



VIRTUAL CENTRE OF EXCELLENCE FOR RESEARCH SUPPORT AND COORDINATION ON SOCIETAL SECURITY

D2.7 GUIDEBOOK FOR KNOWLEDGE SHARING ON SOCIETAL SECURITY

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D2.7 Guidebook for Knowledge Sharing on Societal Security

Abstract: This is the first of three versions of the guidebook to be issued within the SOURCE Network of Excellence. After a general overview of knowledge sharing where the importance of tacit knowledge is highlighted the very challenging conditions for knowledge sharing in societal security are explored. Thereafter follows an exploration of knowledge sharing methods. At the present stage of the action it is mainly based on literature and pre-SOURCE experience.

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Introduction

The overall objective of WP2 in SOURCE is to establish and support a network linking researchers, actors, agencies and institutions most concerned with societal security in Europe. The network will form the core for the future Virtual Centre of Excellence. The challenge lies in the fact that though there are many actors concerned with societal security, they are concerned in widely different ways.

The different perspectives of each security sector on societal security are accompanied for example by different technical languages, different understanding of needs and requirements, different national or cultural backgrounds, and/or different ideologies or philosophies of life. These factors influence how the different stakeholders communicate and collaborate, so that the interaction between the representatives of different stakeholders ranges from easy and smooth to sometimes problematic or even conflictual.

This deliverable will be updated three times during the EU funded SOURCE action to take advantage of gained experience. Within SOURCE this first issue builds primarily on two tasks (with related deliverables). Task (and Deliverable) 2.4 mainly aimed at characterising different modes of interaction of the different sectors and has identified the obstacles which could hinder a successful collaboration. Task (and Deliverable) 2.5 identified a set of tools and methods to facilitate (and also improve) links and interactions between the different security sectors and their respective points of view on societal security. In fact D2.5 can be seen as the '0th' iteration of this D2.7.

For the present report different types of data have been used: (1) literature research on knowledge sharing in general, updated from D2.5, (2) findings of D2.4, (3) results of the online questionnaire which has been developed and conducted in task 2.4, (4) literature research to gather information regarding methods and principles to induce and facilitate knowledge sharing and thus a better understanding of and between the different security sectors, and (5) the team's own experience of concerned approaches, so far predominantly in other setting than SOURCE.

1 Knowledge Sharing – An Introduction

This section discusses knowledge sharing in general, not specifically for societal security.

1.1 What is knowledge?

Knowledge sharing is an activity through which knowledge is exchanged among people or organisations. To understand the preconditions for this we must also have an understanding of knowledge. One famous conceptualisation distinguishes knowledge from information and information from data on the basis of a value-adding process, which transforms collected facts and figures into communicable messages and then into knowledge¹ (e.g. Davenport and Prusak 1998)

- **Data** is a set of discrete, objective facts about events.
- **Information** can be described as a message, usually in the form of a document or an audible or visible communication. As with any message, it has a sender and a receiver.
- **Knowledge** consists of experience, values, contextual information and expert insight that provides a framework for evaluating and incorporating new experiences and information. It originates and is applied in the minds of knowers.

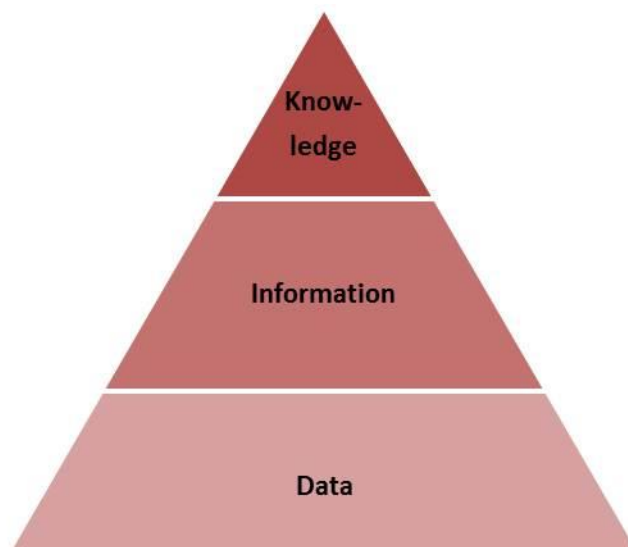


Figure 1 The knowledge pyramid

Another famous conceptualisation distinguishes between **tacit knowledge** and **explicit knowledge**.

Tacit knowledge is the kind of knowledge that is difficult to transfer to another person by means of writing it down or verbalizing it. For example, the ability to speak a language or knead dough requires sorts of knowledge which are difficult or impossible to explicitly transfer to other users. Since tacit knowledge is highly individualised, the degree and facility by which it can be shared depends to a great extent on the ability and willingness of the person possessing it to convey it to others. **Explicit knowledge** is knowledge that has been articulated, codified and stored in certain media like writing. It can therefore be readily transmitted to others. The information contained in encyclopaedias and textbooks are typical examples of explicit knowledge. (Polanyi 1958, Nonaka 1995, Collins 2001)

The two mentioned conceptualisations seem to have been developed relatively independently of each other. It is, however, a reasonable position that “all knowledge is tacit” with the corollary that explicit

¹ Sometimes ‘wisdom’ is placed on top of ‘knowledge’ in the pyramid (Figure 1); see Zeleny (2005).



knowledge is information (Zeleny 2005). Another conceptual contrast with similar or identical meaning is know-that (close to explicit knowledge) vs. know-how (close to tacit knowledge).

Although the sharing of tacit knowledge is a great challenge, there are various helpful activities and mechanisms. They traditionally involve face-to-face interaction like conversations or workshops. Arguably also some information technology tools can be conducive to tacit knowledge sharing such as email, groupware, instant messaging and related technologies (see Section 5.1).

1.2 Knowledge sharing in networks – a literature review

Although there are many reports about knowledge sharing in teams or within organisations or companies, there are only few studies available about inter-organisational knowledge sharing or knowledge sharing in interdisciplinary networks. To be able to learn from the experience of other networks or multi-organisational settings we have conducted a literature review about inter-organisational knowledge sharing. The aim of this review is to learn about possible barriers and promoters of knowledge sharing as well as about best practices in other domains.

1.2.1 What are the barriers and promoters for knowledge sharing?

In a study about knowledge sharing among the different stakeholders involved in the health sector (researcher, policymaker, end-user) it was reported about several barriers due to the different backgrounds and work conditions. (Tsui et al. 2006)

Firstly, academic **researchers** receive only few incentives from universities to participate in non-research activities beyond publishing in peer-reviewed academic journals and presenting at conferences. As knowledge sharing is often seen as something that occurs after the research is concluded, when resources may be exhausted, the knowledge-sharing component is often lost.

Secondly, **policymakers** and their supporting analysts are constantly faced with the daunting task of sorting through a mountain of information to create effective understanding of the situation they are facing. Research evidence is only one source of information among many and may conflict with policymakers' values and the current political climate.

Thirdly, **end-users** face a number of challenges that limit their participation in knowledge sharing. Often, time and resources are not available to engage in knowledge sharing. End-user may also see research evidence as contradictory with their practice experiences. Given that research evidence may be perceived as inaccessible or difficult to understand, it is not surprising that research evidence may be rejected in favour of professional experience.

In another study about knowledge sharing among industrial research scientists Ensign (2008) takes up the task of understanding tacit knowledge transmission within the context of a multinational, multidivisional company. The main finding of Ensign's research is that reputation² matters a great deal

² **Reputation** is defined as an assessment of past behaviour and the expectation of future behaviour. Past behaviour is further decomposed into the nature of the interaction between two scientists (personal/professional interactions, and co-work or co-location interactions), duration of the interaction, and frequency of interaction. Future behaviour is conceptualised as predictability in the interaction, reciprocity, and obligation (or "debt" in information exchange).



in knowledge sharing among scientists, with a favourable reputation of the scientist asking for information resulting in a greater likelihood that the information will be shared. However, contrary to expectation, sharing was less among closer colleagues in terms of reputation component past favourable behaviour – perhaps because of issues of competition. The results are summarised in Table 1. **Error! Reference source not found..**

Table 1: Summary of results of Ensign's (2009) study

Influencing factor	Effect on knowledge sharing
Past favourable behaviour – (personal/professional relationship)	negative
Past favourable behaviour - (Co-work/Co-locate relationship)	negative
Duration of interaction	positive
Frequency of interaction	not significant
Predictability of behaviour	positive
Reciprocity (expectation that the recipient would give help back to the source)	positive
Obligation (imbalance of exchange)	negative
Physical distance	negative
Expertise of recipient	positive
Organisational Connection	positive
(Substantial) Contribution and Uniqueness of Sharing (knowledge cannot be obtained readily from another source)	positive
Time and Effort Required for Sharing	negative

A study conducted by DG Research in 2006 regarding the transnational research cooperation and knowledge transfer between public research organisations and industry highlighted a number of key issues that should be addressed if closer linking between research and industry should be achieved (EC 2006, EC 2007):

- The alignment of interests between a research organisation and a private company within a given Member State is not always straightforward due to the **different agendas and expertise** of the parties;
- Transnational collaboration is additionally hampered by three main factors: **cultural differences** (including language), **legal differences**, and **difficulties in finding partners**.



- Research organisations find it difficult to balance their researchers' desire for **open access** to research results with the need to protect them if they are to become commercially viable products.
- Although not being the sole factor, the differences between existing **legal frameworks** has a strong disincentive effect on transnational collaboration. The main research related barriers are the differences in IPR ownership regimes and joint ownership.

According to McDermott (1999) four key challenges must be overcome in knowledge sharing communities:

- **The technical challenge.** Human and information systems must be designed to help community members think together, in addition to simply making information available.
- **The social challenge.** Communities must maintain enough diversity to encourage innovative thinking, yet still have common goals and interests.
- **The management challenge.** Environments that truly value knowledge sharing must be created and maintained.
- **The personal challenge.** Community members must be open to the ideas of others, be willing to share ideas, and maintain a thirst for new knowledge.

When these challenges are addressed, knowledge-sharing communities can provide opportunities for researchers, policymakers, and end-users to work together and learn from one another.

Lawson et al. (2009) reported about knowledge sharing in inter-organisational product development teams. He came to the conclusion that **informal**, rather than formal, **socialisation mechanisms** are the most important means of facilitating knowledge sharing within the teams. Although formal approaches (like cross-functional teams, matrix reporting structures) provide the structure for interaction, informal social interactions define the roles and processes that underlie knowledge sharing. Knowledge sharing requires the development of trust and shared understandings built up over time and through experience. Informal socialisation tactics help create and maintain this “bank” of goodwill, which enables further collaboration. (Lawson et al. 2009, Cousins et al. 2006, Cousins & Menguc 2006)

In another study of Fey & Furu (2008) about knowledge transfer in multinational corporations it was also stressed that the transfer of tacit knowledge depends on informal interactions among individuals and organisations. It was also reported that even highly sophisticated expert data-bases which have been used in consulting companies as well as in industrial companies do not have the desired effect. The authors concluded that they would recommend a variable pay based on overall multinational company performance as a better substitute to the futile efforts of trying to control behaviour and force knowledge sharing. Of course, this is not applicable in the framework of the SOURCE network of excellence, but nevertheless it proves the importance for knowledge sharing of a **common aim**.

1.2.2 What are the lessons-learned from other disciplines regarding knowledge sharing?

The Handbook of Knowledge Sharing from the University of Alberta (Tsui et al. 2006) formulated three main strategies to overcome common obstacles in knowledge sharing between different sectors:



1. Consider the audience

Knowledge sharing is a process that requires guiding the audience in a particular way of thinking. To do so requires an understanding of the problems they face, the level of detail they need, and the style of thinking they use (cf. McDermott 1999). The message must be one that is valuable to an audience based on their needs, delivered by a messenger they can trust, in a language they are comfortable with. (CHSRF 2002a)

2. Use plain language

If a community of people sharing knowledge spans several disciplines and contexts a common language is needed (cf. McDermott 1999). Thus, the use of plain language is highly recommended whenever possible in knowledge sharing.

3. Tell stories

Evidence itself is not sufficient; it must be communicated in ways that make it compelling. Telling stories may be one way to present research and other forms of knowledge in a way that is appealing to diverse audiences. (CHSRF 2002a)

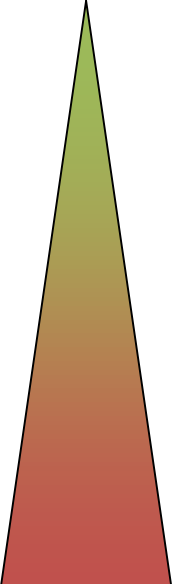
The Knowledge Handbook further points out six characteristics of successful partnerships in research collaborations of partners with different backgrounds (CHSRF 2002b):

- **Cultural sensitivity.** Differences between partners are respected.
- **Trust.** The investments researchers, policymakers and end-users make to engage in a partnership are recognised; disagreements are expected; and ways to resolve conflict are established prior to disagreements.
- **Commitment.** Partners are committed to solving a problem and see research projects as single steps towards the solution.
- **Clear roles and expectations.** All parties are clear about their intentions, assumptions, and limitations at the start of the process. In particular, written partnership agreements can be helpful in ensuring clarity.
- **Partner with the organisation, not the individual.** Partnerships should be between organisations rather than individuals to protect against staff turnover and to increase the likelihood that project outcomes will be used.
- **Organisational support.** Resources such as time and money may be more accessible if employers are supportive of the partnership.

1.2.3 Summary

Table 2 provides a summary of the barriers and promoters of knowledge sharing in inter-organisational and/or interdisciplinary settings. The different aspects are sorted by their personal or technical nature respectively.

Table 2: Summary of barriers and promotors to inter-organisational knowledge sharing

	Barrier to knowledge transfers	Promoters to knowledge sharing
Personal aspects 	Unfavourable behaviour of members	Favourable behaviour of members, trust among different members
	No personal interaction, physical distance of members	Informal socialisation, duration of interaction
	Different aims, goals and interests	Common goals, commitment to reach common aims
	Cultural differences and different languages	Common culture and language or cultural sensitivity and good knowledge of foreign languages
	Lack of time and resources	Willingness to spend time and resources on knowledge sharing
	Use of technical language	Use of plain language, good communication skills
	Different legal frameworks, agendas, organisational settings, management styles and bureaucratic backgrounds	Similar organisational conditions
Technical aspects Technical systems (data bases, information systems) available		Unsuitable technical systems

1.3 Conclusion

This section shows that the success of networks in terms of knowledge transfer does not mainly depend on the quality of data-bases and IT systems, but more on people's commitment and interaction. It should also be pointed out that security – as we shall see in the following section – is a particularly difficult area, both for cognitive and value-oriented reasons. It seems reasonable to assume that the greater the distance in such dimensions, the less useful is it equating successful knowledge transfer with reaching consensus; instead success must be measured as increased understanding of each other's positions.



2 Conditions for knowledge sharing in societal security

In Section 2 we discussed knowledge sharing in general. For the task of this report it is important finding out whether societal security is a simple, average or difficult case. To this end we will first discuss security in general – knowledge sharing across security sectors, between security practitioners and solution providers, as well as between security stakeholders in different countries or regions; the knowledge base here is largely provided by the ETTIS FP7 project. As once proclaimed by ESRIF,³ security is societal, and hence the knowledge sharing problems addressed in Section 3.1 must be of relevance to societal security. However, the character of the SOURCE consortium and network largely derives from the presence of on the one hand security practitioners and solution oriented researchers and on the other more critically oriented security scholars who especially often gather under the banner of ‘societal security’. Therefore the SOURCE specific experience so far is of particular interest, and is discussed in Section 3.2.

2.1 What’s special about security?

In this section we will discuss three attributes that make security difficult to handle in comparison to other “industries”, even when the technology can look similar.

2.1.1 Public good character

Many, if not all, major societal challenges concern the provision of public goods. In the case of security it is hard to identify the beneficiaries of many security activities. Therefore these are typically pursued either by the public sector – as with police and rescue service – or by the operators of certain (more or less) private companies, but under detailed legislation or governmental regulatory arrangements. Examples of the latter include airport security and the protection of nuclear establishments, where operations may be closed down for compliance failure. There are of course also companies making profit from security services. But their operations are typically also constrained by requirements to comply with public legislation and regulation, as well as with industry codes and detailed contracts. Thus the insurance sector is an important player in security governance. All of this means that novel solutions have a lot to prove; even a solution that dramatically improves security performance will be in big trouble in many markets if the cost is even marginally higher than extant and still accepted solutions. Hence demand side characteristics of security makes it necessary to use analogies with the commercial sector only with great care.

The public good character also means that people are often not allowed to decide themselves what security measures they are being subjected to. One public good-related logic here is that if I make choices that compromise security, others rather than I may suffer, e.g. if my poorly secured computer is used in a botnet for criminal purposes against others or if poor security levels at my airport makes it possible for terrorists to attack a plane in flight, use it as a weapon 9/11 styles, or attack at the

³ The European Security Research and Innovation Forum; see http://europa.eu/rapid/press-release_MEMO-07-346_en.htm, full report at [https://www.bmbf.de/files/ESRIF_Final_Report_\(EN\).pdf](https://www.bmbf.de/files/ESRIF_Final_Report_(EN).pdf) (both checked 31 October 2015).



destination airport. Anyway the difficulties in limiting concerned groups makes security particularly sensitive with regard to civil liberties and the like.

2.1.2 A broad scope of low probability events

A defining feature of security services – be they independent or units within larger organisations – is their broad area of responsibility. From the vantage point of the security services the world can be described such that specialised entities take care of a few types of very frequent events – and security takes care of everything else, at least as long as it has potentially negative consequences and requires a quick response (otherwise there are a few other categories with special responsibility for ‘everything else’ like CEOs and receptionists). In sum: security is about being prepared for dealing with a very broad scope of low probability events with strongly negative potential consequences; this is true of extremes like averting catastrophic terrorism but even a department store detective answers reasonably well to this description.

At least as regards the extremely negative consequences security services also have to prepare for events that have not even happened if they are deemed as ‘possible’. Sometimes the term ‘possibilistic thinking’ is used for this risk governance perspective (Clarke 2006; Eriksson and Carlsen 2015).

There is a discourse linked to scholars like Perrow (1984) essentially arguing that increasing complexity leads to more and worse incidents. Without accepting such claims off-hand, at least the *scope* of threats unavoidably increases with complexity. Considering the problem purely from the vantage point of safety (referring only to unintentional threats) this need not be a major problem, due to the extremely low probabilities for many independent rare events occurring simultaneously. If having to consider the possibility of intentional threats, however, anything but a possibilistic stance is insufficient as a first approach, meaning essentially that we have to tend to a booming scope of threats as economic and technological globalisation proceeds. In view of this we need to muster our imagination and creativity to the utmost to anticipate all possible kinds of threats – but also accept that we will never succeed fully in view of inherent limitations to these faculties; this is not least due to developmental openness – e.g. in the form of radical product innovation or new diseases emerging as consequence of mutating infecting agents (Rescher 1998: 134, Tuomi 2012, Eriksson and Carlsen 2015).

In economic terms the arguments outlined suggest that security has little *economies of scale*, elsewhere in the economy an extremely powerful principle whereby extreme specialisation can be utilised to achieve high efficiencies. Instead, to avoid the increasing scope of insecurity leading to financial collapse, security has to rely on *economies of scope*. This means that the same personnel and the same equipment should be possible to use for many different types of task.⁴

To somewhat temper the above dismal picture, fortunately there are normally security measures where this multi-task quality for broad classes of – even unidentified – events comes naturally.

⁴ A further characteristic that hinders specialisation is the emergency character typical for security incidents; the additional effects if problems are not addressed very fast can be dramatically negative. In a somewhat similar activity like non-emergency medicine there is a sophisticated system for finding the right specialist, even for the rarest of conditions. Due to the timeliness requirements security professionals, in contrast, have to be generalists. This does, of course, not exclude that having reach-back access to extreme specialists may be practicable and very useful in emergencies.

Perimeter defences and access controls are broadly relevant as are well-trained cadres of first responders.

Also investment into civic resilience, e.g. in the form of ability among non-specialist employees or the general population for sense-making and rational acting – helping themselves and perhaps their peers – also in new and threatening situations could be a case in point. But this example also indicates yet a problem of relevance for knowledge sharing: security problems can often be addressed by an abundance of approaches. Taking an infrastructure like electricity as example we can decide to see security of service as an entirely provider side problem to be solved by means of technical systems served by professional staff within the utilities. Or we can chose to export the problem to the user side, meaning that the social component of the problem becomes much more prominent; more usual is some combination. This possibility to make very different choices even for the same security problem is a generic feature as will be explicated in the next subsection.

2.1.3 A broad scope of potential solutions

One way of getting a handle on the broad scope of potentially security-enhancing measures just alluded to is the so-called crisis management cycle (also known as the emergency management cycle and the resilience cycle). It exists in slightly different forms, but we will use: *prevention/mitigation – preparedness – response – recovery*, see Figure 2 (NGA 1979, Edwards 2009, Baird 2010, Roche et al. 2013). The phase most in need of explanation to people is usually prevention/mitigation: the latter part refers to activities taken in advance intended to reduce the effect of an incident should it occur – this is often referred to as *vulnerability reduction*; say constructing metro cars in a way that makes an explosion less harmful. Prevention in contrast is about reducing the probability of an incident happening in the first place. Jointly the two are called *risk reduction*.



Figure 2. The crisis management cycle



The multitude of potential security-improving measures is just part of a complex web of inter-dependencies that can easily entail the risk of having significant counter-productive side effects. To this complex web of inter-dependencies adds the fact that the perception of security may both strengthen and weaken security: If people have confidence in security measures they are likely to follow instructions during an incident. But if people have overconfidence in the security professionals they may fail to exercise their own judgment, waiting for instructions that are not forthcoming. And if the public has come to believe that a certain state of affairs provides security, this may be a major hindrance for discontinuation in case the belief is unfounded; some would argue this to be the case with some of the current airport security arrangements.

Studying the phases of crisis management more carefully another categorisation becomes evident, characterised as the ability to deal with *threats vs. sources of security*.

Taking prevention as an example, one threat-centred way of doing this is trying to identify and check suspicious people. Sources-of-security oriented types of prevention is to try to alleviate conflicts and cleavages in society, sometimes called 'root cause prevention'. Going back to our threat-centred prevention type, identification of suspicious people is sometimes – planned or on first responders' own initiative – done according to ethnic profiling; this is an example of something with a potential for counter-productive effects, since the natural frustration in the 'suspect' ethnicities may increase propensities to join extremist groups.

A source of security (mainly) pertaining to other parts of the cycle is so called civic resilience (cf. Section 3.1.2). This can be defined as the ability in ordinary citizens to help themselves and – perhaps – their peers in the recovery phase. Sometimes it is also applied to the response phase – ordinary citizens are normally first on the scene of an incident. The conditions for citizen involvement are changing radically due to people's access to mobile communication and social media.

2.1.4 Summing-up: an innovation-oriented perspective

Adding the obvious fact that security incidents are dangerous situations where the willingness to experiment with novel solutions is very limited for good reasons, it is no wonder if the security sector is less innovation prone than technologically similar commercial industries. Many stakeholder groups may be involved and necessary to convince – e.g. regulators and the public. And furthermore the fact that security is about many types of rare events as well as many different types of solution creates a *knowledge geography* different from the highly specialised industries typical of today's economy. Security in contrast is what has been metaphorically described as a 'sparsely populated' or 'rural' field where experts are likely to have less in common than in a more 'urban' field where many researchers gather around the same problem.⁵ The fact that – at least non-cyber – security incidents are highly localised also in the physical geography further adds to fragmentation; e.g., different countries organise their emergency services very differently.

⁵ This concept is inspired by Becher (1989), in particular the sections on population density and urban and rural scenarios (mainly 151-65).



2.2 SOURCE findings on obstacles to mutual understanding

In task 2.3 of the SOURCE project a sector survey meeting has been performed to learn about how the different actors concerned with societal security interact and where obstacles in mutual understanding and consequently, in reaching a common agreement might lie.

In task 2.4 this issue was investigated further by analysing the results of an **online questionnaire** and using six different studies containing **desktop research** about the different security claims defined in D2.3 (security value, morals, social norms, cultural ideals, political priorities and economics). The results of this report are threefold.

Firstly, we were able to identify the issues and topics of societal security which are especially conflictual. We learned about the **problem-specific obstacles** the stakeholders have to overcome to reach a common security decision and identified the conflictual security aims. For more details please see D2.4.

Secondly, we showed that barriers and disagreements between the different sectors do not only depend on the different professional backgrounds or the technological or specialist knowledge of the actors. The main reason for societal security actors in Europe experiencing difficulties with other sectors seems to be the feeling that they have **incompatible ideologies or philosophies of life**.

And thirdly, we demonstrated that the societal security actors experience **moral and ethical issues followed by social implications to be the most conflictual subjects** to discuss with representatives of other sectors. This also shows that the different specialised knowledge alone is not the main reason for the encountered differences. Instead, it seems that it goes to the heart of our personal moral concepts, our ethical principles and our own priorities how societal security should look like in Europe.

The main aim of the questionnaire, which was developed and distributed in task 2.4, was to analyse the interaction of the different sectors involved in societal security and to identify obstacles and barriers in the cooperation as well as conflictual subjects in discussions. Additionally, the participants were asked to make some **suggestions how to overcome the encountered difficulties** and obstacles. This question was not answered by all participants. However, the received “free text” answers are included in the annex of D2.5.

The answers show that most of the participants are aware of problems existing between the different actors and their different ways of dealing with the societal security topic. Although not all of them formulated it explicitly, it seems that the main reason for the difficulties among the different security sector representatives is a lack of a common understanding regarding societal security in general and a missing mutual understanding and acceptance regarding different perceptions, perspectives, arguments and attitudes.

A minority of the participants (3 out of 25 responses) of the questionnaire seem to be pessimistic that the discrepancies between the different sectors can be overcome. These participants experience the different sectors to be in incompatible thought-worlds and see **deep-rooted discrepancies** between professional needs and perspectives. They have “no suggestion how to overcome the fundamental difficulties with ‘hardliner’”.



Most of the participants suggest having **more face-to-face meetings** between the representatives of different sectors. They state that “more dialogue is needed” and that we should “reserve time-slots for interactive-discussions and comparison of how minor and mayor aspects are perceived and understood”. It was also stated that “language is an ongoing challenge” and that we should use **plain language** and make an effort to “ensure clarity of understanding, reduce jargon, acronyms and ‘insider’ language”. It was also generally suggested to present results in “popular and easy to understand formats”.

To reduce this lack of mutual understanding it was also demanded to **educate** the representatives of the different sectors about the approaches, processes and needs of other sectors. Participants wrote that it would be “useful that the researchers recognised the processes and routines of the policy-makers and that the policy-maker understood the principles of research and the freedom of thinking”. This requires more communication and/or collaboration between the actors concerned with societal security in order to promote the dialogue between them. Knowledge should be shared to improve the understanding of each other, to make points of view comprehensible and to facilitate learning from each other.

In sum the different sectors involved in the SOURCE network of excellence operate with fundamentally different understandings of security threats and societal security in general. They differ considerably in terms of their values, their means and their goals. This is because they grow out of different “knowledge communities”, that is educational and training backgrounds, institutional foundations, different techniques and technologies, and different means for communication and dissemination of their work.

2.3 Knowledge sharing is particularly hard in security

This section has demonstrated that societal security is characterised by particularly challenging knowledge transfer situations. The insight on the key role of tacit knowledge in human communication can explain many of these challenges, particularly when combined with the ‘knowledge geography’ perspective. This will be the theme of Section 4.

3 Understanding cross-sector knowledge creation in societal security: the SECI model

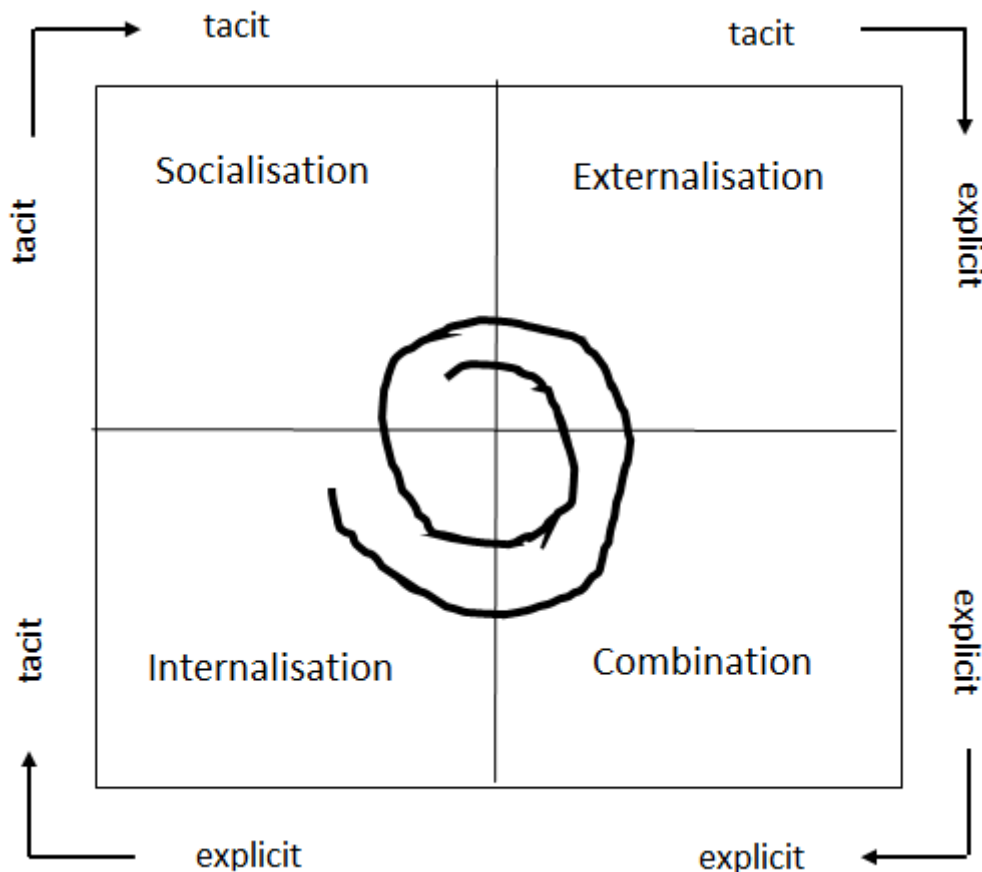


Figure 3: Organisational knowledge creation model of Nonaka & Takeuchi (1995)

Sticking to the ‘knowledge geography’ metaphor introduced in Section 3.1.4, when encountering a problem⁶ requiring knowledge transfer in an ‘urban’ setting it will typically be easy finding ‘interpreters’ – if the problem requires spanning a broad gap, maybe a chain of them. While this could be labelled a tacit approach to tacit knowledge, a more ‘rural’ type of knowledge geography – like in societal security – is likely to require more explicit considerations since able interpreters will not be a more or less free utility as in an ‘urban’ scenario. Therefore we shall now discuss the four so called **SECI modes of knowledge creation** in an explicitly cross-sectoral context, where we assume the ‘knowledge

⁶ Such problems can of course be of very different types. But in the absence of any type of problem motivating the exchange, parties are not so likely to engage



distance' between the sectors at issue – albeit all sectors involving societal security – to be fairly long as is typical of a 'rural' knowledge geography with sparse knowledge communities.⁷

The SECI model of knowledge creation is one of the basic constructs of knowledge management. It can be used to explain the process of knowledge creation in organisations on the basis of knowledge transfer activities. While it has been developed for the business sector, it can also be used to understand how knowledge creation could work in broader networks including different sectors and disciplines. In particular SECI is built on a subtle understanding of the relationship between **tacit and explicit knowledge**. **Error! Reference source not found.** Figure 3 shows the four modes of knowledge conversion according to the model: socialisation (from individual tacit knowledge to group tacit knowledge), externalisation (from tacit knowledge to explicit knowledge), combination (from separate explicit knowledge to systemic explicit knowledge), and internalisation (from explicit knowledge to tacit knowledge) (Nonaka & Takeuchi 1995, Nonaka et al. 1998):

Socialisation is the process of sharing tacit knowledge of individuals. Sharing experiences is a key to understanding others' ways of thinking and feeling.

Externalisation requires the articulation of tacit knowledge and its translation into forms that can be understood by others. Dialogue supports externalisation. In practice, externalisation is supported by the use of metaphors and analogies.

Combination involves the conversion of explicit knowledge into more complex sets of explicit knowledge. Editing and systematising explicit knowledge are keys to this conversion mode.

Internalisation means the conversion of newly created explicit into tacit knowledge of individuals. Learning by doing, training and exercises are important to embody explicit knowledge. Thus on the-job training (OJT) as well as games and simulations are used to induce internalisation of new knowledge.

Cross-sectoral **socialisation** is conceptually straightforward – socialisation involving participants from different sectors. While easy to conceptualise, effective cross-sectoral socialisation over long mental distances is hard to achieve and to our knowledge not a well-researched field. If not possible to mediate by chains of interpreters as sketched above we suggest that certain interaction formats are better suited than others for this purpose; this will be discussed in Section 5.2. One important quality in such formats that should be mentioned right away is the need to iterate between socialisation, externalisation and combination.⁸

In the **externalisation** phases of the iterative process just mentioned but also in other externalisation with a cross-sectoral aim, it is important to keep in mind that externalisation is – practically speaking

⁷ D2.5 presented five so called SOURCE modes of interchange, originating in the grant proposal. In D2.5 these modes were set in the SECI context. Reconsidering that exercise we believe that it showed the SECI modes to be more informative than the SOURCE ones. Therefore the main development here will be in SECI terms, with the SOURCE modes commented in footnotes.

⁸ In D2.5 SOURCE mode 'coordination' is linked to socialisation. While socialisation – creating shared tacit knowledge – is undoubtedly a key component of effective coordination this will also need to involve, as mentioned, externalisation and combination.



– never complete.⁹The immense collections of explicit rules necessary in Artificial Intelligence can exemplify this: essentially every human knows, because we have an in-depth understanding of the concept, that if a person is dead he or she will cease with all intentional activities – but for a computer all this has to be made explicit. Hence explicit knowledge is not independent of tacit knowledge but rests on a foundation of it. It is obvious that the shared such fundament is larger in intra-sector externalisation than in its cross-sector counterpart. Hence cross-sector externalisation needs to be particularly thorough.¹⁰

Cross-sectoral **combination** has already been discussed as part of an iterative process also involving socialisation and externalisation. It would seem almost impossible achieving effective cross-sector combination without some element of such iteration.¹¹

Cross-sectoral **internalisation** is extremely problematic already at the conceptual level if taken to mean that sector A is somehow allowed to internalise their knowledge content into sector B staff, at least if the sectors are professions (and beyond routines where the public at large is a legitimate target group for internalisation – say safer car driving or life-saving training). If accepting each profession's integrity, what could feature under this heading is cross-sectoral **aspects** of internalisation. This could mean, e.g., that police officers are trained to adopt certain routines that are particularly helpful when collaborating with paramedics. This would first require something like combining this new knowledge content with the pre-existing knowledge of the target profession.¹²

⁹ Some might argue that an axiomatic method ensures complete explicitness. However, Lakatos (1976) casts doubts on this by demonstrating how tacit assumptions at least historically have featured prominently also in mathematical research.

¹⁰ In D2.5 two SOURCE modes are linked to externalisation, translation and conceptualisation. A possible distinction is that translation is intended for combination and conceptualisation for internalisation in the other sector. However, below we shall argue that combination is a necessary step in between externalisation and internalisation in another sector. Therefore the externalisation part of the two modes will be similar.

¹¹ The SOURCE mode linked to combination is 'dissemination' of relevant knowledge to the public sphere. Dissemination must be seen as a very special type of combination and it is questionable if it is capable of transferring knowledge as opposed to information.

¹² The SOURCE mode linked to internalisation is (cross-sectoral) 'application'. This could perhaps include also importing best operational practices from other professions simply for reasons of better effectiveness, but would too always require combination with the target profession's extant knowledge base. Anyway this is not cross-sectoral in the same sense as otherwise used here.



4 Overview of knowledge sharing tools and methods

Based on the above analysis we will now make an overview of knowledge sharing tools and methods. In view of the findings above we will particularly be looking for methods with a potential for overcoming large knowledge – or perhaps worldview – distances. The section builds heavily on D2.5 and ‘method profiles’ from there are also rendered in the Annex; these profiles should be seen as work in progress; references in the main text are made with the profile number in parenthesis: e.g. (1).

The first subsection includes the types of tools typically found in knowledge management handbooks. These examples range from the distribution of newsletters, web-based tools to communities of practice. Short descriptions will give a brief overview about the selected examples. This selection does not intend to be an exhaustive list of knowledge sharing tools, but should give a general idea which tools might be useful for the SOURCE project. In the forthcoming tasks the consortium has to verify with external stakeholders which tools could be helpful, attractive and easy-to-use for the SOURCE network.

The overview of knowledge sharing tools is followed by a subsection about interactive methods which are useful for the SOURCE network to increase mutual understanding, mediate between different worldviews or across great knowledge distances and to share knowledge about societal security. In comparison with D2.5 we are here restricting ourselves to methods that the deliverable team has direct experience of. This means that references are made to own work in situations where similar methods likely have been proposed by others, but where no alternative has emerged as dominant.

4.1 Knowledge sharing tools

4.1.1 Newsletters

Newsletters, typically a collection of articles on organisational activities and related topics, can be useful for raising awareness of new ideas and innovations, and also to promote knowledge-sharing activities. Newsletters can reach a broad audience, especially if available both in print and electronic versions. However, because many newsletter articles are intended to reach a broad audience, thus requiring that content be generalised and limited in length, newsletters may be unsuitable for detailed communication. (Tsui et al. 2006)

4.1.2 Media Advisories and Releases

Media advisories and releases are documents sent to the media with the goal of attracting press coverage. A media advisory is a brief tip sheet designed to attract the attention of assignment editors and the attendance of news reporters to an event. A media release is more extensive than an advisory and contains the entire news story, providing all of the information needed for media coverage. (Tsui et al. 2006)

4.1.3 Electronic mailing lists

Electronic mailing lists are a special use of e-mail that facilitates the distribution of information to many users. They are typically organised around a shared interest of some sort and have a list “owner,” who is responsible for setting the guidelines around acceptable content and behaviour of subscribers.



4.1.4 Knowledge Portals

Portals can be defined as single points of access that provide easy and timely access to knowledge. Portals are frequently web-based, allowing creation of distributed documents and making it possible to search for online information. From a technical perspective, the two main features of portals are taxonomies and crawlers. Taxonomies and advanced search engines are essential elements of portals that facilitate navigation. (Uriarte 2008)

4.1.5 Websites

Websites primarily put information “out there” for consumption, with greatly varying opportunities for providing feedback. However, websites have the potential to reach wider audiences than workshops and conferences as anyone interested in a particular topic or organisation can access a website as long as they have a computer and an internet connection.

As the web has become a common resource people turn to when seeking for information, websites become critical to knowledge sharing. Given the sheer amount of information available online well-designed websites are necessary to keep users interested and engaged with the content. (Tsui et al. 2006)

4.1.6 Knowledge Map

Knowledge management tools deal not only with documents but also with information about living experts who provide advice and share their expertise with colleagues. The system is an efficient way of making the “localisation of experts” easy and quick. (Uriarte 2008)

4.1.7 Expert interviews

Interviews – face-to-face, by video, audio or in written form – are obviously an important knowledge sharing methodology, both for actually externalising their tacit knowledge and for knowledge mapping. This method is covered by a method profile (1).

4.1.8 Conferences

Although scientific conferences have traditionally been events for researchers to present and discuss their work, an increasing number of researchers, policymakers, industry representatives and end-user are networking at conferences on areas of shared interest. As conferences often draw participants from larger geographic areas, one advantage is the opportunity to bring together individuals who would not have the chance to interact face-to-face on a day-to-day basis. Beyond the knowledge shared at conferences, opportunities for networking may support the formation or expansion of knowledge-sharing communities. Unfortunately, conferences require a huge investment of time and resources by organisers. Depending on the target audiences, costs of travel and related expenses to attend may be prohibitive. The time required for participation in a conference with duration of a full day or a number of days may be particularly for end-user and policymakers deterrent. (Tsui et al. 2006)

4.1.9 Discussion Forums

Online discussion forums, also known as message boards, internet forums, and bulletin boards are web-based applications that support ongoing discussions. Discussion forums are usually focused on particular topic areas and led by forum moderators whose role is to keep discussions on topic and to censor abusive behaviour. The degree to which moderators intervene and are actively involved in the day-to-day activity of a particular forum varies. (Tsui et al. 2006)



4.1.10 Collaboration Tool

Collaboration resembles a large meeting space in which colleagues work together, even over long distances or at different times of day. They share opinions, calendars and projects. A collaborative environment enables people to work in secure online workspaces, in which they use e-mail, Internet web browser and desktop applications in order to share knowledge, build closer relationships and streamline work processes. Such an environment also encourages colleagues to share information in open discussion forums, thereby providing access to tacit knowledge. (Uriarte 2008)

4.1.11 Wiki and crowdsourcing

Discussion forums and collaboration tools are not distinct. Wikis and crowdsourcing exercises can be seen as intermediate forms. They are presented more in-depth in method profiles (2, 3).

4.1.12 Communities of Practice (CoPs)

A community of practice is a very ambitious 'tool' utilising many of the others. It is a group of people who regularly interact with one another to share and learn based on their common interests (Lesser & Fontaine 2004). Some knowledge-sharing professionals believe that these communities are necessary for both the creation and transfer of knowledge (Estabrooks et al. 2006). The establishment of CoPs may help partners and collaborators overcome four barriers to knowledge sharing (Lesser & Fontaine 2004):

- **Awareness.** CoPs increase community members' awareness of one another's knowledge.
- **Access.** CoPs provide time and space for community members to connect with one another.
- **Application.** CoPs ensure that community members share the common language and understanding necessary to share their insights.
- **Perception.** CoPs create an atmosphere where knowledge sharing among community members is respected and valued.

4.1.13 Conclusion

While many of the conventional tools are undoubtedly useful for SOURCE they are coming from situations where worldviews are more aligned (typically for-profit businesses) and knowledge distances easier to negotiate.

4.2 Workshop-based knowledge sharing methods

Here we will first provide a working definition and then discuss three variations:

- Workshops for broad idea harvesting
- Decision-oriented workshops
- In-depth brainstorming-oriented workshops.

Then we will discuss gaming, which can be seen as special types of workshop, and scenario-based planning. The latter is often performed as a complex system of various types of workshop.



In this subsection only methods where the author team has some level of personal experience have been included.

4.2.1 Working definition

A workshop (cf. method profile 4) is an event or special form of meeting in which a small group works intensively with a limited amount of time on one particular subject. People will meet here in order to jointly develop strategies, solve problems or want to learn from each other. The main characteristic of a workshop is the moderated cooperation towards a common goal.

Moderation means a method to control/steer the communication in working groups, thereby guiding the participants in a cooperative and collaborative way to reach a specific goal or result. In addition to common communication structures, in which the moderator guides and influences a dialogue, moderation should facilitate the motivated and active participation of all workshop members. The aim is a result comprehensible for everyone and jointly developed.

While the participants specifically contribute to the workshop topic the moderator is responsible for the process of discussion, the temporal and structural course and the documentation of the results.

Tasks of a moderator during a workshop are:

- Definition of the aim of the workshop, in collaboration with the 'owner' and typically necessary to 're-negotiate' with the participants,
- Structure of the discussion (dramaturgy),
- Organisational preparation,
- Introduction of the topic of interest,
- Control/steering of the discussion/dialogue,
- Clarification of the content if ambiguities occur,
- Visualisation and documentation of results

The specific workshop character develops when:

- A group of people takes some time beyond their usual work/daily business, to find together a solution for a specific problem,
- The results have influence beyond the workshop,
- The discussion is guided by a moderator (can be an external person),
- External experts may be involved,
- Active involvement of the participants,
- Visualisation of ideas and contributions,
- Flexibility of workshop design in response to group dynamics

Dependent on the purpose one can distinguish different workshops types (Lipp & Will 2008):

- Workshop to "solve a problem"
- Workshop to "solve a conflict"
- Workshop to "develop a concept"
- Workshop to "make a decision"

4.2.2 Workshops for broad idea harvesting

The paradigmatic workshop format for broad idea harvesting is World Café (see method profile 5). The method is built on conversations at tables dedicated to different topics, with participants sequentially



participating in a number of such exchanges. Each table has a host who leads and captures the conversations, typically striving to have later rounds build on earlier ones.

Other formats are computer-based such that groups – again at tables – (or individuals) feed their ideas into a database such that moderators can pick up interesting themes, e.g. by interviewing their originators for everyone to hear.

These types of workshops are likable to most people and provide a fun setting for sharing of – if not knowledge so at least – ideas. They are not designed for in-depth exchange between the participants. As participant you have little influence whether and how the hosts utilise your ideas.

4.2.3 Decision-focused workshops

Decision-focused workshops in contrast strive for a highly controlled process yielding very exact results of high participant ownership. Examples are Weighted-bit assessment as well as some of the workshop steps used in Scenario technique – ‘German school’¹³ (see method profiles 7, 9). In a decision-focused workshop, groups are typically asked to reach consensus on many highly specific assessments. For a group with shared values, outlook or responsibilities such clear decision-focus is often felt as very useful in facilitating a shared description or work programme. But in a more mixed group the approach is liable to several dysfunctions. Some groups revolt and question the utility or legitimacy of, e.g., squeezing a complex reality into a simple digit. Others take the task lightly in a way that calls serious use of the results into question. A common situation is that parts of the group are lost due to dissatisfaction with the approach of the majority or the most vocal section of the group.

Particularly the last dysfunction mode suggests that the discussed type of decision-focusing is seldom an ideal approach for cross-sectoral knowledge sharing. In Sections 5.2.4 and 5.2.5 we will discuss alternative types of decision-orientation, which are more helpful in this regard.

4.2.4 In-depth brainstorming-oriented workshops

The basic idea in brainstorming is not to criticise each other’s ideas; if you feel so inclined – instead come up with something better! In a moderated, in-depth workshop setting, this respect for everyone’s ideas also demands that they be documented. Now, just a long list of ideas is not a useful end product so therefore some decision-making is necessary also here. Some type of voting among the workshop participants is then a common approach, typically such that each participant gets a number of votes to distribute among ideas; often this number is fairly high and it is also common to have different types of votes – e.g. ‘urgent action needed’ and ‘important in the long term’. Clustering of related ideas can usefully be made before or after the voting.

As for method profiles, investigation of influencing factors in Scenario technique is normally done in brainstorming mode (both ‘German school’ and ‘Shell school’; method profiles 9, 10). Method profile structured brainstorming (6) is dedicated to this approach. Well-publicised examples can be found in Eden & Ackerman (1998) and Kepner & Tregoe (1997).

¹³ Particularly analysis of consistency where participants are asked to judge on a scale how consistent state *i* of factor *a* is with state *j* of factor *b*, say e.g., high economic growth with leisure-oriented socio-cultural values.



The mind-set of this workshop type – and also World café – can be compared to the ‘innovation funnel’, well-known from innovation research: It is not possible picking the winners directly, instead, for successful innovation it is necessary collecting first a large number of ideas, then selecting (perhaps after clustering), say, the most promising tenth of those for some kind of preliminary study, then based on the preliminary study results identify, similarly the most promising for, say, some low cost experimental evaluation, than again the most promising for building more costly demonstrators, etc.

For the present purpose, however, it is worth focusing on the more in-depth character of the brainstorming workshop methods as compared to World café.¹⁴ The brainstorming workshop formats either invite participants to briefly write down their ideas or have the moderator help in this formulating exercise; anyway it is a key feature to capture ideas in such a succinct format that all participants can simultaneously get an overview of all ideas and read each individual one; graphical display of ideas is a key feature.¹⁵ While the no-criticism rule applies, asking for explanation is allowed and encouraged. In concert with the demand for brevity, which forces people to concentrate their ideas, this provides a good basis for cross-sectoral knowledge sharing. Also, voting is typically not seen as the final verdict. Rather it is a start of a new phase in the discussion where people can say: “I can’t understand why so many voted for X! Can someone please explain how you reasoned to come to that position!”¹⁶ Hence, used thus voting provides yet an opportunity for cross-sectoral knowledge sharing. In the end a well-managed in-depth brainstorming workshop is normally able to reach consensus on a list of selected ideas. But this consensus was reached in a very different way than demanding consensus at every juncture as in Section 5.2.3.

4.2.5 Manual gaming

Arguably computer games have become the artistic expression most representative of our time. Serious gaming is also used widely, mainly for training – in SECI terms internalisation. Here we will instead focus on learning games, games used by a group of people to explore a part of reality that is not well-understood by them from the start. Gaming means that a sequence of events is simulated such that participants are taking on roles with a decisive influence on the evolution. Some roles – in the extreme case all but one – can be played by ‘game control’. For our purposes gaming can be used to capture and debate views on actors’ likely choices in at least two distinct ways. The normal alternative is, as mentioned, to actually play the key roles and then somehow adjudicate the situation arising due to a round of moves of all players – for the purposes of cross-sectoral knowledge sharing the suitable method of adjudication should be so called free-form gaming, i.e. adjudication is made based on an open discussion rather than based on a predefined rule book (Eriksson & Dreborg 2015). Method profile (8) is along these lines albeit structured by IoS-cards. The other alternative, exemplified by Rand’s Day After format (Molander et al. 1996), is to have the participants play advisors to a high

¹⁴ In innovation funnel terms World café, as suggested by the Section 5.2.2 heading, fits well in the very first idea harvesting phase, in-depth brainstorming workshops more after a first round of studies where, e.g., combination of ideas from different studies might be highly relevant.

¹⁵ The penetration of IT solutions has been surprisingly slow in this field – mostly it’s still flipcharts on the wall being used.

¹⁶ ‘Veto’ votes – i.e. votes meaning that a participant raises serious objections to an idea – can be particularly helpful in bringing out differences of opinion.



level decision-maker; this even means that no game control is needed since the moves can be predetermined – the decision-maker doesn't have to follow advice!

In both the cited cases a game situation is used to create a debate where people are forced to take and defend positions. From the vantage point of cross-sectoral knowledge sharing this can be exploited in ways reminiscent of in-depth brainstorming.

4.2.6 Scenario-based planning

Scenario-based planning is currently a leading approach to business strategy work and also frequently used in public policy with climate change and national security two key applications. The two leading scenario approaches – at least from a European perspective – have been included as method profiles: the 'Shell school' and what we, for lack of a commonly accepted term, have called the 'German school'.¹⁷ They contain workshop elements, some of which have already been mentioned. Scenario exercises can serve the purpose of cross-sectoral knowledge sharing; the Shell tradition has numerous examples of this (Wilkinson & Kupers 2014). It must, however, be kept in mind that serious scenario work is quite costly.

¹⁷ Mietzner and Reger (2005, 228) call it "...a special scenario method in German-speaking countries".



5 Concluding remarks

As clarified at the outset this report will be updated during the conduct of the SOURCE action. Already at this stage a relatively clear picture can be drawn regarding the very challenging situation that characterises knowledge sharing in societal security. A clear search direction can also be indicated for useful methods: they must enable cross-sector sharing of tacit knowledge. In terms of the SECI models this entails iteration between socialisation, externalisation, and combination. Methods with properties like in-depth brainstorming – including certain types of gaming and scenario-based planning – have been identified as useful. They build on respectful debate where moderation is about helping participants convey their positions to one another as clearly as possible. Rushing to consensus too fast is unhelpful.



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Annex: method profiles

1. Direct consultations with external experts by interviews or written input

Origin:	n. d.
Description:	<p>Direct consultations with external experts e.g. through interviews or by asking for written input can broaden and consolidate results gained by in-house desktop research.</p> <p>This method require a network of experts that can be involved as required. While setting up such a network might be time-consuming, it allows high flexibility when responding to specific requests.</p> <p>Building a network of highly qualified external experts is demanding but may be a good extension of in-house expertise.</p>
Equipment:	
Appropriate for: yes partly suitable no	<ul style="list-style-type: none"> • Networking (among participants) • Knowledge sharing • Organisation/documentation of data/knowledge • Identification of complex dependencies • Holistic assessment / Assuring completeness to • Awareness rising • Facilitate communication to • Facilitate common understanding • Mediate between /reconcile different world of thoughts, perspectives, philosophies • Exchange of best practices • Other (please specify):
	High flexibility when responding to specific requests
	Time-consuming (setting up a network of experts, preparation of interview guide, travel)
Minimum number of participants:	1
Maximum number of participants:	5
Effort for organiser:	<p>The level of effort ranges from medium to high.</p> <p>Setting up a network might be time-consuming.</p> <p>The preparation of a good interview guide is challenging and time consuming.</p> <p>Traveling time to visit the interviewees might be extensive. However, telephone interviews can be time saving alternative.</p>



Effort for participants:	The effort for the participant ranges from low to medium and is dependent from the kind of requested input; in comparison to provide a written report giving an interview is less time consuming.
Fun Factor (participant (re-) motivation):	Medium
Active Engagement of participants:	Yes
Dissemination effect:	Medium to high (Easily transferable into a publication)
Other comments:	

2. Wiki Principle

Origin:	The first wiki engine (“WikiWikiWeb”) was published 1995 by Ward Cunningham. Wiki systems reached great public attention through the multi-lingual online encyclopaedia Wikipedia.
Description:	A wiki engine is software that enables the creation of hypertext pages by multiple users. It usually provides an interface that enables authors with only little technical knowledge to create presentable content. The content created can usually be accessed with common web browsers.
Equipment:	Server (to host the database); PC (with connection to the database, e.g. via the internet)
Appropriate for: yes partly suitable no	<ul style="list-style-type: none"> • Networking to • Knowledge sharing • Organisation of data/knowledge • Identification of complex dependencies • Holistic assessment / Assuring completeness • Awareness rising • Facilitate communication • Facilitate common understanding • Mediate between /reconcile different world of thoughts, perspectives, philosophies • Exchange of best practices • Other (please specify):
	Easy to use; easy to access knowledge; creating pages can be fun.
	Author motivation is key to success and sometimes hard to achieve. Some persons are reluctant to share knowledge in online systems.
Minimum number of participants:	1
Maximum number of participants:	Unlimited
Effort for organiser:	Medium: Commercial systems with good support are available. Expert knowledge is necessary to use advanced features.
Effort for participants:	Low: Common PC knowledge is sufficient. No physical presence necessary.
Fun Factor (participant (re-) motivation):	Variable: Depends on interest of participants to create web pages.
Active Engagement of participants:	Yes: It is easy to contribute.



Dissemination effect:	Variable: Content can be limited to a certain audience, but also shared freely through the internet.
Other comments:	Many users may have positive associations to Wikipedia, but sometimes the concept of a wiki is wrongly limited to www.wikipedia.org only. Several dozen wiki engines are available, either for free or associated with licence cost. Wiki engines can usually be customised through add-ons and plug-ins (similar to web browsers). Through these variations they can be adapted to multiple uses. Wiki engines are very resilient concerning wrong use (e.g. erroneous deletion of content): Most errors can easily be corrected or “reverted”.




3. Crowdsourcing

Origin:	The term “crowdsourcing” was first coined by Howe (2006).
Description:	Crowdsourcing in general, is described as being a distributed, problem-solving and production model. The latter aspect is of no interest for the present deliverable. However, the possibility to use it as a problem-solving model makes crowdsourcing a potential knowledge-sharing tool. Normally, problems are sent to a group of unknown solvers in the form of an open call for solutions. The “crowd” that works on these problems normally communicates via various online media and then selects and submits their solutions to the problem. The solution can then be used by the entity that submitted the open call in the first place and the group of users that submitted the successful solution may or may not be rewarded. A concrete model called FLIRT (Focus, Language, Incentive, Rules and Tools) has been developed which uses the principles of crowdsourcing to consider closer collaboration between a company and its customers and online customer communities. One possible advantage of crowdsourcing is the so-called “Wisdom of the crowd” which supposedly leads to better decisions and/or solutions than if only a group of experts is asked (e.g. via the workshop or world café method above), Surowiecki (2004).
Equipment:	PCs, Access to the internet
Appropriate for: yes partly suitable no	<ul style="list-style-type: none"> • Networking • Knowledge sharing • Organisation/documentation of data/knowledge • Identification of complex dependencies • Holistic assessment / Assuring completeness • Awareness rising • Facilitate communication • Facilitate common understanding • Mediate between /reconcile different world of thoughts, perspectives, philosophies • Exchange of best practices • Other (please specify):
	By accessing a wide number of “crowds”, knowledge can be widely disseminated and problems can be discussed and solved.
	The method very much depends on the definition of the accessed “crowds” and the form of the problem that should be solved.
Minimum number of participants:	5
Maximum number of participants:	Unlimited



Effort for organiser:	High (selection of “crowds”, definition of feedback form, mode of using the feedback etc.)
Effort for participants:	Low (once the process has been started, the effort for the individual participant is low)
Fun Factor (participant (re-) motivation):	Medium (depends very much on the problem which is to be solved or the topic which is discussed)
Active engagement of participants:	Yes
Dissemination effect:	Medium (depends on the selection of “crowds”)
Other comments:	This method very much depends on the formulation of the problem or the topic that is to be discussed by the crowds. Also, in its modern form, it normally depends on the usage of online communities, which also need to be pre-selected. After this work has been done, the form of the feedback from these communities has to be given a certain form, so that the initiator of the crowdsourcing can actually use the proposed solutions.

4. Moderated (conventional) Workshops



Origin:	Unknown (Neolithic hunter and gatherer societies?)
Description:	<p>A workshop is an event or special form of meeting in which a small group works intensively with a limited amount of time on one particular subject. People will meet here in order to jointly develop strategies, solve problems or want to learn from each other. The main characteristic of a workshop is the moderated cooperation towards a common goal.</p> <p>Moderation means a method to control/steer the communication in working groups, thereby guiding the participants in a cooperative and collaborative way to reach a specific goal or result. In addition to common communication structures, in which the moderator guides and influences a dialogue, moderation should facilitate the motivated and active participation of all workshop members. The aim is a result comprehensible for everyone and jointly developed.</p> <p>While the participants specifically contribute to the workshop topic the moderator is responsible for the process of discussion, the temporal and structural course and the documentation of the results.</p> <p>Tasks of a moderator during a workshop are:</p> <ul style="list-style-type: none"> • Definition of the aim of the workshop, • Structure of the discussion (dramaturgy), • Organisational preparation, • Introduction of the topic of interest, • Control/steering of the discussion/dialogue, • Clarification of the content if ambiguities occur, • Visualisation and documentation of results <p>The specific workshop character develops when:</p> <ul style="list-style-type: none"> • A group of people takes some time beyond their usual work/daily business, to find together a solution for a specific problem, • The results have influence beyond the workshop, • The discussion is guided by a moderator (can be an external person), • (Optional) experts are involved, • Active involvement of the participants, • Visualisation of ideas and contributions, • Flexibility of workshop design in response to group dynamics <p>Dependent on the purpose one can distinguish different workshop types (Lipp & Will 2008):</p> <ul style="list-style-type: none"> • Workshop to “solve a problem” • Workshop to “solve a conflict” • Workshop to “develop a concept” • Workshop to “make a decision”
Equipment:	Projector, beamer, flipchart, moderation toolkit, pin boards, PC
Appropriate for: 👤 yes	<ul style="list-style-type: none"> • Networking  to  • Knowledge sharing 



<p>☞ partly suitable ☹ no</p>	<ul style="list-style-type: none"> • Organisation/documentation of data/knowledge ☹ to ☞ • Identification of complex dependencies ☞ • Holistic assessment / Assuring completeness ☞ • Awareness rising ☞ • Facilitate communication ☞ • Facilitate common understanding ☞ to 😊 • Mediate between /reconcile different world of thoughts, perspectives, philosophies ☞ to 😊 • Exchange of best practices ☞ to 😊 • Other (please specify):
	<p>Structured process of discussion, well established processes</p>
	<p>Engagement of external participants often difficult due to time constraints</p>
<p>Minimum number of participants:</p>	<p>5</p>
<p>Maximum number of participants:</p>	<p>35</p>
<p>Effort for organiser:</p>	<p>Medium efforts are necessary regarding time for preparation/execution/wrap-up, technical equipment and costs.</p>
<p>Effort for participants:</p>	<p>The effort is low for in-house participants. The effort for external participants might be medium to high due to travel costs and travel time.</p>
<p>Fun Factor (participant (re-) motivation):</p>	<p>Variable</p>
<p>Active engagement of participants:</p>	<p>Yes</p>
<p>Dissemination effect:</p>	<p>Medium</p>
<p>Other comments:</p>	

5. Workshops applying the World Café Method

Origin:	http://www.theworldcafe.com/
Description:	<p>The aim of this method is "awaking & engaging collective intelligence through conversations about questions that matter".</p> <p>The participants sit together at small tables in a casual manner. Usually 3 to 5 people share a table, including one "table host". Each World Café session is usually designed to answer two or three questions. Questions will be answered in discussions held at each table in different rounds (2 or 3 rounds per question); the length of the rounds is about 25-30 minutes each. At the end of each round everyone at the table, except the table host, moves to other tables to further discuss the questions. The table hosts have to provide continuity to the discussions launched at each table.</p> <p>The environment at the workshop needs to be stimulating and informal so that people feel comfortable: they may drink coffee while discussing their ideas and sketch, paint and write on a large paper, the tablecloth. When all the rounds for a question have finished, a conversation guided by a moderator is started to collect the main conclusions and findings of the discussions held at the different tables in order to share them with the audience. The conclusions are summarised by the moderator in a report.</p> <p>The principles are:</p> <ul style="list-style-type: none"> • Set the context • Create a stimulating environment • Discuss questions that matter • Encourage everyone's contribution • Connect diverse perspectives • Share new findings <p>The main factor of success of the World Café is the formulation of interesting and stimulating questions. The World Café method is well suited for stakeholder consultation as it provides exceptional scalability. It is especially useful to generate ideas and to get to a common picture, but should be used with care if concrete answers to specific questions are needed.</p>
Equipment:	Large paper suitable as tablecloth, coloured felt tip pens, flipchart, moderation toolkit, pin boards
Appropriate for: 🟢 yes 🟡 partly suitable 🔴 no	<ul style="list-style-type: none"> • Networking 🟢 • Knowledge sharing 🟢 • Organisation/documentation of data/knowledge 🔴 • Identification of complex dependencies 🟡 • Holistic assessment / Assuring completeness 🟡 • Awareness rising 🟢 • Facilitate communication 🟢 • Facilitate common understanding 🟢 • Reality check regarding technological feasibility 🔴 • Exchange of best practices 🔴 • Other (please specify):

	<p>The World Café method is especially useful to generate ideas and to get to a common picture. All participants have a chance to share their views and ideas, which is sometimes difficult in large “conventional” workshops. The World Café method is easily scalable: It can be applied to groups of 15 to 20 persons, but it can also be carried out with much larger groups.</p>
	<p>It is not straightforward to integrate data or results from other sources (e. g. other workshops, desktop research etc.) The composition of the group influences the direction the discussions take and fewer participants introduce a larger bias.</p>
<p>Minimum number of participants:</p>	<p>12</p>
<p>Maximum number of participants:</p>	<p>2000</p>
<p>Effort for organiser:</p>	<p>Medium effort is necessary for the preparation/execution/wrap-up, for the invitation of participants, the organisation of location and technical equipment. Costs for workshop material are low.</p>
<p>Effort for participants :</p>	<p>The effort for participants is low to medium due to one day for the workshop participation and time for traveling.</p>
<p>Fun Factor (participant (re-) motivation):</p>	<p>The (re-) motivation of participant is high; the participant response is mostly very positive.</p>
<p>Active engagement of Participants:</p>	<p>Yes. The World Café method stimulates the participants to be active and to take a stand.</p>
<p>Dissemination effect:</p>	<p>High (depending on the number of participants)</p>
<p>Other Comments:</p>	<p>Appropriate design and formulation of the question for a workshop is very important. The question will drive the whole workshop. It’s important to create questions that both focus the topic and encourage out-of-the-box thinking. The method is especially useful for highly heterogeneous stakeholder groups.</p>



6. Structured Brainstorming Workshops

<p>Origin:</p>	<p>FOI (Eriksson 2003, Eriksson & Weber 2008) based on Oval mapping technique (OMT; Eden & Ackerman 1998) and scoping for scenario building in the Shell/Global Business Network tradition (GBN; e.g. van der Heijden 2005).</p>
<p>Description:</p>	<ol style="list-style-type: none"> 1. A workshop starts with explaining its role – preferably by the ‘workshop owner’ (the person commissioning it) – and managing the participants’ expectations. It is, e.g., important to agree on the participants’ possibility to comment on results before they are utilised in subsequent work. 2. Next step is to agree to the focus question (or if already determined by the workshop owner: discuss and relate to). 3. Capturing of ideas is different between OMT and GBN: <ol style="list-style-type: none"> a. In the OMT tradition the participants write down their thoughts in relation to the focus question (this is often prompted by the facilitator(s) introducing a few example ideas as inspiration). Typically large oval post-its are used – computerised versions exist but typically require custom-built rooms. The participants are encouraged to continuously post their ovals on a large working wall (typically a large whiteboard or made up of 10-12 flipcharts on a normal wall (slightly overlapping to avoid pen-marks on the wall when numbering and connecting ideas etc....; in Germany Metaplan pin-boards are often used). They are also encouraged to take in the other participants’ ovals – for this to work all must write with broad tip markers. In relation to each other’s input brainstorming rules apply: ask questions of understanding but don’t criticise – instead develop concepts by adding nearby ovals. The facilitator can also ask questions but typically operates in silent mood, moving around ovals at her/his judgment. In addition to thematic clustering – horizontally – it is also strived for having the most obvious causal relationships going upwards with the goal system at the top. Another feature is to see concepts as polar and capture both poles for the relevant problems – often trivial like “high taxes...low taxes” but sometimes more situation specific like “patient and family focus...technology focus”. b. Something like a. – but with more pragmatic clustering rules – can be used also in GBN. More common is, however, round robin prompting where – after a short time for each participant gathering own ideas – the facilitator asks each participant for one idea at a time, which the facilitator(s) then in dialogue help(s) formulate on, e.g., an oval post-it similar to under a. Allow time for at least three rounds. Declare when we start the final round – that may prompt controversial ideas that people have hoped somebody else should raise... If someone has a lot of ideas left to report it can be practical



letting them do that individually as under a. – these ideas will have a handicap vs. the normal ones, but participants should enter ideas in priority order! During the prompting facilitators should try to create clusters; it is useful also trying to have similar clusters nearby – say economics in one corner and environment in another.

4. Tidying and prioritisation. The order between these two can differ. If the number of ideas is reasonably small (say around a hundred or fewer) and/or the participants have reason to see the situation as competitive (e.g. researchers identifying new research topics), particularly in GBN, prioritisation should be made first and tidying/more careful clustering after that. Then clusters are built by putting ‘poor cousins’ (low priority ideas) together with their more highly prioritised relatives. Clustering should always involve dialogue with participants and veto right for idea originators (if they are sure they are – this is not always the case!). In the case where fairness is important clusters should represent comparable levels of granularity (to continue the research example: if all natural science is one cluster while social science is divided into tiny sub-specialities this might be seen as unfair against the latter). In a more broadly exploratory exercise it can instead be productive that a small team (e.g. while participants have lunch) look for more specialised and innovative clusters and attach thought-provoking labels to them; in this case varying level of granularity is rather seen as a benefit (a fair overview can still be established afterwards by assigning clusters to broad categories like economy, environment etc.); also here participants should have their say about clustering. In all cases prioritisation is typically made by individually assigning points to ideas. There may be different types of points (e.g. ‘immediate action required’ and ‘strategic for the long term’) and typically each participant is given a budget – even if not strictly required for the focus question this can create interesting patterns to discuss. There are two main techniques for prioritisation:
 - a. Closed prioritisation can be achieved by a computer-based system (not so sophisticated requirements as for making the whole exercise digital) or by participants handing in their voting results on paper. This method allows more complex voting rules like not putting more than half the budget on one idea or not voting on own ideas). This is applicable when fairness is required for the same types of reason as mentioned above. If the alternatives are not so many, putting all in priority order could be an alternative to point-voting.
 - b. Open prioritisation means that participants see the voting result emerge, e.g., by having votes as small stickers that they physically attach to the ideas. This can be seen as unfair – putting many votes early on an idea might create a bandwagon effect, waiting for most of the others to vote you can affect the order in the top list. But these dysfunctions from a fairness perspective can be helpful in creating more interesting discussion in the next phase!

	<p>5. Normally the voting is just an introduction to more in-depth discussion (but as an exception a short version of structured brainstorming can be used as a 'data dump' where the brainstorming with voting is the end-result). Naturally the post-voting discussion starts in plenary where, e.g. those who think the group 'voted wrong' can ask the others for explanations – and try and swing the group! Almost always it is useful after a while to break up into smaller groups to discuss and elaborate on the most prioritised idea clusters.</p> <p>6. In a ½-1 day workshop we should now be close to done; after a short debriefing from the groups (but be sure to also get more elaborate capturing of discussions!) and a few words to remind of how the process continues (cf. 1), an individual questionnaire on process and content, with some open questions, is often helpful. Not only for continuous improvement of methodology, but also because useful additional content often pops up as afterthoughts.</p>
Equipment:	Oval post-its, flipcharts, good markers, possibly Metaplan moderation toolkit and pin boards,
Appropriate for: yes partly suitable no	<ul style="list-style-type: none"> • Networking to • Knowledge sharing • Organisation/documentation of data/knowledge • Identification of complex dependencies to • Holistic assessment / Assuring completeness • Awareness rising to • Facilitate communication • Facilitate common understanding • Mediate between /reconcile different world of thoughts, perspectives, philosophies • Exchange of best practices to • Other (please specify):
	Structured process of discussion, well established processes, perceived as fair (equal say for all) and inspiring
	Engagement of external participants often difficult due to time constraints, very action-oriented participants may see work as too open-ended
Minimum number of participants:	(5)-12 (a dozen is required for full dynamism)
Maximum number of participants:	20- (50) (a score is maximum for one facilitator)
Effort for organiser:	Medium efforts are necessary regarding time for preparation/execution/wrap-up, technical equipment and costs.
Effort for participants:	The effort is low for in-house participants. The effort for external participants might be medium to high due to travel costs and travel time.
Fun Factor (participant)	High



(re-) motivation):	
Active engagement of participants:	Yes
Dissemination effect:	Medium
Other comments:	

7. Weighted-Bit Assessment Method

Origin:	<p>Originally developed by Fraunhofer INT for the assessment of risk associated with toxic substances. The development was supported by the German “Commission on Civil Protection of the Federal Ministry of the Interior” and the “Federal Office of Civil Protection and Disaster Assistance” (BBK).</p>
Description:	<p>Within a Weighted-Bit Assessment Method (WBAM), a set of items is plotted against a set of yes/no-questions. This is typically done in a matrix with a value of zero corresponding to “no” and a value of one to “yes”. A selection of these values for a given item can be added to give a “score”. Individual values can be weighted by multiplying them with variable values to adapt “scores” to certain problems and/or scenarios.</p> <p>The development and use of a Weighted-Bit Assessment Table (WBAT) can be divided in three phases:</p> <ol style="list-style-type: none"> 1. Development of a set of yes/no questions: This is intellectually challenging, as finding the right set of questions is essential for the success of the WBAT. Great expertise in the subject matter is required for this. 2. Filling the table: All items to be classified have to be assessed concerning the yes/no-questions. Certain subject matter expertise is necessary for this, but less than for defining the questions. The experience gained while filling the table is usually used to refine the set of questions. 3. The filled matrix can be used to find scores for given scenarios and/or create charts by aligning several scores. This is a playful activity that can easily be performed by a group of non-experts under the technical guidance of an expert as a workshop.
Equipment:	<p>PC (spreadsheet programme, e.g. Excel); beamer</p>
Appropriate for: yes partly suitable no	<ul style="list-style-type: none"> • Networking • Knowledge sharing • Organisation/documentation of data/knowledge • Identification of complex dependencies • Holistic assessment / Assuring completeness • Awareness rising • Facilitate communication • Facilitate common understanding • Mediate between /reconcile different world of thoughts, perspectives, philosophies • Exchange of best practices • Other (please specify):
	<p>Very transparent as only addition, subtractions, and multiplications are used.</p>
	<p>Preparing the tables is time-consuming.</p>
Minimum number of participants:	<p>1</p>



Maximum number of participants:	10 per PC
Effort for organiser:	Medium: High for preparing the method. Normal for doing the workshop in step 3.
Effort for participants:	Low: Not even physical presence is required (although beneficial).
Fun Factor (participant (re-) motivation):	Medium: Depends on the step performed.
Active engagement of participants:	Yes: Straightforward and transparent process – everybody can contribute.
Dissemination effect:	Medium: Results can be easily published as plots.
Other comments:	Multiple uses possible, depending on the phase: Phase 1: Intensive discussion among experts concerning relevant questions. Phase 2: Collection of distributed knowledge in a simple to understand format. Possibility to compare individual assessments. Phase 3: Playful assessment of complex matters with experts of various backgrounds.

8. “Serious Gaming” approach using the example of SETAG / DTAG

<p>Origin:</p>	<p>The Disruptive Technology Assessment Game (DTAG) was developed in a military context by task group SAS-062 within the NATO Research and Technology Organization (RTO) framework.</p> <p>The Security Emerging Technology Assessment Game (SETAG) is based on DTAG and was adapted to a civil context within the EU FP7 Project ETCETERA (GA No. 261512).</p>
<p>Description:</p>	<p>Serious gaming is understood as games which do not primarily or solely serve for entertainment but mandatorily include entertaining elements. Common aspects of serious games are the aims of transferring information and equipping people with knowledge. Serious games intent to close the gap between education and practical application and exploitation of knowledge.</p> <p>Serious gaming in the field of security addresses e. g. civil protection, disaster management, the defence sector etc. with the involvement of public, private and local institutions like fire departments, police, crisis management centres and NGOs. Scenarios like natural disasters, acts of terrorism, emergency preparedness and response can be simulated by serious gaming.</p> <p>The Security Emerging Technology Assessment Game (SETAG) is based on the Disruptive Technology Assessment Game (DTAG), which was originally developed to evaluate innovative technologies and systems for defence purposes. The goal of the original game was to identify those technologies that can be “disruptive” to military operations. These technologies could rapidly change the way military operations are conducted and thus influence long-term goals and strategies.</p> <p>During the FP7 ETCETERA project, the military DTAG was modified to assess the relevance of Emerging Technologies for security purposes. In contrast to the DTAG methodology, the this modified game does not focus on the disruptiveness of technologies, but on possibilities future technologies could provide. The name was therefore changed to Security Emerging Technology Assessment Game (SETAG).</p> <p>The SETAG concept revolves around cards representing future equipment and scenarios to which these cards can be applied, pictured on a game board. The game is played by two teams of end-users. Each team has a hand of cards with descriptions of innovative technological concepts described as futuristic systems, called 'Idea of Systems' (IoS, or in the game as IoS-cards). The game board has fields that represent operational situations. As the teams act on the game board, they move from situation to situation, answering a set of predefined questions related to the use of IoS-cards in the situations encountered. The goal for each team is to optimally apply the available IoS-cards to the situations. (Besselink et al. 2013)</p> <p>It is up to the teams to:</p> <ul style="list-style-type: none"> • Determine what operational challenges a situation poses to the response organisations • Describe how the IoS-cards can provide a solution to these operational challenges

	<ul style="list-style-type: none"> • Share their ideas with the other team and discuss alternative solutions
Equipment:	Game board, IoS-Cards
Appropriate for: yes partly suitable no	<ul style="list-style-type: none"> • Networking • Knowledge sharing • Organisation/documentation of data/knowledge • Identification of complex dependencies • Holistic assessment / Assuring completeness • Awareness rising • Facilitate communication • Facilitate common understanding • Mediate between /reconcile different world of thoughts, perspectives, philosophies • Exchange of best practices to • Other (please specify):
	Open discussion triggers the game and allows for gathering new insights. The game combines theory and practice and is considered dynamic and entertaining to play. Possibility to feed results back into the main work stream of a project.
	The preparation of the game, especially the creation of the Idea-of-System cards, needs great effort. Adapting the serious gaming to new purposes needs great effort.
Minimum number of participants:	The SETAG was designed for a relatively small number of participants. It is to be played with two teams and each team ideally consists of 4 to 6 people. The total number of participants will therefore be somewhere around ten per session. This number of participants allows for productive plenary discussions. If the group is larger, it could be more difficult to have an interactive group discussion.
Maximum number of participants:	6 participants per group can be considered as the maximum number to allow fruitful discussions and not jeopardise possible contributions from any player.
Effort for organiser:	Serious gaming needs considerable time for preparation execution/wrap-up. The costs for the workshop are at a medium level.
Effort for participants:	The effort is at a medium to high level due to the duration of the workshop for the game and the time for traveling to the workshop venue.
Fun Factor (participant (re-) motivation):	High
Active engagement of participants:	Yes
Dissemination Effect:	High
Other comments:	The effort necessary for conducting a serious game for the first time is considerably higher than for a repetition of the same game.

9. Scenario Technique ('German school')

<p>Origin:</p>	<p>The scenario technique was originally developed in a military context (Rand Corporation) but was adapted and further developed in corporate, technological or societal settings. The 'German school' (not a commonly accepted name but cf. Mietzner & Reger 2005) has its background in the Battelle version of Cross-impact analysis. Currently there exist several, mainly academic, centres without a strong shared identity (e.g., von Reibnitz 1988, Gausemeier et al. 1998, Scholz & Tietje 2002, Weimer-Jehle 2006).</p>
<p>Description:</p>	<p>The scenario technique is a core tool in applied future studies. It supports the systematic identification and evaluation of future trends and uncertainties. When determining and judging the drivers of these developments, particular emphasis is placed on the interactions between them.</p> <p>Using scenarios, pictures of the future that are both plausible and intrinsically consistent can be drawn up. Scenarios involve the participants and factor in their interests, so as to translate the challenges of the future into effective, strategic actions.</p> <p>In practice scenarios are based on the systematic analysis of relevant influencing factors, key factors and directions of development leading to the development of consistent alternative pictures of the future for selected topics.</p> <p>The scenario process is complex and can lead to a very broad set of results, not only including drivers and barriers of a topic (e.g. a particular technology), but also a multitude of societal perspectives. The analysis of a topic using the scenario technique does not only involve e.g. the technical feasibility of a technology, but also considers user demands and social aspects, political and framework conditions, industrial systems and infrastructures, the education and research system, and the interrelated dynamics of these elements.</p> <p>The scenario process consists of the following steps:</p> <ul style="list-style-type: none"> • Scenario preparation: <ul style="list-style-type: none"> - Determination of the objective - Definition of the field of interest • Analysis of the scenario field: <ul style="list-style-type: none"> - Investigation of influencing factors - Analysis of interconnections - Identification of key factors • Scenario prognostic: <ul style="list-style-type: none"> - Projections for the key factors related to the selected time horizon • Scenario construction: <ul style="list-style-type: none"> - Analysis of consistency - Calculation of scenarios • Scenario implications: <ul style="list-style-type: none"> - Workshop on the impact of selected scenarios • Development of strategies: <ul style="list-style-type: none"> - Workshop on the identification of necessary actions - Compilation of action options
<p>Equipment:</p>	<p>PC, software for scenario development, workshop equipment like beamer, flipchart, moderation toolkit, pin boards</p>
<p>Appropriate for:</p>	<ul style="list-style-type: none"> • Networking to



<p> yes partly suitable no </p>	<ul style="list-style-type: none"> • Knowledge sharing • Organisation/documentation of data/knowledge • Identification of complex dependencies • Holistic assessment / Assuring completeness • Awareness rising • Facilitate communication • Facilitate common understanding • Mediate between /reconcile different world of thoughts, perspectives, philosophies • Exchange of best practices • Other (please specify):
<p></p>	<p>A scenario process should be conducted if broad stakeholder involvement is sought and transparency is a key requirement. Scenario processes can be used for the assessment of broad conditions for the development of a topic of interest. The whole scenario process can foster the process of gathering insights about a new topic and can contribute to a common understanding.</p>
<p></p>	<p>Carrying out a scenario process is a very expensive method since the process of preparing, conducting, and evaluating scenarios, expert interviews and scenario workshops is very labour-intensive. 3-4 People are needed to prepare, organise and conduct the whole process. As the scenario process is complex, participants might find it hard to understand. In particular, since the scenario sets comes as result of a computer model run participants will likely have problems developing a shared understanding of the logic of each scenario (in contrast in Shell school this logic is central throughout the work process)</p>
<p>Minimum number of participants:</p>	<p>15</p>
<p>Maximum number of participants:</p>	<p>40 (many more can be involved in a sequence of workshops)</p>
<p>Effort for organiser:</p>	<p>The costs for workshops and workshop equipment are at a medium level. However, costs for personnel are high.</p>
<p>Effort for participants:</p>	<p>The effort for the participant is low, if an interview is conducted. The effort regarding the participation in a scenario workshop is at a medium to high level due to its duration and the time for traveling to the workshop venue.</p>
<p>Fun Factor (participant (re-) motivation):</p>	<p>Variable, mostly medium to high</p>
<p>Active Engagement of participants:</p>	<p>Yes</p>



Dissemination effect:	High
	<p>The process requires substantial involvement of experts from different backgrounds concerned with the topic of interest to ensure a holistic reflection of all relevant perspectives.</p> <p>A high amount of communication and discussion about the topic of interest is mandatory.</p> <p>The complexity of the process should be carefully balanced with the size of the scenario workshops involving external experts. End-users sometimes experience the scenario technique as too academic. Therefore, the overall aim of the exercise should be carefully explained to all participants.</p> <p>Execution of the scenario workshops is especially suitable for assessing one specific topic of interest (e.g. one technology) or one topic area (e.g. a technology area), as dealing with diverse topics or topic areas might overstrain participants.</p>

10.Scenario Technique ('Shell school')

Origin:	The 'Shell school', despite being the world leader is here described in contrast to the 'German school'. The 'Shell school' aka 'intuitive logics' has a longstanding centre at oil company Shell. Other centres are consultancy Global Business Network (GBN) in addition to numerous other academic and consultancy centres. In contrast to the 'German school' the common background is well acknowledged (Schwarz 1996, van der Heijden 2005, Wilkinson & Kupers 2014)
Description:	Despite the greater self-awareness the Shell school seems more methodologically diverse than the 'German school'. Generally the approach is more holistic and both diachronic issues (the path from now to the scenario time horizon) and the synchronic ones (society at time horizon) are considered.
Equipment:	Workshop equipment like flipchart, moderation toolkit, pin boards
Appropriate for: yes partly suitable no	<ul style="list-style-type: none"> • Networking to • Knowledge sharing • Organisation/documentation of data/knowledge to • Identification of complex dependencies • Holistic assessment / Assuring completeness • Awareness rising • Facilitate communication • Facilitate common understanding • Mediate between /reconcile different world of thoughts, perspectives, philosophies • Exchange of best practices • Other (please specify):
	Largely similar to 'German school'; however, more of shared understanding is created in intuitive logics – here this is the main method, in the German school more done by way of interpreting model results.
	Largely similar to 'German school'; Shell has been criticised as more subjective (Lloyd & Schweizer 2014)
Minimum number of participants:	Similar to 'German school'
Maximum number of participants:	Similar to 'German school'
Effort for organiser:	Similar to 'German school'
Effort for participants:	Similar to 'German school'
Fun Factor (participant)	Similar to 'German school'



(re-) motivation):	
Active Engagement of participants:	Similar to 'German school'
Dissemination effect:	Similar to 'German school'
Other comments:	Similar to 'German school'