there is need for sustained adaptive capacities (Woods, 2015). While the bureaucratic model is really good at the *deploy* model of response, it is increasingly ill-suited to the *mobilize* model of response and is poorly

[a] Within resilience, functional resonance is proposed as a way to understand outcomes that are emergent and non-linear, it refers to approximate adjustments of people make - individually or collective - in how they respond to unexpected situations. So functional resonance emerges from unintended interactions from multiple adjustments (Hollnagel, 2012).

suite to the *generate*. Adaptive capacity is increasingly required for *mobilize* and *generate*, which requires (among other things) all stakeholders acting as team players: mutual predictability, mutual directability, common ground, basic compact (Klein et al., 2005; Woods et al., 2014). In contrast to the traditional expectations for organisations – that they are defined by a common goal – systems with sustained adaptive capacities are fluid with respect to goals; the goals are always relative to the challenges. While a community can never be organised to withstand a pandemic, it can turn pandemic management into the main objective in the course of a few days, as was the case in e.g. the Norwegian city of Trondheim (Haavik et al., 2022; Haavik et al., 2025).

According to recent studies and theoretical models (Verlin et al., 2023), societal resilience is shaped by the way informal actors act during crises and the degree of coordination with formal systems, using everyday capabilities and context-specific social structures. A compilation of contextual factors include (non-exhaustive): situational (closeness to the event, perception and level of alertness), individual backgrounds (level of trust in other, beliefs, socio-economic status), local environment (social bonds and social networks, topography), society (collective socio-economic, cultural and demographic conditions), in addition to the 'team player' definitional requirements of mutual predictability, mutual directability, common ground, and basic compact (Klein et al., 2005). It is argued that it is possible to see how these contextual factor influences interaction between formal and informal actors involved in crisis management.

## 3. Results

### *3.1 Crisis management as emergent performance*

Faced with crises, local communities tend to use the whole repertoire of capacities to muddle through the challenges as they appear.

-When a large fire broke out in the centre of the Lærdal community in Norway in 2014, many of the capabilities that came to play a crucial role in the crisis management were not a part of any crisis management scenario before the fire (Andresen, 2017). They were turned into assets *during* the crisis. Hitherto 'invisible' local social dynamics turned important for the management of the fire. Role multiplexity (Almklov et al., 2018) and close and personal relations and communication between responsible officials and affected parties coordinated and synchronised the networked response.

-When the Covid-19 pandemics challenged the municipality of Trondheim in their management of information both upwards to the national authorities and outwards to the sharp end of the municipal organisation, a new 'coordination group' spontaneously emerged that helped synchronise the information management, and so successfully that it got an important role to support the crisis management (Haavik et al., 2025). The group grew out of, and functioned through, existing social networks among individuals from different parts of the organisation. After the Covid 19 pandemic, although there were will in the group to keep it as a permanent resource, it did not 'survive'. One interpretation could be that the networked resilience could not be stabilised in fixed forms – it was shaped and held together *by* the crisis.

### *3.2 Self preparedness and networked preparedness*

The year 2026 is officially a 'year of total defence' in Norway (DSB, 2026). Several activities are planned in order to raise awareness of the potential of contributions from citizens to societal safety. Exercises are planned where citizens will play an active role.

Another initiative is to focus explicitly on the importance of self preparedness: campaigns are launched where every household is urged to have a minimum of food, water and energy resources (firewood, batteries) to cope for at least seven days in the case of loss of critical societal functions and infrastructures like transportation, food distribution, water distribution and energy distribution. The Total Preparedness Commission acknowledges recent developments of the threat landscape which requires individuals, voluntary organisations, private sector, local, regional and national authorities to contribute to preparedness as a shared responsibility with greater demands on citizens self-preparedness (The Norwegian Parliament, 2024-2025). Self-preparedness guidance is provided at national level, although recent studies recommend adapting this guidance to local concerns, this remains an unresolved

issue (Swedish Civil Contingencies Agency, 2025).

While self-sustenance is obviously important, there is a social/network dimension of self-sustenance that we believe has not received the focus it deserves. In case of crisis self-sustenance can be activated to extend the formalised and structured crisis management apparatus with citizens' contributions. Thus, the preparedness for self-sustenance may be transformed into societal sustenance as it statistically more often will be some of our neighbours than ourselves that will be in need of the buffered resources when infrastructures break down. Thus, self-preparedness may turn to be a mislabelling of what is really *networked* resilience[b].

From this perspective, networked resilience can be understood as a participatory infrastructure embedded in everyday social life. Informal networks and neighbourhood ties constitute distributed capacities that can be activated under conditions of uncertainty, raising important governance questions about how public authorities can support and learn from these capacities without formalising them.

## 4. Discussion – a resilience strategy for coping with crises

### *4.1 Extending the system by introducing new capabilities*

Municipalities' approaches to emergency preparedness and crisis management are largely based on formal plans with mapped risk scenarios (see e.g. Trondheim kommune, 2024) and dedicated responses, roles and responsibilities (see e.g. Trondheim kommune, 2026). The plans are developed with the ROS analyses as a basis (Trondheim kommune, 2026). We may call this organised safety for organised risks.

This works well in many instances, such as in urban fire and rescue operations where extensive planning and training are turned into successful crisis management. Another example is the management of the extreme weather event 'Hans', where DSB described the crisis management as successful due to good planning (DSB, 2024).

However, when uncertainty is high, as with unexpected crises or expected crises that do not follow the expected 'script', successful crisis management hinges on the ability to stretch, or extend, the system by dynamically folding new capabilities into the resource network. The successful management of the Lærdal fire in 2014 (Andresen, 2017) (see Section 3.1) can be interpreted as an example of such – and of what Woods (2015) labels as *graceful extensibility*. Another example where the crisis organisation was 'extended' dynamically was when the cruise ship Viking Sky lost power in rough weather in Hustadbukta (Direktoratet for samfunnssikkerhet og beredskap, 2020). The extension involved both new collaborative networks between formal actors, and involvement of private and voluntary (informal) resources particularly for the evacuation of 475 passengers and crews.

As increasing frequency and roughness of extreme weather is expected in the future, the relative contribution of informal resources in crisis management is expected to rise. From experiences like the mentioned Lærdal and Viking Sky cases we know that such graceful extensibility (Woods, 2015) is *possible*, but if such examples are to be more than rare and resulting from more than casual, positive functional resonance, there is a need to develop what (Woods, 2015) calls *sustained adaptive capacities*. This will be discussed in the following.

### *4.2 Sustained adaptation through trade-off of goals*

The management of the Covid-19 pandemic was an exhaustive experience to many municipalities, because it involved crisis management over very long time. Crisis management is often a sprint exercise, with much effort in a limited time period. A recurring metaphor by the crisis management in Trondheim municipality was that they were taking part in a marathon, not a sprint (Haavik et al., 2022; Haavik et al., 2025).

To be able to cope with crises over time is something different than being able to mobilise for one serious crisis over a shorter time period. The latter can be managed by stretching the

[b] Or it may not if there is insufficient reciprocity!

organisation or the system, and often that will be enough to manage the crisis. If the crisis lasts longer, or if crises come more often so that the organisation or the system does not get the opportunity to restituate, the stretching may result in systemic or organisational fatigue.

Few organisations can afford a substantial buffer capacity to manage every thinkable and unthinkable event. Maybe only a handful of HROs may be in that position, so for the leaner systems, other strategies than redundancy are necessary to achieve resilience.

Sustained adaptive capacity – or the ability to exert graceful extensibility over time – implies the ability to actually *changing the system*. One way such change, or sustained adaptation, can take place, is through trade-offs between goals. To return to the case of pandemic management in a municipality, the leap from graceful extensibility to sustained adaptive capacity – or in practice, the leap from short-term to long-term management of the crisis – can be supported by adapting the goals of the system to the new context of crisis. For a municipality, this can mean to go from a goal of delivering high quality services in all municipal function areas, to a goal of delivering the most critical services *and* in parallel prioritise *organisational adaptation* to cope in the longer term. In Trondheim, the development of a 'collaboration group' (Haavik et al., 2025) to support the crisis management with information management and coordination across the functional areas was an example of this more long-term work to reduce work pressure both at lower and higher levels in the municipal organisation. The coordination group has been described as an informal organisational construct that was not reflected in the formal organisational charts (Haavik et al., 2025). The trade-off implied that many of the expectations from the citizens to the municipality with respect to services, were 'downgraded'. The frequent reference to 'dugnad' during the pandemic (Nilsen & Skarpenes, 2022), meaning that everyone took part and took their share in the pandemic management, can be seen as a premise for this trade-off.

## 5. Conclusion

Networked resilience refers to the resilient performance that emerge during crises and unforeseen events. The emergence is not random, but is only possible by combining formal strategies, plans and resources with *informal* and often *intangible* resources and modes of working (ref. the Pentagon model) that allows for dynamically meet the uncertainty of 'unannounced' crises that are not within the scope of risk analyses, plans and preparations. While the informal and the intangible are not new to governance and organisational theory, it is not really operationalised and translated into practice theories for crisis management.

Resilience theory points to many principles and mechanisms that describe preconditions for resilience in organisations and sociotechnical systems (Hollnagel et al., 2006). Several of the resilience principles are, however, scalable[c], and resilience perspectives have potential to inform risk governance at a community and societal level.

The larger scale at which organisations and systems operate, the greater are the uncertainties. For example, the preparedness and emergency plans in the Norway society reflected that we were prepared for a pandemic. Actually, it was on top of the listed scenarios of The Norwegian Directorate for Civil Protection. But as the Prime minister said: "We were prepared for a pandemic. But not *this* pandemic" (Aspøy, 2022). Organising safety with unorganised uncertainty does not render plans unnecessary, to the contrary, but their limitations also become clearer. As Suchman (1987) formulates, plans are resources for situated action. And so is the social fabric – the trust, the interaction patterns, the culture that can be found in social networks and that can be exploited as dimensions of networked resilience.

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## References

[c] Indeed, resilience theory borrow much inspiration from more large-scale ecological thinking in the first place (Holling, 1973).

Almklov, P. G., Gjøsund, G., Haavik, T. K., & Antonsen, C. W. (2026). Don't quit your day job. Part-time firefighters in rural Norway. *International Journal of Disaster Risk Reduction*, 106054.

Almklov, P. G., Nilsen, M., & Gjøsund, G. (2018). Role multiplexity and home-grown resilience: a study of part-time firefighters in rural emergency management. In *Safety and Reliability–Safe Societies in a Changing World* (pp. 189-196). CRC Press.

Andresen, S. A. (2017). In the heat of the moment: A local narrative of the responses to a fire in Lærdal, Norway. *International Journal of Disaster Risk Reduction*, *21*, 27-34.

Aspøy, A. (2022). De utenkelige scenarioene. *Stat & Styring*, *32*(4), 2-5.

Direktoratet for samfunnssikkerhet og beredskap. (2020). *Evaluering av Viking Sky-hendelsen*.

DSB. (2024). *Evaluering av ekstremværet Hans – forebygging, beredskap og håndtering (Directorate for civil protection)*.

DSB. (2026). *Totalforsvarsåret 2026 (The Norwegian Directorate for civil protection)*. https://www.dsb.no/ros-og-beredskap/totalforsvarsaret-2026/

Holland, J. H. (2006). Studying complex adaptive systems. *Journal of systems science and complexity*, *19*(1), 1-8.

Holling, C. S. (1973). Resilience and stability of ecological systems. *Annual review of ecology and systematics*, *4*(1), 1-23.

Hollnagel, E. (2009). *The ETTO Principle: Efficiency-Thoroughness Trade-Off - Why Things That Go Right Sometimes Go Wrong*. Ashgate.

Hollnagel, E. (2012). *FRAM: the functional resonance analysis method: modelling complex socio-technical systems*. Ashgate.

Hollnagel, E., Woods, D. D., & Leveson, N. (Eds.). (2006). *Resilience Engineering: concepts and precepts*. Ashgate.

Haavik, T. (2010). Making drilling operations visible: the role of articulation work for organisational safety. *Cognition, Technology & Work*, *12*, 285-295.

Haavik, T. K., Antonsen, S., Gjøsund, G., & Aasen, T. M. B. (2022). Public Administration, Reliability and Innovation - Learnings From a Municipal Pandemic Management Case Study. In *Proceedings of the 32nd European Safety and Reliability Conference (ESREL 2022)* (pp. 3500). Research Publishing Services.

Haavik, T. K., Gjøsund, G., Karlsen, A., & Antonsen, S. (2025). How crises solve organisations: a case study from the Covid-19 pandemic.

Klein, G., Woods, D. D., Bradshaw, J. M., Hoffman, R. R., & Feltovich, P. J. (2005). Ten challenges for making automation a" team player" in joint human-agent activity. *IEEE Intelligent Systems*, *19*(6), 91-95.

Mintzberg, H. (1993). *Structure in fives: Designing effective organizations*. Prentice-Hall, Inc.

Nilsen, A. C. E., & Skarpenes, O. (2022). Coping with COVID-19. Dugnad: a case of the moral premise of the Norwegian welfare state. *International Journal of Sociology and Social Policy*, *42*(3-4), 262-275.

Samfunnssikkerhetsintruksen. (2017). *Instruks for departementenes arbeid med samfunnssikkerhet*.

Satalkina, L., & Steiner, G. (2025). Innovation systems and co-evolutionary development: A systematic literature review. *Journal of Innovation & Knowledge*, *10*(6), 100808.

Schiefloe, P. M. (2025). Holistic Organizational Analysis–the Pentagon Model. *Journal of Organizational Sociology*, *3*(3), 507-537.

Schmidt, K., & Bannon, L. (1992). Taking CSCW seriously: Supporting Articulation Work. *Computer Supported Cooperative Work*, *1*(1), 7-40.

Suchman, L. (1987). *Plans and situated actions: the problem of human-machine communication*. Cambridge University Press.

Suchman, L. (1996). Supporting articulation work. In R. Kling (Ed.), *Computerization and controversy: value conflicts and social choices* (pp. 407-423). Academic Press.

Swedish Civil Contingencies Agency. (2025). *Risk communication with an EU added value: The PreparEU pilot project: Recommendations for coordinated and inclusive actions to enhance population resilience across the EU (Publication No. MSB2626)*.

The Norwegian Parliament. (2024-2025). *Forberedt på kriser og krig*.

Trondheim kommune. (2024). *Helhetlig Risiko- og sårbarhetsanalyse 2024 (HROS)*.

Trondheim kommune. (2026). *Overordnet beredskapsplan - Administrativ del*.

Verlin, J., Antonsen, S., Fiskvik, J. T., Holen, S. M., & Floch, J. (2023). *Model for assessing and enhancing societal resilience*.

Weber, M. (2019). *Economy and society: A new translation*. Harvard University Press.

Woods, D. D. (2015). Four concepts for resilience and the implications for the future of resilience engineering. *Reliability Engineering and System Safety*, *141*(C), 5-9.

Woods, D. D., Chan, Y. J., & Wreathall, J. (2014). The stress–strain model of resilience operationalizes the four cornerstones of resilience engineering. In5th Resilience Engineering Symposium,