engage2innovate

State of the Art in Social Innovation, RRI and Engagement in the Security Field

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Authors
Lena Dubinsky
Naama Eliraz
Caroline L. Davey
Andrew B. Wootton
Dagmar P. Heinrich

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Contributors

Name	Organisation
Lena Dubinsky	BEZ
Naama Eliraz	BEZ
Professor Caroline L. Davey	USAL
Professor Andrew B Wootton	USAL
Dr Dagmar P. Heinrich	USAL

Peer Reviewers

Name	Organisation
Dr Avner Molcho	BEZ
Dr Elad Persov	BEZ
Vered Shapira	BEZ
Dr Claudia Heinzelmann	DPT

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Table of Abbreviations and Acronyms

Abbreviation	Meaning
E2i	Engage2Innovate
RRI	Responsible Research and Innovation
SI	Social Innovation

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1. Introduction

> *"If the only tool you have is a hammer, it is tempting to treat everything as if it were a nail."*
>
> *Abraham Maslow, 1966*

Engage2Innovate (E2i) critically examines the prevailing technology-centric view of innovation and advocates for a broader understanding that encompasses social, process, and organisational innovations, among others.

E2i represents a broader movement that seeks to redefine innovation in a way that fully captures the complexity of human and societal needs. We advocate for an approach to innovation that is inclusive of, but not limited to, technological solutions, emphasising the importance of understanding and addressing the root causes of societal challenges. This perspective encourages a more holistic and interdisciplinary approach to innovation, recognising the value of contributions from fields outside of the traditional tech sector. One such field is Social Innovation.

1.1 The role of social innovation

Social Innovation is a human-centred approach to developing meaningful solutions rooted in a rich understanding of end-user contexts, such that novel ideas (inventions) are carried into practice — and implemented.

Through effective engagement with security practitioners, researchers, and policymakers across the quadruple helix, E2i champions good practice in Social Innovation and human-centred design. Researchers will demonstrate and deliver the E2i Security R&I Toolbox:

1. Enabling adoption of Social Innovation and human-centred design approaches to engage citizens and end users in security R&I
2. Supporting security R&I actions in framing and designing security solutions and outputs and optimising their acceptance and adoption
3. Providing benchmarks, standards, and quality criteria for security solutions through Responsible Research and Innovation; and thereby
4. Strengthening EU security research and innovation.

To promote the engagement of end-users and citizens, E2i will develop a

Societal Development Plan describing the current landscape of Social Innovation. This toolbox will guide how the approach can strengthen EU security research and innovation and include an explanatory conceptual model and practical exemplars to inspire and motivate. Finally, E2i will build on the enthusiasm and inspiration of the next generation of researchers and design thinkers through two international Social Innovation Design Challenges, showcasing new innovative thinking and solution concepts while fostering the adoption of E2i outputs (E2i Delivery Plan).

1.2 Review of wider literature on Social Innovation, RRI and citizen and end-user engagement

This report presents findings from Task 1.2: *Review of wider literature on Social Innovation, Responsible Research and Innovation (RR&I) and citizen and end-user engagement*. The objectives were:

- To review and develop a critical synthesis of empirical and theoretical literature on social innovation, Responsible Research and Innovation (RRI), and citizen and end-user engagement.
- To comprehensively review the application of Social Innovation in security and related research programs supported by the EU and other funding bodies.

Led by Bezalel Academy of Arts and Design (BEZ), Task 1.2 reviewed and developed a critical synthesis of empirical and theoretical literature on Social Innovation, Responsible Research and Innovation (RRI) and citizen and end-user engagement in security research projects. This Task aimed to review the state of the art, assess the strength of evidence, identify existing and potential guidelines for practice and policy making, and highlight areas for future research. The resulting report (deliverable D1.2) will enable the E2i consortium to consider relevant concepts and arguments and engage with and inform debates in the field.

2. Social Innovation

2.1 Defining Social Innovation

Social innovation is defined by Phills *et al* (2008) as *"... a novel solution to a social problem that is more effective, efficient, sustainable, or just than existing solutions"* (p. 38), while Albury and Mulgan (2003) suggest social innovation is about developing new ideas to tackle social problems or meet social needs. A social innovation may be a new product, service, initiative, organisational model or approach to the delivery of a service.

'Innovation' is both a process and a product, and may be conceived of as: (i) an organisational **process** that produces novel thinking or outputs, that is dependent on individual creativity, organisational structures and context; and (ii) an **outcome** of this process, such as a new product, product feature and production method. To be considered an innovation, the resulting process or outcome must meet two criteria *(ibid)*:

- *Novelty* – an innovation need not be original, but must be new to the user or context, or be a new application
- *Improvement* – an innovation must be a more effective, efficient, commercially viable or sustainable solution than existing products or processes.

The 'social' component is central to the concept of social innovation — but is interpreted differently by different people. Leading thinkers in the field use 'social' to signify a range of attributes of this class of innovation, including:

- That it addresses a social problem or need
- That the process is guided by social motivations or intentions
- That the result provides a positive social impact of some sort
- That the innovation process is led by or involves not-for-profit, civil society organisations or government bodies — sometimes referred to as the 'social sector'.

Phills *et al* (2008) suggest that the term Social Innovation should be used to describe innovations that address social problems, benefitting wider society (rather than simply private individuals) on the grounds that there is some consensus about what constitutes a social need or problem or what might

be a social objective. Such objectives include improved health, better education, justice, fairness, environmental sustainability, and greater access to arts and culture *(ibid)*.

Social innovations produce a kind of value that is generally considered as being distinct from financial or economic value — i.e. goes beyond the private gains and general benefits of market activity (Jessop et al., 2013):

> *"Many innovations tackle social problems or meet social needs, but only for social innovations is the distribution of financial and social value tilted toward society as a whole"* (Phills *et al,* 2008. p. 39).

As a consequence of such a broad and differently interpreted definition and a wide use of jargon (often reusing terms that are already in use in other fields, but to mean something different), it is perhaps unsurprising that 'Social Innovation' has come to encompass a rather wide range of initiatives, including: creating products or services that address social needs; making changes in social practices; developing alternative organisational models; and introducing new methods for social interaction. Indeed, for some researchers, there has been so much discussion about the meaning of social innovation (Edwards-Schachter & Wallace, 2017; Moulaert, 2013) that *"the term is 'overdetermined'"* (Edwards-Schachter & Wallace, 2017, p. 64).

2.2 Key characteristics

The previous section observed that social innovation may be considered both an outcome and a process. Below is a list of other characteristics of Social Innovation drawn from the literature:

- **Novelty** – Social innovation is the creation of new solutions, models or approaches that differ from existing practices. It may combine elements from various fields, challenge conventional thinking, or adapt existing ideas to new contexts.
- **Aims to address a social issue** – The primary goal of Social Innovation is to bring about positive and meaningful change in society. It often targets social issues such as poverty, poor health, inequality, environmental sustainability, education and community development.

Safety and security – a social aim?
Improved safety and security are goals that are seen as integral to citizen's quality of life, a key aspect of sustainability, and can therefore be considered within the concept of Social Innovation.

- **Is primarily aimed at achieving positive and meaningful social change — rather than this being a byproduct** (Porter & Kramer, 2011) – Social Innovation initiatives seek to improve the quality life[1] of *"society as a whole"* or of specific groups through participatory methods and gaining innovative perspectives. Such efforts aim to address not only immediate needs, but also foster societal wellbeing over the longer term. Some projects addressing social exclusion, discrimination, and various inequalities between social groups explore new forms of innovation and promote international cooperation, striving to create more inclusive and equitable societies (Falzetti, 2013).
- **Empowerment** – Many Social Innovation projects aim to empower participating individuals (e.g. marginalised groups) by providing them with tools, resources, or opportunities to better participate in decision-making processes, and thereby improve their lives. Marginalised individuals and groups are those that experience discrimination and exclusion due to social, political and economic factors and/or unequal power relationships (IPBES, n.d., see here).
- **Collaboration and engagement** – Social Innovation often involves collaboration among diverse stakeholder groups — including governments, nonprofits, businesses, academics and communities. Indeed, to address complex social challenges, cross-sector partnerships are often necessary. This should be meaningful engagement where research with end-users and other key stakeholders is used to better understand and frame problems and prototype test solutions. It should not consist of: 'tokenistic' representation (so-called "window-dressing"); poorly-managed processes; or inappropriate research methods that fail to provide insight into problems or issues (Davey & Wootton, 2016). There are three main models for collaboration that are discussed in the

[1] Standard indicators of the quality of life include wealth, employment, the environment, physical and mental health, education, recreation and leisure time, social belonging, religious beliefs, safety, security and freedom, see link.

literature as contributing to the implementation of Social Innovation projects — the Triple-Helix Collaboration (Easton & Dormaels, 2019); the Quadruple Helix collaboration models (Nguyen & Marques, 2022; Roman *et al.*, 2020); and the Quintuple Helix Model (Carayannis & Campbell, 2011a, 2011b; Carayannis *et al.*, 2012). These are discussed in **Section 2.4**, below.

- **Trust** – According to Ley & Sommerfeld (2013), the principles of cooperation, inclusiveness and trust are foundational to achieving a better understanding of the needs of community members and providing sustainable development that relies on long-term collaborative relationships (Ley & Sommerfeld, 2013). The engagement of citizen, community, and civil society organisations contributes to social innovation by identifying and organising services and advocacy activities and addressing various societal needs (for example, from the health sector, see Beinare & McCarthy, 2012).
- **Cross-sectoral connections** – Cooperation between the science, business, and government sectors has been shown to be a valuable characteristic of the innovation process when taking a regional perspective (Puślecki, 2015; Bosworth *et al.*, 2016).
- **Compatibility with context** – Also termed 'place-specificity' or 'placeness', this ensures that the innovation project can be successfully anchored into the social and political fabric, as the solution is tailored to a specific situation or environment (for example, from the digital transformation field, see Zhu *et al.*, 2006; and from the urban development field, see Moulaert *et al.*, 2007).

While not all the above characteristics need to be present in every Social Innovation project, they nevertheless emphasise the importance of engaging a wide range of stakeholders in creating socially and ethically responsible innovative solutions — from local communities to international bodies.

Franz *et al.*, (2012) argues that social characteristics should be included in *both* the process and its outcome / result (Franz *et al.*, 2012). In other words, it is not enough that the outcome of an innovation performs a social good, the process of its creation should also include a social engagement aspect.

2.3 Community of social innovation practice

Social Innovation engages a wide range of stakeholders from policymaking, the private and academic sectors to the business sector, while sometimes focusing on community and civil society representatives. Social Innovation involves reevaluating social networks while fostering innovation in community relationships, achieving human development goals and enabling the socio-political empowerment of underrepresented groups.

Depending on how one chooses to interpret 'social innovation', things can get rather complicated. For example, according to Jessop *et al* (2013), the *"implementation of Social Innovation"* requires the development of new forms of social learning oriented towards the production of knowledge, as well as fostering collective, problem-oriented learning. In terms of the innovation process recognised by designers, this may appear somewhat overblown.

2.4 Models of Social Innovation

Collaborative efforts between the state, business sector, academia, and community have been modelled in relation to Social Innovation:

- **The Triple-Helix Innovation Model** – This is an approach that emphasises collaboration between three key actors: government, industry, and academia. Originally proposed by Henry Etzkowitz and Loet Leydesdorff (1995), this model suggests that innovation is most effective when these three spheres work together in a dynamic and mutually beneficial relationship. This model underscores the importance of collaboration in multi-stakeholder, multicultural environments, with improved communication between diverse groups increasing the potential for innovative projects and implementation (Straka 2019). Various authors suggest that this is one of the most promising cooperation models (Easton & Dormaels, 2019; Viktorova *et al*., 2019). Interorganisational collaboration is said to contribute to the development of innovative approaches, but evaluations of the impact of such projects has revealed variable results (Faems *et al*., 2005; Johnson, 2008).
- **The Quadruple Helix Innovation Model** – The quadruple Helix Model adds the *"third sector"*—civil society, community, and citizens. According to Carayannis & Campbell, 2011b, *"the Quadruple Helix*

embeds the Triple Helix by adding as a fourth helix the 'media-based and culture-based public' and 'civil society'" (Carayannis & Campbell, 2011b, p.1). The engagement of the community/citizens ensures that the development will meet actual societal needs and promote sustainability of developments and of collaborative networks (Nguyen & Marqués, 2021). Quadruple-helix innovation architecture (Q-HIA) proposes a working model that fosters engagement and supports cooperation between different sectors (MacGregor *et al.,* 2010; Roman *et al.,* 2020).

- **The Quintuple Helix Innovation Model** – Not to be outdone, the Quintuple Helix innovation model is broader and more comprehensive by contextualising the Quadruple Helix and by adding the helix (and perspective) of the *'natural environments of society'* (Carayannis *et al.,* 2012, p. 1). Dr. Elias G. Carayannis, a Professor of Science, Technology, Innovation and Entrepreneurship at George Washington University, has conducted research in the areas of innovation, entrepreneurship, and sustainability (Carayannis & Campbell, 2011a, 2011b; Carayannis *et al.*, 2012). The Quintuple Helix stresses the necessary socio-ecological transition of society and economy in the twenty-first Century, seeing the natural environments of society and the economy as drivers for knowledge production and innovation. According to Carayannis *et al,* 2012, "*Global warming represents an area of ecological concern, to which the Quintuple Helix innovation model can be applied with greater potential*" (p. 1). In positioning environmental challenges as drivers for knowledge and innovation, this model has the potential to help advance society, economy, and democracy (Carayannis *et al.,* 2022).
- **'Benefit of society as a Whole'** and the **'Benefit of the Underrepresented' –** In 2014, the Organization for Security and Co-operation in Europe (OSCE) identified two distinct approaches within the field of Social Innovation: (i) *Benefit of Society as a Whole* – focuses on creating solutions and initiatives that aim to benefit society at large by addressing broader societal challenges, enhancing well-being, and contributing to positive social change on a large scale; and (ii) Benefit of the Underrepresented – this approach to social innovation directs attention specifically on marginalised or underrepresented groups within society. The emphasis being on developing solutions that address their unique needs, challenges, and opportunities. This approach seeks to reduce inequalities and ensure

that the benefits of social innovation are inclusive and reach those who may be disadvantaged or marginalised.

Further information – The Organization for Security and Co-operation in Europe (OSCE)

Bringing together 57 states, the OSCE has a comprehensive approach to security encompassing politico-military, economic, environmental and human aspects. It addresses a wide range of security-related concerns, including arms control, confidence- and security-building measures, human rights, national minorities, democratisation, policing strategies, counter-terrorism and economic and environmental activities, see here. Numerous resources are available on the OSCE website, see here.

From the list presented above, the value Social Innovation places on collaboration across different groups, disciplines and sectors is clearly evident.

2.5 Approaches and methodologies for Social Innovation

The literature on Social Innovation reveals a number of approaches and methodologies:

- **Community-based innovation** – such approaches involve engaging local communities in the co-creation of solutions to address their specific needs and challenges. It emphasises the importance of local knowledge, participation, and empowerment. The inclusion of local communities and civil society organisations (CSOs) in research and innovation can support identification of specific needs and help drive policy change (Beinare & McCarthy, 2012).
- **Corporate Social Innovation (CSI)** – Corporate Social Innovation refers to the process by which businesses integrate social and environmental concerns into their core business strategies and operations to create positive social impact while driving innovation. CSI aligns with the concept of the triple bottom line, which considers not only financial performance but also social and environmental impact. Companies measure success by their contributions to people, planet, and profit. CSI goes beyond traditional corporate social responsibility (CSR) practices, which often involve philanthropy and charitable contributions. CSI opens up possibilities for solving social problems by allowing businesses

to innovate, while reaching their economic goals and also offering new business models for a more responsible future (Dionisio & de Vargas, 2020). In combining social goals with commercial impact, this links to the concept of the social entrepreneur.

- **Social entrepreneurs** – A "social entrepreneur" is an individual who pursues innovative solutions to social problems. Rather than primarily aiming for profit, social entrepreneurs focus on creating social value and addressing societal issues through the establishment of enterprises or initiatives that have a positive impact on the community, environment, or society at large. They combine the passion of a social mission with business-like discipline, innovation, and determination commonly found in the entrepreneurial business world. Social entrepreneurs identify areas where traditional forms of public and private sector organisations are not effectively meeting societal needs and they seek to fill these gaps. Their ventures can cover a wide range of areas including education, health, environmental sustainability, and social justice, among others. These entrepreneurs are often seen as change agents for society, creating social capital without necessarily measuring performance in profit and financial return in the traditional sense. Instead, they measure their success in terms of the impact they have on the society and the extent to which they are able to address the social issue they are concerned with. Social entrepreneurs can be used as a bridge between cooperation systems that include public, private, and third-sector representatives (Battisti, 2019).
- **Participatory research methods** – such methods involve active collaboration between researchers and the individuals or communities that have a stake in the problem being addressed or implementing the social innovation being designed. The goal is to engage participants in the research process, empowering them to contribute their knowledge, perspectives, and experiences. Participatory research emphasises mutual learning, shared decision-making, and the co-creation of knowledge. Examples of participatory research methods include: focus groups; community-created maps; and participatory approaches to ethnography. Vaughn & Jacquez (2020) present a *"research-to-action approach"* that emphasises direct engagement of communities that will be affected by the action (Vaughn & Jacquez, 2020).

- **Research-to-action** – The term "research-to-action" refers to a process or approach that aims to translate research findings into practical, actionable strategies or interventions. This approach is particularly prevalent in fields such as public health, environmental science, education, and social policy, where the goal is to apply the insights gained from research to address real-world challenges, improve outcomes, and inform policy and practice. The research-to-action model emphasises the importance of making research relevant and useful to society by ensuring that it informs decision-making and leads to tangible improvements in people's lives, environmental conservation, public health, and other areas. It challenges the traditional view of research as an end in itself, instead seeing it as a means to effect positive change (Vaughn & Jacquez, 2020).
- **Changing behaviour through cooperation and trust** – Social innovation, by fostering environments of trust and cooperation, can significantly impact behaviour change towards positive social outcomes. Through creating shared values, enhancing social capital, and involving stakeholders in meaningful ways, social innovations pave the way for sustainable and impactful solutions to societal challenges. By addressing the underlying relational dynamics, such as trust and cooperation, social innovations offer pathways to more resilient and adaptive communities. Soma *et al.* (2018) encourage a bottom-up approach to problem-solving and responsible innovation through networks of collaborators.
- **Inclusion of underrepresented social groups** – involves exploring new forms of cooperation with the socially marginalised or underrepresented groups to create innovation that addresses social exclusion, discrimination, and inequalities for societal benefits (Falzetti, 2013; Zeldin *et al*., 2003).
- **Enhancing visibility and countering the hegemonic discourse** – Through gaining political and financial authority, Social Innovation projects can empower the less dominant, often ignored views of, for example, communities, end-users and disadvantaged groups to become visible, better understood and implemented (Moulaert *et al.*, 2007). The relationship between 'counter-hegemonic discourse' (see box) and social innovation is dynamic and symbiotic.

Counter-hegemonic discourse provides the critical foundation necessary to question and understand the shortcomings of current systems, processes and practices. In turn, this understanding fuels the design of social innovations that seek to address these shortcomings through practical, impactful actions. By understanding the counter-hegemonic discourse, social innovation can represent a powerful combination for driving social change, offering new solutions for problems, pushing the boundaries of what is considered possible, and ultimately aiming for a more just and equitable world.

Counter-hegemonic discourse

Counter-hegemonic discourse refers to the creation, promotion, and use of ideas, narratives, and practices that challenge, resist, or seek to change the dominant or hegemonic ideologies and power structures in a society. This concept is rooted in the work of Italian Marxist philosopher Antonio Gramsci, who introduced the idea of cultural hegemony to describe the way in which the ruling class uses cultural institutions to maintain power in capitalist societies (Hoare & Nowell Smith, 1971).

- **Novel educational models to enable social innovation** – Academic models of social innovation, such as the Quadruple Helix Innovation Model (O'Neill *et al*., 2017) focus on the possibility of building new models of higher education practice that enhance cooperation between educational and business organisations, enabling improved social innovation.
- **Centres of Innovation and 'Innovation Labs'** – Often referred to as an Innovation Centres, these are organisational entities or physical spaces specifically designed to foster and support innovation. Such centres can serve as hubs for research, development, collaboration, and the generation of new ideas and technologies (van Vuuren *et al.*, 2014; Nguyen & Marqués, 2021). The collaborative spaces they provide are considered instrumental in bridging the gap between academia and business sectors, while driving the strengths of each sector to benefit development (van Vuuren *et al.,* 2014; Hogeforster & Priedulena, 2014). They may enable the building of emotional connections between

partners in collaborative networks, and thus improve performance (Ferrada & Camarinha-Matos, 2012).

- **Global partnerships** – These are collaborative efforts between organisations, institutions, and stakeholders from different parts of the world to address complex societal challenges and promote positive social change. Multi-cultural cooperation and exchange of ideas can contribute to innovation (Straka, 2019). Such cooperation may be in regard to policy making, information exchange, operational instruments, and legislation (Monar, 2006).

2.6 Existing tools and toolkits

Desk research was conducted to identify the available tools and toolkits associated with Social Innovation published in English. Fourteen tools or toolkits were identified. These demonstrate a range of methodologies, techniques and technologies for fostering social innovation across various sectors, highlighting the importance of collaborative and interdisciplinary approaches in addressing complex social challenges. All tools / toolkits identified have been developed and/or used to promote sustainability and social justice, create "common ground" in collaborative practices and enhance users' innovation capabilities.

- **Living Labs (LL) model** – A Living Lab is an immersive, real-world environment where researchers, industry stakeholders, and end-users collaborate to innovate and test solutions. In security research, Living Labs provide dynamic settings to simulate and address complex challenges, allowing for the development and evaluation of cutting-edge technologies and strategies. By integrating diverse perspectives and offering opportunities to engage with actual users, Living Labs can facilitate rapid prototyping, iteration, and validation of security innovations, fostering a responsive and adaptive approach to addressing evolving threats. This interactive and iterative process enhances the effectiveness of security solutions by aligning them closely with real-world needs and scenarios. The Living Lab is a 'practice-drive' concept that is being used to provide space for collaborations and explorations across the Quadruple Helix (Nguyen & Marqués, 2021; Mastelic *et al.,* 2015; Dekkers, 2011; van Geenhuizen, 2018; Gumbo, *at al.*, 2012).

Example – The Hague Security Delta

The *Hague Security Delta* (HSD) in the Netherlands is a national security cluster where businesses, governments, and research institutions collaborate in the development and testing of cutting-edge security solutions. For example, the HSD serves as a physical and virtual space for experimentation and validation of cybersecurity technologies. In this setting, companies and researchers can simulate cyber threats, test security protocols, and refine their products and strategies, ultimately fostering tangible advancements in cybersecurity and contributing to the national and global security landscape, see link.

- **Smart specialisation** – Often referred to as *Research and Innovation Strategies for Smart Specialisation* (RIS3), Smart Specialisation is a policy framework developed by the European Union (EU) to guide regional development through targeted investments in research and innovation. RIS3 aims to enhance regional competitiveness and economic growth by identifying and capitalising on each region's unique strengths and opportunities. One example of a method used within Smart Specialisation is the Entrepreneurial Discovery Process (EDP).
- **Entrepreneurial Discovery Process (EDP)** – This is a bottom-up approach where stakeholders, including businesses, research institutions, and local communities, actively participate in exploring and uncovering untapped opportunities for innovation. It is a dynamic and inclusive process that aims to identify the unique strengths and potential competitive advantages of a region (Roman *et al.,* 2020).
- **P2P (Peer-to-Peer) mentoring** – P2P is a collaborative mentoring relationship between individuals of similar experience levels or expertise. Unlike traditional mentoring, where a more experienced person guides a less experienced one, P2P mentoring encourages mutual learning, knowledge exchange, and shared experiences between peers to foster professional and personal growth within digital Social Innovation (Cangiano *et al.,* 2017).
- **Open Design Approach** – The Open Design Approach is a design methodology emphasising transparency, collaboration, and accessibility. Designers openly share their work, engage diverse

stakeholders, and use open-source tools. This iterative process encourages community involvement, knowledge sharing, and user-centric design, fostering inclusive and innovative solutions across various design disciplines (Cangiano *et al.*, 2017).

- **Digital Social Innovation** – Digital Social Innovation (DSI) harnesses the power of digital technologies to address pressing social challenges and foster positive societal change. Innovative tools, platforms, and approaches are used to empower communities, promote inclusivity, and drive social impact. It aligns with open source, open data, and open innovation approaches, and includes: artificial intelligence for social good; employing data responsibly; and supporting social entrepreneurship. The scalability and impact of Digital Social Innovation has been supported through sustainability toolkits to promote the development and expansion of projects emerging from Tech Social Innovators (Cangiano *et al.*, 2017). Examples of Digital Social Innovations include:
  - *Crowdsourced Security Testing* – By engaging a community of ethical hackers and security enthusiasts, organisations can leverage collective intelligence to improve cybersecurity.
  - *Community-Led Safety Apps* – These have been used to enable users to report and address security concerns, share information about local incidents and collaborate with law enforcement or community organisations.
  - *Citizen Engagement in Cybersecurity Policies* – By involving the public in decision-making processes, governments and organisations can create more inclusive and effective strategies for addressing cybersecurity challenges.
  - *Digital Platforms for Crisis Response* – These platforms enhance the resilience of communities and improve response efforts in the face of security threats.
  - *Privacy-Preserving Technologies* – This includes the creation of tools and protocols that protect individuals from digital surveillance and unauthorised access to personal information.

Example of a Digital Social Innovation – Callisto

The Callisto initiative is a notable example of Digital Social Innovation (DSI) that addresses security issues, specifically focusing on sexual assault and harassment. Callisto is a non-profit organization that created a unique online platform designed to provide survivors of sexual assault and harassment a safe, confidential, and empowering way to document and report their experiences.

Key features of the Callisto platform include:

1. *Confidentiality:* Callisto allows survivors to securely document the details of their assault in a time-stamped record without immediately reporting it to authorities. This documentation can be done anonymously, providing survivors with control over their information.
2. *Matching System:* One of the innovative aspects of Callisto is its matching system. If another individual reports the same perpetrator, both survivors are notified and given the option to connect with a legal advocate. This system aims to identify serial offenders and provide survivors with the option to take collective action, which can be more empowering and may increase the likelihood of a successful legal outcome.
3. *Support and Resources:* The platform provides survivors with access to specialised support services, including legal advice and counselling. This ensures that individuals are informed of their rights and options for seeking justice and support.
4. *Empowerment:* By giving survivors control over their information and the choice of when and how to report, Callisto seeks to empower individuals, reduce the trauma associated with reporting, and encourage more survivors to come forward.
5. *Data Security:* Callisto places a high emphasis on the security and privacy of the information stored on its platform. This is crucial for maintaining the trust and safety of its users.

The Callisto initiative is a prime example of how digital technologies can be leveraged to address complex social issues like sexual violence, providing innovative solutions that prioritize the needs and safety of survivors. Through its focus on confidentiality, empowerment, and community, Callisto represents a significant contribution to the field of digital social innovation.

- **User community toolkits —** This refers to resources, tools, and collaborative platforms to engage users and the broader community in the innovation process related to a product or service. Such toolkits are aligned with principles of user-centred design, open innovation, and crowdsourcing. The *User Community Toolkit* developed by Parmentier & Gandia (2013, see link) is based on a longitudinal case study of the video game *Trackmania*, which has an integrated toolkit connected to its user community.
- **Online civic engagement platforms** – These are digital tools or websites designed to facilitate public participation, collaboration, and interaction between citizens and government entities (Nelimarkka *et al.* 2014). Examples include: ePetitions Platforms; virtual town hall platforms; participatory budgeting platforms that help identify citizen's priorities; and collaborative mapping platforms.
- **International Association for Public Participation (IAP2) Spectrum of Public Participation** – This is a framework that outlines different levels of engagement and participation in public processes. Developed by the IAP2, a global organisation focused on promoting and improving public participation practices, the spectrum provides a range of participation options for involving the public in decision-making. The IAP2 Spectrum consists of five levels: Inform, Consult, Involve, Collaborate, and Empower. The model offers practical tips for public involvement. Discussion and agreement on the level of participation promises that expectations are managed across all stakeholders, reducing the risk of conflict (Stuart, 2017[2]). However, this framework has received mixed reviews (Jones, 2017; Robinson, 2016).
- **Front-end tools** – In the context of the design process, *"Front-end tools"* typically refer to methods, techniques, and processes that support the definition of project goals, solution requirements, constraints and potential design directions during the early stages of a project often referred to as the innovation *"front-end"*. Such tools can assist designers / design teams in gaining a deeper understanding of problems,

[2] Graeme Stuart is an *Alternatives to Violence Project* facilitator, honorary lecturer (University of Newcastle) and environmentalist. He is committed to promoting peace, nonviolence, sustainability, strengths-based practice and community development, see link.

empathising with users, defining the challenge, and ideating potential solutions.

> **Example – The FrontEnd Toolkit™**
>
> Developed by Barroca *et al* (2017, see here), this set of tools supports the use of "Design Thinking" to transform new ideas into innovative products, services and businesses. The objective of the Toolkit is to help policymakers, project owners, and managers as well as their stakeholders to design and implement projects with real impact.

- **Innoweave modules and workshops** – *Innoweave* is an initiative of the McConnell Foundation that aims to help community groups assess and implement new and innovative social change approaches through a series of innovative modules. Based in Canada, Innoweave provides access to a series of coaching streams built around social innovation approaches. An organisation can access information, explore their readiness, and begin implementing approaches with the help of a coach (Huddart, 2012, see link).
- **Open Social Innovation (OSI)** – OSI involves businesses and organisations sourcing ideas from external sources as well as internal ones. This means sharing knowledge and information about problems and looking to people outside the business for solutions and suggestions. Instead of the secrecy and silo mentality to research and development, open innovation invites a wider group of people to participate in problem-solving and product development, see link. The Open Social Innovation (OSI) framework incorporates open innovation strategies for addressing social challenges and innovative approaches to organisations' business models (Chesbrough & Di Minin, 2014; Yun *et al.,* 2017).
- **Use of social media to support Social Innovation** – Social Innovation is being supported by online platforms and websites that enable users to create, share, and interact with content. Users engage through text, images, videos, and links, fostering real-time communication and community-building. Popular examples include Facebook, Instagram, Twitter, and LinkedIn. Research shows that *Multiple Social Media Combinations* foster social innovation by promoting networking,

communication, and collaboration among social actors (Charalabidis *et al.,* 2014).

- **Storytelling** – This involves conveying narratives that illustrate the impact of Social Innovation activities. Such stories have the potential to humanise innovation actions, connect donors with causes, and inspire others to contribute / participate. Through compelling narratives, social entrepreneurs share the journey, challenges, and successes, fostering empathy and encouraging a broader community to join in creating positive change and promoting the long-term impact of Social Innovation projects (Maclean *et al.*, 2012).

2.7 Underpinning theories and related concepts

Embedding Social Science and Humanities (SSH) within research and innovation actions is one of the EU research and innovation goals. By doing so, the EU aims to address social exclusion, discrimination, and inequalities from the humanistic perspective, exploring new forms of innovation and promoting international cooperation (Levidow & Neubauer, 2014). The state of the art in Social Innovation demonstrates the integration of social sciences and humanities (SSH) into various aspects, as in the following:

- **Innovation Theory** – Concepts from innovation theory, such as diffusion of innovations, technology adoption, and disruptive innovation, inform understanding of how new ideas, practices, and solutions spread and create change within society. One of the foundational thinkers is Joseph Schumpeter, who emphasised the role of entrepreneurs in driving innovation and economic development (Schumpeter, 1934). Another key thinker is Clayton Christensen, renowned for his theory of disruptive innovation (1997). It should also be noted that extensive research has been conducted into new product success factors that contribute to commercial success (Cooper and Kleinschmidt, 1987a, b).
- **Knowledge Economy** – The knowledge economy is an economic system in which the generation and exploitation of knowledge play a predominant part in the creation of wealth. Unlike traditional economies, which were primarily based on agriculture or manufacturing, the knowledge economy relies heavily on intellectual capabilities, information, and technology. The Triple and Quadruple helix models are instrumental in forming strategic knowledge

management frameworks. The frameworks, including the transfer and application of knowledge, enhance the capacity for innovation. They play a crucial role in promoting the development of a Knowledge-Based Economy (Powell & Snellman, 2004; Jali *et al.*, 2020).

- **Open Innovation Diplomacy (OID)** – OID was presented back in 2011 as a new and novel strategy, policy-making, and governance approach in the context of the quadruple and quintuple innovation helices. OID encompasses the concept and practice of bridging distance and other divides (cultural, socioeconomic, technological, etc.) with focused and properly targeted initiatives to connect ideas and solutions with markets and investors ready to appreciate them and nurture them to their full potential (Carayannis & Campbell, 2011b).
- **Wicked Problems Theory** – Wicked problems theory refers to a concept in problem-solving and planning that addresses complex and ill-defined issues, often referred to as "wicked problems." The term "wicked problems" was introduced by design theorists Horst Rittel and Melvin Webber in the 1970s to describe challenges that are particularly difficult to solve due to their inherent complexity, ambiguity, and the interconnectedness of multiple factors. Wicked problems are different from "tame problems," which are more straightforward and well-defined (Rittel & Weber, 1973). In the context of Social Innovation, Wicked problems theory is applied to complex social problems not addressed by existing market offerings or government services. It necessitates broad discourse and synthesis to formulate shared definitions and objectives among stakeholders (Charalabidis *et al.,* 2014).
- **Diffusion of Innovation Theory** – The Diffusion of Innovation Theory, proposed by sociologist Everett Rogers in 1962, seeks to explain how new ideas, innovations, products, or technologies spread through a social system or community over time. This theory identifies key factors influencing the adoption and diffusion process and categorises individuals into different adopter categories based on their willingness to try new innovations. 'Innovators', the first individuals to adopt an innovation, are typically risk-takers, eager to try new things. 'Early Adopters' are individuals who adopt innovations early in the process but are more deliberate in their decision-making compared to innovators.

'Laggards' are the last individuals to adopt an innovation. They are generally resistant to change and may adopt only when the innovation becomes a social norm or necessity. The theory is widely used in fields such as marketing, communication, technology adoption, and public health. The theory outlines the characteristics of an innovation that determine its degrees of adoption, such as relative advantage, compatibility, complexity, trialability, and observability (Rogers., 2003). In the context of Social Innovation, the diffusion of innovation theory is applied to assess the potential of innovative ideas or practices to spread within society, considering factors like compatibility with existing values, complexity, and observability to foster the adoption of constructive societal changes (Charalabidis *et al.,* 2014).

- **Citizens' movements** – Citizens' movements, also known as social movements or grassroots movements, are collective efforts by individuals who come together to advocate for social, political, environmental, or cultural change. These movements typically emerge from the grassroots level, driven by ordinary citizens who share common concerns, values, or goals. Citizens' movements play a crucial role in shaping public discourse, influencing policy, and fostering social transformation. Representing people's collective reaction to government priorities, citizens' movements can be a central accelerator to social change. These changes can provide creative approaches and corrective feedback to the process of social evolution, but can be destructive if not properly integrated into society. In the context of Social Innovation, citizen movements can be beneficial for integrating environmental and social indicators of quality of life within traditional economic indicators and advocating a more comprehensive understanding of social progress and well-being (Aqdas *et al.,* 2020; Henderson, 1996).
- **Systems Thinking** – Systems thinking is a problem-solving and decision-making approach that considers the holistic view of systems and their interdependencies, using both qualitative and quantitative tools. It encourages a holistic approach to understanding and addressing complex challenges, examining the interconnections between various parts of a system and recognising unintended consequences of interventions (Ackoff, 1968; Booher, 2003; Norman and Draper, 1986). Theoretical biologist Ludwig von Bertalanffy is often

considered one of the early pioneers of general systems theory, a precursor to systems thinking. In the 1950s, he developed the idea that complex systems share common principles and that they can be understood as wholes. Russell Ackoff (1919–2009) was a management theorist and consultant who made significant contributions to systems thinking, particularly in the field of operations research and management science. He emphasised the importance of a holistic approach to problem-solving and decision-making.

- **Design Thinking** – presents a problem-solving approach that focuses on understanding the needs of end users, promoting teamwork, and using creative problem-solving techniques originating from the design field. Design thinking addresses the importance of empathy, understanding, divergent and convergent thinking, and problem-framing in developing new solutions. Design thinking has been widely adopted in various industries and sectors, including business, education, healthcare, and social innovation, as a means of fostering innovation, addressing complex problems, and creating solutions that resonate with the end-users. It is associated with organisations like IDEO and the Stanford d.school, which have played key roles in popularising and promoting design thinking methodologies. However, critics raise various concerns about the concept, its application, and its impact (Kolko, 2015, see link).

2.8 Impact assessment

Efforts to assess the impact of Social Innovation projects have led to the development of various concepts and methodologies designed to measure the effectiveness, return on investment and other broader societal impacts.

- **Social Innovation Research** – Social Innovation Research is the systematic investigation and study of innovative solutions and practices aimed at addressing social issues and improving societal wellbeing. It involves examining novel ideas, strategies, and interventions that lead to positive social change and the advancement of social goals. Jessop *et al*., (2013) discusses the importance of developing methodologies that can access societal dynamics, social transformation, and human development resulting from social innovation. It touches on the macro-social meaning of social innovation and the methodological framework proposed for studying social innovation (Jessop *et al*., 2013).

- **Social Innovation Index 2016** – The Economist Intelligence Unit (EIU) established the Social Innovation Index 2016 to assess the capacity of 45 countries to deliver social innovation, see link. The Index includes seven quantitative data points and ten qualitative scores by EIU analysts, grouped into four pillars, as follows: (i) Policy and Institutional Framework (weight: 44.44%); (ii) Financing, including ease of getting credit (weight: 22.22%); (iii) Entrepreneurship (weight: 15%); and (iv) Society (weight: 18.33%), including culture of volunteerism and political participation (Line & Hopfner 2016).
- **Measuring the effectiveness of collaboration systems** – The success of a project can be influenced by variability in a wide range of factors impacting it. Such variability arising from the heterogeneity of participants, geographic diversity, and network position all reinforce the long-lasting effect of the project. Effective cooperation structure determines how effectively different stakeholders can collaborate and innovate. This understanding underscores the need for diverse and inclusive innovation ecosystems where different perspectives and expertise are valued and leveraged (de Arroyabe *et al.*, 2021). The impact of Social Innovation projects can be measured by the adoption and commercialisation of the developments (Johnson, 2008).
- **The IMPACT Model** – This model was developed from a review of literature on inclusive growth, social innovation, and collaborative leadership. It uses case studies of alumni of the Asian Institute of Management's Bridging Leadership program to build frameworks for understanding the role of Social Innovation in bridging societal divides (Herrera, 2016). The study examines stakeholder engagement and formalisation of such engagement. This is a qualitative analytical model that identifies three categories of conditions (or variables) influencing the lasting impact of Social Innovation projects: process, leader, and situational variables (*ibid.*). It is based on the definitions presented by Kania and Kramer (2011).
- **Emotion-oriented involvement within the collaborative network** – Ferrada & Camarinha-Matos (2012) introduced an approach to develop an emotions-oriented supervision system aimed at assisting in the management of the participants' interactions and the emotional dynamics that affect the normal lifecycle of collaborative networks.

Qualitative research on emotional engagement in the cooperative network can help in the assessment of the sustainability of the network (Ferrada & Camarinha-Matos, 2012).

- **A 10-Point Scale for Evaluation** – Online civic engagement platforms accessed via desktops or mobile devices can provide new opportunities for the public to express views and insights, consider the views of others, assist in identifying innovative ideas and new approaches to public policy issues, and directly engage with elected leaders. Existing platforms vary widely in their approaches to: assessment, engagement, ideation, evaluation, and deliberation. Nelimarkka *et al.* (2014) consider three online platforms: the Living Voters Guide, including its earlier iterations Consider.it and Reflect; the Open Town Hall; and the California Report Card. Platforms are compared using the International Association of Public Participation's "Spectrum of Public Participation" framework. Using a 10-point scale, the authors evaluate the user interface of each platform in terms of how well it supports the Spectrum's levels of civic engagement (inform, consult, involve, collaborate, and empower). Results suggest how user interface design affects civic engagement and suggest opportunities for future work on the user interface of public participation platforms assesses how user interface design affects civic engagement.
- **Assessment of impact of public participation**: Abelson & Gauvin, 2006 produced an extended report of methods and gaps in research assessing the public participation levels and their impact. The report presents three main approaches for evaluation of the level of goal achievement: user-based (examining the goals of participants), theory-based (driven by participation models) and "goal-free" approaches (ibid).
- **Assessment of Social Open Innovation success** – With reference to two study cases, Yun *et al.,* (2019) emphasise the need to provide a universal framework for evaluations of success of Social Open Innovation initiatives.
- **Return on investment analysis** – Francesco Campanella and colleagues highlight the importance of classifying firms with high Return on Investment (ROI) in the context of the Quadruple Helix model. This approach helps in determining the financial impact and

innovation outcomes of collaborative projects using the classification analysis method—referred to as *"Classification and Regression Trees"* (Campanella *et al.,* 2017).

- **Institutional and Structuration Theory and the Individualistic Perspective** – a methodology has been proposed for assessing structure, process, input, and output in Quadruple Helix collaboration (Cajaiba-Santana *et al.*, 2014).
- **Sustainable Development Goal (SDG)** – 16 indicators or goals have been defined by the United Nations and account for institutions' role in sustainable development (Jandl, 2017).
- **Effect Metrics for Innovation Projects –** Hero *et al* (2022) demonstrated a set of effect measurement scale variables discovered through document analysis and focus group interviews (Hero et al., 2022).
- **Social Innovation Research** – research discusses the importance of developing methodologies that can access the societal, social, and economic changes resulting from social innovation. The assessment of impact is suggested in the discussions about the macro-social meaning of social innovation and the challenges posed by the reductionist interpretations of social innovation in policy discourse and business practice. It provides insights into the complexities of assessing social innovation initiatives' impact within broader societal and economic contexts (Jessop *et al.,* 2013).

2.9 Benefits of the Social Innovation concept / approach

The benefits of the Social Innovation concept primarily arise from the shift from economy-based to community- and socially- based innovation and development. The Quintuple Helix model adds the environment as a constitutive factor of social responsibility. A lasting contribution to societal improvements, including knowledge enhancements and efficient provision of new goods and services, is a notable outcome of Social Innovation. It also indirectly influences economic development by addressing societal challenges such as poverty, ageing, social exclusion, and health, enhancing overall well-being. As the innovation develops from different stakeholders' perspectives, it has the potential to create long-lasting contributions and impact (Herrera, 2016).

Following the Triple, Quadruple, and Quintuple helix models, strategic knowledge management, encompassing knowledge creation, transfer, and application, significantly boosts the capability to innovate, thereby fostering the creation of a Knowledge-Based Economy. This approach is critical in achieving faster innovation and benefiting society at large.

Social Innovation strengthens capabilities through public-private partnerships, mutual strategic benefit, and trust. It is crucial in bridging the qualification gap for innovation, as cooperation between enterprises, educational institutions, and other stakeholders aligns current qualifications with real-world conditions.

2.10 Social Innovation — limitations and challenges

There are a number of limitations and challenges in relation to Social Innovation as a concept, approach and set of methodologies. Despite its potential, the concept of social innovation is not without limitations and challenges:

- **Scalability and Sustainability** – One of the primary challenges of Social Innovation is the difficulty of scaling solutions to have a broader impact. Many Social Innovations are successful on a small scale but face significant hurdles when trying to expand their reach or sustain their efforts over time due to funding constraints, logistical challenges, or the complexity of replicating localised solutions in different contexts.
- **Measurement and Evaluation** – Assessing the impact of Social Innovations can be challenging due to the often qualitative, long-term, and complex nature of social change. Traditional metrics and evaluation frameworks may not capture the nuanced and multifaceted outcomes of social innovations, making it difficult to demonstrate effectiveness, secure funding, and guide improvements.
- **Funding and Resource Constraints** – Social Innovations often rely on external funding sources, which can be highly competitive and unstable. The dependence on grants, donations, or governmental support can limit the development and implementation of initiatives, especially when funders' priorities change or when economic conditions are unfavourable.
- **Institutional and Regulatory Barriers** – Social Innovations may face obstacles in the form of existing regulations, policies, and institutional

inertia that resist change. Navigating bureaucratic hurdles and influencing policy reform can be time-consuming and detract from the primary goals of the innovation.

- **Collaboration Challenges –** Effective Social Innovation frequently requires collaboration across sectors, disciplines, and communities. However, differing priorities, values, languages, and working cultures can hinder collaboration, making it challenging to form and maintain productive partnerships.
- **Ethical and Equity Concerns** – There is a risk that social innovations may inadvertently reinforce existing inequalities or create new forms of exclusion. Ensuring that social innovations are inclusive, equitable, and ethically sound requires ongoing attention to the diversity of stakeholders and the potential unintended consequences of new initiatives.
- **Dependency and Disempowerment** – There is a concern that certain social innovations might lead to dependency of communities on external solutions or organisations, potentially disempowering those they aim to help by not building local capacities or fostering long-term, sustainable changes from within the community.
- **Complexity of Social Problems** – Social problems are often deeply rooted in complex, interrelated systems. Social innovations that address symptoms rather than underlying causes may fail to bring about significant or lasting change, highlighting the need for systemic thinking and approaches.

The term "social innovation" can be seen as somewhat vague, largely because it encompasses a wide range of activities, processes, and outcomes aimed at addressing societal needs. This vagueness stems from several factors:

- **Broad Applicability** – Social Innovation can address a wide range of issues, including poverty, education, healthcare, environmental sustainability, inequality, and more. The diversity of problem domains makes the term cover a broad spectrum of activities and interventions.
- **Varied approaches** – Social Innovation can manifest in various forms, including new programs, policies, technologies, business models,

community initiatives, and cultural shifts. The term is not limited to a specific method or sector, adding to its versatility.

- **Interdisciplinary nature** – Social Innovation often involves collaboration across disciplines, bringing together insights from fields such as business, technology, design, social sciences, and public policy. This interdisciplinary nature contributes to the term's inclusivity and adaptability.
- **Context dependency** – What constitutes social innovation can be highly context-dependent. Solutions that work in one community or cultural setting may not be directly applicable elsewhere. The local context and the nature of the social challenge play a significant role in defining social innovation.
- **Inherent Subjectivity** – The perception of what is innovative in the social context can be subjective. Different stakeholders may have diverse views on what qualifies as a novel and impactful solution to a given social issue.
- **Evolutionary Concept** – Social innovation is an evolving concept that adapts to changes in societal needs and values. As new challenges emerge, the definition and understanding of social innovation may expand to encompass innovative responses.

While the perceived vagueness allows social innovation to be a flexible and adaptive concept, it can also lead to challenges in measurement, evaluation, and communication. Critics argue that without clear boundaries, the term may be used broadly, potentially diluting its impact or making it susceptible to misuse.

2.11 Lack of practical tools to support collaboration

There is a lack of practical collaboration tools to facilitate effective cooperation between the participants (state, business sector, academia, and the community) during the early, advanced, and implementation stages of a Social Innovation action. One fundamental critique involves challenging traditional relationships without developing clear structures of cross-sector cooperation, including civil cooperation structures (Penksa & Mason, 2003). The collaborations between the sectors raise a need for new forms of cooperation (e.g., multi-level community administration), which are yet to be implemented (Ekengren, 2006).

Few impactful models exist for the third (civil) sector involvement. It has proved to be a bottleneck that impedes collaborative progress. Therefore, not all social innovation initiatives involve community participation and active engagement. The Quadruple Innovation Helix, which emphasises the role of government, academia, industry, and civil society, highlights the lack of well-developed tools that can engage the community in goal setting and during the design of innovative solutions, might end up failing to achieve real social impact that can serve communities (Fayard & Fathallah 2024). Yet, the critique of the Triple Helix model revolves around its inability to answer the actual needs of society, as the lack of community engagement created some tensions that this model cannot address (Carayannis & Campbell 2012). Its effectiveness in proposing innovative regional solutions was questioned (McAdam & Debackere 2018).

2.12 Social Innovation conclusion

While the initiative to create cooperative relationships between various sectors is commendable, it is fraught with challenges that need careful navigation. The future of such collaborations will depend on the ability of the diverse entities to work together harmoniously, respecting each other's expertise and perspectives while upholding ethical standards and prioritising the wellbeing and rights of individuals.

3. Social Innovation in the Security Field

Social Innovation collaborations in the security sector form knowledge communities that transcend traditional organisational systems. These collaborations foster the creation and sharing of both explicit and implicit knowledge. Cross-sectoral collaborative models are instrumental in developing practical, socially responsible strategies to combat crime and terrorism and enhancing the public's perception of security. By merging resources and expertise from various sectors, this approach aids in developing innovative tools. Additionally, the research underscores the effort to achieve integration at the European level, ensuring that solutions are adaptable and implementable locally. Local collaborations bolster regional innovation, aligning with the European innovation policy to choose security measures attuned to regional needs.

Furthermore, research in security-related Social Innovation underscores the importance of community involvement in devising solutions tailored to their specific security, safety, and perception needs. This involvement is crucial to ensure that the strategies developed are also socially acceptable and in harmony with the values of the community.

Implementing the Social Innovation approach in the security field requires rethinking current practices. This approach challenges the security sector's dominant economic focus, often overshadowing public sector leadership. By adopting Social Innovation as a guiding principle, there is potential to shift the emphasis from economic to societal impacts and sustainability in developing security solutions.

A comprehensive analysis of security Social Innovation highlights the necessity for establishing trusted forums. These forums are envisioned as collaborative platforms facilitating trust-building and knowledge exchange, crucial for fostering innovation. This approach is aimed at addressing security challenges, ultimately benefiting both the community and its members. Research in the field of security Social Innovation reveals various strategies for establishing strategic dialogue among stakeholders, as presented in Table 1. These approaches are designed to enhance communication and coordination while providing effective knowledge-sharing mechanisms.

Considering the limitations of hierarchical and traditional systems in security solutions and policies, Social Innovation offers a possible answer, introducing novel methodologies and processes. These aim to reconceptualise security approaches and provide practical tools and tangible benefits for European communities.

Table 1. Comparison between SI in security references

Project (publication)	**Key characteristics**	**Summary**	**SI element**	**Aims**	**Tools**	**Actions**	**Results and findings**	**Suggestions**
Strategic Dialogue on Serious Crime and Terrorism in the EU Dorn & Levi, 2009	• Security dialog • Trusted forum • Shift of ownership • Informal interactions • Information exchange	• Examines the shifting roles and leadership dynamics between the public and private sectors in security dialogue and cooperation • Analyses various models for structuring EU forums for strategic dialogue • Reflects on the legal and ethical implications of these partnerships	Addressing security challenges through cooperation between various stakeholders	• To improve strategic, pan-European security dialogue • To provide a knowledge exchange platform, such as a *"trusted forum"* • To conceptualise security cooperation as private-public rather than public-private • To address dilemmas related to informal information exchange	Trusted Forum to improve dialogue; European Security Research and Innovation Forum (ESRIF); European Organization for Security (EOS)	Forums establishment	• Shift in ownership • Gap in private sector interlocutor • Proposed trusted forum and ESRIF	• Establishment of a "Trusted Forum" and strategic think tank forum to scan emerging security challenges and risks for terrorism and crime • Outline the criteria for membership • Establishment of *"information hub"*

Planning urban Security (PLuS) Davey & Wootton, 2014	• Planning Urban Security (PLuS): developing transferable measures for crime prevention through urban planning and design processes • Explored transferability of best practices • Shifting from reactive crime reduction to proactive crime prevention • Led by the State CID in Lower Saxony in Germany	• Discusses the integration of crime prevention within urban design and planning • Highlights the Crime Prevention Capability Maturity Model (CPCMM) • Examines the role of design in crime prevention • Presents a design-led, proactive approach to crime prevention, contrasting it with reactive methods.	SI as addressing complex societal challenges related to crime and security	• To address the challenges associated with implementing crime prevention within urban environments by introducing the Crime Prevention Capability Maturity Model (CPCMM) • To improve security by embedding crime prevention within urban planning and design processes	• Design Against Crime initiative • Design Against Crime Solution Centre • Security Partnership in Urban Development (SIPA) • Greater Manchester Police Design for Security Consultancy Service	• Establishment of the Design Against Crime Solution Centre at the University of Salford in partnership with Greater Manchester Police (GMP) • Crime prevention services are delivered by GMP's Architectural Liaison Unit to planners and architects working in Greater Manchester • Application of CPCMM in the State CID of Lower Saxony, Germany	• Embedding crime prevention within urban planning • Design Against Crime demonstrates the value of adopting a design-led approach to security • Promoting designers to consider crime prevention within the design process • Illustrates capability levels within the CPCMM • Addresses the challenges of transferring practices across different contexts	• Embedding crime Prevention in Design Education and Practice • Establishing Solution Centres • Adapting Crime Prevention Through Environmental Design (CPTED) and Situational Crime Prevention (SCP) • Implementing Accreditation Schemes and Consultancy Services

Designing Safer Urban Spaces (DESURBS) Turner *et al.*, 2014	• Emphasis on urban safety • Collaboration and end-user involvement • Design thinking methodology • Product development progress • Security product in a systems • Innovative technologies • Holistic narrative for safety challenges	• Focuses on the development of new security products for urban environments • Incorporates design to improve safety in public spaces • Details the design process, product development, and end-user field research • Includes case studies and discussions on two security products designed for urban spaces, emphasising their applicability and effectiveness in different scenarios	• Involving the community in enhancing the quality and safety of their environment (CitiZen cellular application) • Democratisation of public sphere discourse • TASKit maximises strengths and value for end-users • Shift towards an inclusive and engaged approach to address security challenges within urban spaces • Identification of unmet needs in various fields of city security • Democratisation of public sphere discourse and urban users' • Shift towards an inclusive and engaged approach to address security challenges within urban spaces	• Addressing the impact of Eyes, Skin, and Neck concepts • Development of urban resilience tools such as the CitiZen based on community of active users • Identifying and addressing vulnerable urban spaces • Establishing an informative emergency infrastructure • Integrating design processes in addressing security challenges	• TASKit – The All Situation crowd control Kit (includes direction balloon, CCTV and GPS applications, barriers, urban connectivity, checkpoints, site management policy) • Urban Design Security Index mapping tool • CitiZen Cellular Application for users reports	• Development of design concept of TASKit, *"The All Situation crowd control Kit"* • Development of a design concept for the CitiZen cellular application • Conceptual development of directive barriers • Conceptual development of the balloon	• Developing novel approaches for designing security products (e.g., product systems) • Urban 'Onion Metaphor' • End-User Field Research Models that facilitate understanding of the social, cultural, and pragmatic dimensions of urban resilience • Product Development Process that allows co-design with end-users, implemented within the master's program at Bezalel • Urban Design Security Index mapping the optimal location for the deployment of security products	• Utilisation of User Oriented Design, Peirce semiotics model application, and Double loop strategy in security innovation • Shift from products to product systems • Product Development Process emphasising co-creation and phases ("ploughing," "sowing," "sprouting," and "budding") • Utilisation of "Urban 'Onion Metaphor' for different 'layers' of security systems and artefacts working together on different levels to achieve greatest impact.

Design Against Crime Davey and Wootton, 2017a	• Situational Approach • Environmental Design Principles • Design-Led Crime Prevention • Collaborative Approach • Architectural Liaison Service • Engagement of Young People	CPTED initiative aims to embed crime prevention within design practice, demonstrating the value of a design-led approach to improving security for everyday urban environments, reducing opportunities for crime, and contributing to perceptions of safety and security for individuals within that environment	CPTED involves several stakeholders and community engagement	• To demonstrate a human-centred design approach for safety and security • To emphasise the integration of crime prevention measures into design solutions • Provide an understanding of crime-related considerations • To apply creative design thinking, problem-solving, and innovation to crime and security	• Crime Reduction Toolkits • European Standard for The Prevention of Crime guidelines • A&E toolkit	• *"Youth Design Against Crime" (YDAC)* programme focusing on the transformative nature of the design process • Reducing violence in hospital accident and emergency (A&E) departments led by professional designers • Preventing handbag theft in bars and cafés led by postgraduate design students	• Insights regarding the impact of design on crime levels, user behaviour, and crime hotspots • Highlights urban and product design's role in impacting crime vulnerability • Identification of "crime hotspots"	• To embrace engagement and empowerment tools in the process of generating design solutions • To include a holistic design research process • Designers should consider the crime vulnerability of designs and locations • Designers should integrate safety and security issues throughout the design process

Knowledge Creation in Cross-Border and Cross-Sectoral Collaborations Norvanto, 2017	• Exploratory case study approach • Exploration of practices and community identity artefacts in a natural context • Utilisation of qualitative content analysis across multiple cases to uncover the practices of social interaction and community identity artefacts in EU R&I project consortiums • Data collected from four study cases • Knowledge creation and management strategies discussed	• Focuses on knowledge creation within EU Security Research and Innovation (R&I) projects, considering them as communities of practice (CoP) • Uses multiple case study designs to analyse these projects through Wenger's framework (domain, community, practice) • Explores how explicit and tacit knowledge is created and shared within project consortiums and across different consortiums	• Emphasising the role of engagement, socialisation, and identity development in knowledge creation • Highlights the unique nature of consortiums as knowledge communities, distinct from traditional project organisations	• To explore how knowledge creation in EU externally funded security Research and Innovation (R&I) projects can be understood through the concept of a community of practice (CoP) • To contribute to the understanding of knowledge creation in multidisciplinary project teams • Understand the implications of knowledge transfers among consortia projects • To offer new insights into the knowledge creation in cross-border and cross-sectoral collaborations	• Consortium establishment tools (negotiation processes, joint enterprise, and the formation of a collective identity) • Shares knowledge creation and management • Development of an innovative base curriculum • Use of collaborative working areas, databases, and e-learning tools in the project execution phase	• IECEU, GAP, EU_CISE_2020, and MARISA consortiums analysis	• EU Funded R&I projects represent unique forms of knowledge communities • EU R&I is highlighted as an effective platform for facilitating knowledge creation, enabling individuals from different organisations to share information and tacit knowledge through regular interactions • Participation in EU R&I projects enables consortium members to access new professional communities and facilitates knowledge sharing • Highlights the significance of face-to-face meetings in building relationships, trust, information sharing, and knowledge creation	• To facilitate the Community of Practice (CoP) concept • To facilitate face-to-face meetings for relationship and trust-building, information, and knowledge sharing among consortium partners • To enhance the potential for knowledge creation through R&I collaborative projects

IMPACT Marret *et al.*, 2017	• Present results, outputs, and lessons learned from the IMPACT Europe project • Present a practical evaluation toolkit for evaluating programs and interventions for CVE • Address toolkit adaptability	• Focuses on assessing counter-violent-radicalization techniques • Presenting the project's results, lessons learned, and a toolkit for evaluating the prevention of violent extremism (CVE)	• Discusses the relevance of social and positive alternatives for the evaluation of violent extremism and radicalization interventions: educational and mentoring activities, identification of strategic communi-cations, and use of counter-narratives	• Emphasises the necessity of robust and standard methodologies for evaluating CVE programs • Addresses challenges and solutions related to the development and implementation of the toolkit programs aimed at CVE	• IMPACT Europe toolkit prototype for improving evaluations in the field of CVE • Training course and a toolkit manual	• Development of evaluation toolkit • Implementing scenario planning methodology • Focus on first-line practitioners • User-friendly toolkit based on end-user feedback to improve user-friendliness • Manual and training course	• Refinement and stress-testing of the toolkit through the evaluation and synthesis of results from pilot studies and the project as a whole, aiming to evaluate its potential future adaptability • End-users were involved in checking and providing feedback on the toolkit's refinement to establish whether these have improved its user-friendliness and usability • Practical actions taken in response to the recom-mendations provided	• Using the toolkit to facilitate the selection and implementation of evidence-based response measures and contribute to the design of better policy programs and interventions • Presents recommendations for further developing and implementing the innovative evaluation toolkit and emphasises its robust and quasi-standardised mode of measuring effectiveness and evaluating programmes

INNOS Easton, 2019	• Triple Helix Collaboration • Evolution from State Model to Triple-Helix Model • Demand-driven Innovation Projects • Focus on Security Challenges	• Discusses the triple helix model of collaboration between industry, government, and knowledge institutes while emphasising this model as a method to foster innovation and technology in safety and security sectors	• Social Innovation as a crucial component in the advancement of technology and security • Triple Helix collaboration • Open Innovation as a necessary condition for the triple-helix model	• To analyse the triple-helix collaboration model as a means to stimulate innovation and technology in the field of safety and security • To underscore the significance of the evolution from a state model to a triple-helix model and the paradigm of open innovation • To reflect on the dynamics of the triple-helix collaboration • To provide an assessment of the triple-helix cooperation in the Belgian context	• Triple-helix collaboration model	• INNOS pilot project	• Discussion regarding various aspects of the triple-helix collaboration model: creation, objectives, ambition, methodology, partners, funding, barriers, and logic used by the government as one of the participants	• Advocates for more comparative international research to gain insights into the added value of triple-helix collaborations for stimulating innovation and technology in the field of security, including factors influencing their development globally • Suggest stimulating innovation in technology and security through the triple-helix model • To encourage the development of demand-driven innovation projects • To facilitate the exchange of knowledge through seminars and workshops

ADDER Keith, 2021	• Comprehensive strategy • Multi-agency approach • Focus on societal benefit • Financial investment • Long-term approach • Targeted interventions	• Outlines a comprehensive strategy by the UK government to combat illegal drug use and its associated social and criminal impacts • Presents a 10-year plan focusing on breaking drug supply chains and delivering recovery systems • Emphasises a multi-agency approach	• Innovation fund and research projects • Testing and learning drug use reduction • Addressing drug-related challenges through innovative endeavours • Focuses on society's benefit	• Encompass comprehensive approach to combating illegal drugs • To deliver wide-ranging societal benefits • Tackling drug-related crime reduction method • To ensure accountability and progress monitoring through national and local outcomes frameworks • Tngage in strong partnerships across the government and local levels • Focus on better outcomes for citizens and neighbourhoods	• Collaboration frameworks • Break the supply chain plan • Dame Carol Black's review • Secure Stairs • Individual Placement and Support (IPS) • National outcomes framework • Local outcomes frameworks • Systems map • Mapping of "complex needs" authorities	• ADDER initiative • Operation Mercury • Behaviour change initiative • Secure Stairs • Individual Placement and Support (IPS) • White Paper	• Requirement for a comprehensive plan combining interventions, enforcement actions, and support service • The need for an integrated approach (including rapid expansion of drug testing on arrest, tough consequences schemes, and targeted behaviour change initiatives) • Implementation of a framework for integrated care (Secure Stairs) • The proposal to publish a White Paper introducing measures to reduce demand • The recognition of the unique needs of children and young offenders in the justice system • The need for the development of an evidence- based database	• Multi-agency partnership and leadership • Data sharing and joint analysis • Maturing existing partnerships • National and local outcomes framework • Focus on young offenders and vulnerable individuals • Cross-government collaboration

Cutting Crime Impact (CCI) Wootton *et al.*, 2023	• Integrating human-centred design principles into security • Predictive policing approach • Problem reframing • End-user research • Solution design and prototyping development process • Technology-led to socially responsible policing	• Examines the role of human-centred design in enhancing technological solutions for security, with a focus on predictive policing • Critiques technology-driven approaches • Highlights the benefits of considering human roles, values, and responsibilities in the design process • Discusses predictive policing	• Social Innovation described in the context of socially responsible design, end-user research, and collaborative efforts in the field of security	• To address the challenges and opportunities associated with the development and implementation of predictive policing tools within the context of the Cutting Crime Impact (CCI) project, specifically focusing on the work carried out by the LKA in Lower Saxony • Adoption of human-centred design approach • Reframing the problem statement from a technology-driven focus to a human-centred focus	• The PATROL Tool • SKALA to predict the probable risk of offences in districts • KLB-operativ integrates crime-related data from police sources and socio-economic data • KrimPro was developed to predict crimes based on police data, infrastructure, demographic data	• Implementation of PATROL tool • The implementation of SKALA, KLB-operativ, KrimPro	• Problem exploration and reframing facilitation through the DesignLab collaborative ideation event • Solution Design and Prototyping resulted in a practical solution suited to the problem context • PATROL Tool facilitates the communication of valuable data, information, and experience to police officers during operations and patrol service • Successful implementation of a human-centred design approach to develop a practical solution	• To employ a human-centred design approach to reveal practical problems in the predictive policing • To emphasise the systematic inclusion of information lacking existing predictive policing systems through the PATROL tool • To offer practical strategies to enhance decision-making processes for police officers with PATROL tool • To reframe the problem from a technology-centred focus on the predictive policing system to a human-centred focus on police patrolling • To conduct end-user research

Innovative approaches to Urban Security (IcARUS) Davey *et al.*, 2023	• Novelty (in process and outcome) • Effective addressing of social problems • Empower-ment • Collaboration • Engagement • Design thinking as a practical approach	• To develop tools tailored to the specific needs and contexts of six cities' law enforcement agencies and local security practitioners to address security challenges in their respective urban environments using a social innovation approach	• Provides an extensive report of social innovation: timeline, advocates, theories • Lists aspects of social innovation	• Developing practical tools for social innovation • Collaboratively deliberating, co-producing, and implementing interventions • Sharing knowledge, expertise, and resources to develop evidence-based intervention strategies • Utilising a digital dashboard for informed decision-making • Fostering an inclusive, data-driven approach to improve urban security	• Stuttgart Tool: mobile performance/workshop aimed at increasing young people's resilience • Turin Tool: to support collaborative decision-making to enable evidence-based interventions • Lisbon Tool: providing a design-oriented approach to engage young people in community safety • Nice Tool: Ask for Angela campaign to keep individuals safe from sexual assault • Rotterdam Tool: The Spaanse Polder Café event involving collaborative forums to address safety and security issues • Riga Tool: web application to support an evidence-based approach to policing tactics	• Workshops, design thinking sessions, and stakeholder engagement events Development and implementation of tools tailored to address specific urban security challenges Definition, prototyping, and adaptation of the tools	• Use of a human-centred design tool development process • Need for in-depth research and supplementary action to define better the problem context, design requirements, and constraints in various cities • Demonstration of the impact of the tools on urban security • Identification of limitations in the design thinking approach • Involvement of different consortium partners to support tool development	• Use of a human-centred design in the development process • In-depth research and collaborative actions to define the problem context, design requirements, and constraints in various cities • Cross-sector cooperation and knowledge acquisition • Iterative development of solutions • Design approach adaptation

4. Responsible Research and Innovation in Security Research (RRI)

4.1 Defining Responsible Research and Innovation

Responsible Research and Innovation (RRI) is attracting growing scientific and political interest, as it proposes a governance approach that aims to align research and innovation with society by considering its needs, values and expectations, and by anticipating and evaluating the potential implications of research and innovation, particularly within the European context (European Commission, 2014). There are many definitions of RRI, the concept is in ongoing development (Schuijff & Dijkstra, 2020). Due to its evolving nature, RRI lacks a universally accepted definition and a clear roadmap for implementation and operationalization.

It is generally agreed that RRI fosters transparent, collaborative research ensuring the sustainability, desirability, and societal acceptance of innovation outcomes (Klimburg-Witjes & Huettenrauch, 2021). At its core, RRI within EU security research embodies a proactive approach that integrates ethical, social, and environmental dimensions into the research and innovation process, aiming to enhance the alignment between technological advancements and societal needs while minimising potential risks and adverse consequences.

One of the earliest (and most cited) uses of the term "Responsible Research and Innovation" in the context of security research has been attributed to René von Schomberg (European Commission, DG Research, Ethics and Governance), as part of the 7th Framework:

> *"Responsible Research and Innovation is a transparent, interactive process by which societal actors and innovators become mutually responsive to each other with a view on the (ethical) acceptability, sustainability and societal desirability of the innovation process and its marketable products (in order to allow a proper embedding of scientific and technological advances in our society)."*
>
> von Schomberg, 2011, 9

Notable is von Schomberg referring to research and innovation processes and the marketable products that they may produce: he separates the process dimension and product dimension (von Schomberg, 2011; Schuijff & Dijkstra, 2020). According to von Schomberg the process dimension should reflect a 'deliberative democracy' and the products of research and innovation should reflect normative anchor points: be ethically acceptable, sustainable and socially desirable (ibid). Essentially he suggests incorporating normative principles into the design of technology.

Stilgoe *et al.* offer a broader definition, based on the prospective notion of responsibility:

> *"Responsible innovation means taking care of the future through collective stewardship of science and innovation in the present."*
>
> Stilgoe *et al.*, 2013, 1570

Following this definition, the approach to RRI involves four dimensions: anticipation, reflexivity[3], inclusion and responsiveness. This means that the expected impacts (both benefits and risks, intended and unintended) should be assessed prior to the R&I activities, as well as reflecting on research and innovation processes, activities and assumptions. Inclusion refers to involving the stakeholders and the public in R&I, to which the R&I should respond by developing "*a capacity to change shape or direction in response to stakeholder and public values and changing circumstances*" (Stilgoe *et al.* 2013, 1572).

Stahl (2013) emphasises that RRI consists of actors, activities and norms. and suggests the following definition:

> *"RRI is a higher-level responsibility or meta-responsibility that aims to shape, maintain, develop, coordinate and align existing and novel research and innovation-related processes, actors and responsibilities with a view to ensuring desirable and acceptable research outcomes."*
>
> Stahl 2013: 5

The activities, actors and foundations Stahl refers to, in many cases predate the term RRI (2013), and are not referenced in previous definitions.

[3] Reflexivity, at the institutional level, means holding a mirror up to one's own activities, commitments and assumptions, being aware of the limits of knowledge and being mindful that a particular framing of an issue may not be universally held (Stilgoe *et al.*,, 2013, 1571).

Finally, the fourth definition of RRI is used by the European Commission, and cited in D1.1 E2i Glossary of Terms:

> "*Responsible research and innovation is an approach that anticipates and assesses potential implications and societal expectations with regard to research and innovation with the aim to foster the design of inclusive and sustainable research and innovation. […] Responsible Research and Innovation (RRI) implies that societal actors (researchers, citizens, policy makers, business, third sector organisations, etc.) work together during the whole research and innovation process in order to better align both the process and its outcomes with the values, needs and expectations of society*".
>
> 2018, in Schuijff & Dijkstra, 2020, 535

In their definition of RRI, the European Commission (2018, in Schuijff & Dijkstra, 2020) stated that there are five characteristics or keys of RRI which make RRI tangible: public engagement, open access, gender, ethics, and science education. Governance of the entire process constitutes a sixth dimension, or key, that serves to integrate the other five.

Governance refers to practices that an organisation has in place in order to foster and promote responsible research and innovation. For instance, this could be:

- Having transparent and reflective internal procedures
- Promoting participatory governance
- Fostering stakeholder engagement exercises
- Encouraging future-oriented governance
- Valuing responsiveness

These approaches highlight the importance of including stakeholders in RRI, and the importance of the active role of researchers in reflecting on and shaping the direction of their research. Stakeholders engaged in RRI can include individual researchers, research organisations (both publicly and privately funded), research ethics committees, users, civil society representatives, policy-makers at different levels, professional and industrial bodies, legislators, and educational organisations (such as schools and universities) (von Schomberg, 2011).

This notion of RRI as a higher-level responsibility is gaining growing relevance in the security field, with privacy as a key concern and at the centre of the discussion (de Jong *et al.*, 2017; Klimburg-Witjes & Huettenrauch, 2021; Stahl, 2013; von Schomberg, 2011). It has been suggested that RRI draws from a rich tapestry of ethical theories, including the principles of research ethics and moral values inherent in science and research (Stahl, 2013). Notably, RRI navigates a range of normative foundations[4] to identify principles for evaluating the desirability and acceptability level of research and innovation (Stahl, 2013).

As has previously been established, according to Stahl, RRI embodies 'meta-responsibility', aligning research and innovation processes. The RRI approach emphasises the importance of involving diverse actors or stakeholders, including industry, researchers, research funders, civil society, and policy-makers, to guarantee meaningful societal impact.

RRI also addresses numerous ways of assessing research and innovation projects, such as risk assessment, impact assessment, technology assessment, and foresight activities (von Schomberg, 2011). RRI moves beyond the traditional researcher and expert-centred view of research and innovation, drawing on a large array of possible activities considering deliberative democracy (Klimburg-Witjes & Huettenrauch, 2021). This means that RRI involves engaging diverse stakeholders in decision-making processes related to research and innovation, promoting inclusive dialogue and participation to address societal concerns and values.

RRI is described as a science policy concept, which focuses on aligning the purposes and values between the different stakeholders, such as scientists and the public, by inclusive deliberation (de Jong *et al.*, 2017). This process is essential to uncover the range of relevant values to be incorporated into responsible development and subsequent embedding or implementation of emerging technologies (ibid).

[4] Normative foundations refer to the ethical, philosophical, or theoretical principles upon which norms, rules, or standards are established. In various fields such as ethics, law, politics, and social sciences, normative foundations provide the basis for evaluating and guiding human behaviour, decision-making, and societal organisation. These foundations often reflect values, beliefs, and principles that shape how individuals and societies perceive right and wrong, justice, fairness, and moral obligations.

4.2 Key Characteristics

As with the definition of RRI, there is no clear consensus regarding the key characteristics of RRI. However, as we have explored the evolution of definitions in the previous section, we do see patterns and overlap in the characteristics and key factors considered to be integral to the process and outcomes of RRI. In Table 2 is a list of characteristics of RRI drawn from the literature, highlighting how they link to the 6 keys of RRI practices according to the European Commission.

Based on the literature, it's evident that Responsible Research and Innovation (RRI) is rooted in normative principles. Given its proposed use in diverse contexts, there's a search for normative anchor points to define responsibility. Several proposals include:

1. Von Schomberg (2011) advocates leveraging the Treaties of the European Union, outlining five anchor points: 1. promoting scientific and technological advances, 2. promoting social justice and equality and fundamental rights, 3. quality of life, health and environmental protection, 4. sustainable development, and 5. a competitive social market economy.
2. Stahl (2013) presents alternative normative anchor points: 1. human rights (UN) and 2. the longstanding discourse on philosophical ethics, encompassing virtue ethics, deontology, feminist ethics, and the capability approach.

However, von Schomberg's list faces challenges: it is focussed on (western) Europe, some elements remain vague, open to interpretation and potentially contradictory (e.g. sustainable development, social justice and technological advance). Therefore, RRI discourse may need to draw from broader philosophical ethics discussions (Stahl, 2013). Resolving tensions between proposed categories, like technological advancement and social justice, is crucial. Ultimately, the implementation of RRI depends on collective efforts to interpret and apply these concepts effectively.

Table 2. Key Characteristics of Responsible Research & Innovation

	Key Characteristic	Description	Link to European Commission 6 characteristics or keys of RRI[5]
RRI Outcome	Meets societal needs	The products of RRI should be socially desirable (von Schomberg, 2011) The needs, values and expectations should be considered to ensure the sustainability, desirability, and societal acceptance of innovation outcomes (Klimburg-Witjes & Huettenrauch, 2021).	Public Engagement Governance
	Ethical	The products of RRI should be ethically acceptable, sustainable and socially desirable (von Schomberg,. 2011).	Ethics Governance
RRI Process	Transparency and Accountability	RRI is guided by principles of governance, with democracy playing a central role in shaping RRI practices, emphasising transparency and broad accountability, as well as public engagement and grand challenges (Stahl, 2013). Ensure transparency in RRI. Transparency and accountability emphasise democratic ethics and promote openness of security practices (OSCE, 2014, Peak & Glensor, 1999, RAN, 2019; Sharabi & Litmanovich, 2023; Uhlmann, 2015). Links to reflexivity (holding a mirror up to one's own activities and assumptions) (Stilgoe *et al*., 2013)	Open Access Ethics Governance Gender Science Education (culture change)

[5] Five characteristics or keys of RRI which make RRI tangible: public engagement, open access, gender, ethics, and science education. Governance of the entire process constitutes a sixth dimension, or key, that serves to integrate the other five (European Commission, 2018, in Schuijff & Dijkstra, 2020).

RRI Process	Anticipation	RRI *"anticipates and assesses potential implications and societal expectations with regard to research and innovation"* (European Commission, 2018, in Schuijff & Dijkstra, 2020, 535) The expected impacts (both benefits and risks, intended and unintended) should be assessed prior to the R&I activities (Stilgoe *et al.*, 2013). Anticipating and evaluating the potential implications of research and innovation, particularly within the European context (European Commission, 2014).	Governance Gender Public engagement
	Reflexivity	Clear identification of limitations. Reflecting on research and innovation processes, activities and assumptions (Stilgoe *et al.*, 2013) Emphasising the need to consider various future scenarios actively and critically reflect on the ethical and societal responsibilities inherent in research and innovation (de Jong *et al.*, 2017)	Open Access Governance
	Responsiveness	RRI is characterised by reflexivity, inclusion, and responsiveness (Klimburg-Witjes & Huettenrauch, 2021). Responsiveness is crucial in adapting the development trajectory to avoid undesired consequences and ensure ethical research and innovation practices (de Jong *et al.*, 2017). Responsiveness is the ability to change after internal reflections and external feedback. Actively seeking feedback. Capacity to change shape or direction in response to stakeholder and public values and changing circumstances (Stilgoe *et al.*, 2013) RRI is also characterised by proactive engagement and inclusion of diverse stakeholder groups, ensuring that all relevant perspectives and concerns are considered. These dimensions are interrelated, creating synergies and tensions within the responsible research and innovation processes.	Public engagement Governance

RRI Process	Equality, Diversity and Inclusivity	Involving diverse actors or stakeholders, including industry, researchers, research funders, civil society, and policy-makers, will guarantee meaningful societal impact (von Schomberg, 2011) It ensures the outcomes of RRI meet the needs of society or are socially desirable. Collaboration, end-user engagement, citizen engagement. This also entails ensuring a representative sample of society when engaging with end-users and citizens. RRI emphasises an inclusive approach, which goes beyond the traditional research-centric view. This approach includes early (upstream) engagement and midstream and downstream activities. It also includes measures that contribute to building trust throughout the process, benefiting the handling of similar issues in the future (von Schomberg, 2011). Engaging with the community promotes accountability, as it allows for the monitoring and evaluation of project impacts by those directly affected (OSCE, 2014, Peak & Glensor, 1999, RAN, 2019; Sharabi & Litmanovich, 2023; Uhlmann, 2015).	Public Engagement Gender Governance

4.3 Aims

RRI emphasises the importance of addressing fundamental values and societal needs by aligning research and innovation with normative anchor points such as ethical acceptability and sustainability, aiming to protect the environment and society. In security, methods such as technology assessment, privacy impact assessment, and technology foresight are used to achieve RRI aims (von Schomberg, 2011).

The aims of RRI in the security field include:

- Enhancing inclusive deliberation is crucial in the early stages of technology development, fostering a broad spectrum of perspectives. This approach enables timely societal intervention within the research and innovation process, mitigating the risk of technologies failing to be implemented or integrated into society. Additionally, it ensures proactive monitoring of potential impacts, both positive and negative, at an earlier juncture (de Jong *et al*., 2017; von Schomberg, 2011).
- Identify relevant societal needs and values to consider in technology development and subsequent implementation phases (de Jong *et al*., 2017).
- Integration of privacy into research and innovation activities, notably through the idea of privacy by design and specific methodologies like privacy impact assessment and ethics impact assessment (Stahl, 2013).
- Improve the conditions for responsibility distribution among the stakeholders through technology foresight, value-sensitive design[6], and methodologies from constructive technology assessment[7] (Stahl, 2013).
- Developing and enforcing legislation and regulations to address privacy and other RRI issues (Stahl, 2013). Recognizing privacy as a human right,

[6] This approach emphasises the importance of considering ethical and moral values throughout the design process of technology. It ensures that the resulting technology aligns with societal values and norms, thus influencing how responsibilities are assigned and distributed (Stahl, 2013).

[7] Constructive technology assessment refers to methodologies used to assess and evaluate the societal implications of technology in a proactive and participatory manner. By employing these methodologies, stakeholders can collaboratively assess the potential impacts of technology on responsibility distribution and take appropriate actions to address any concerns or issues (Stahl, 2013).

and actively aiming to regulate contested technology-related issues (ibid).

- Prevention of early closure (premature alignment on problem statements and purposes between different stakeholders, potentially reducing the possibilities for open dialogue between stakeholders). Early closure can occur while dealing with taboo subjects or in the presence of influential stakeholders. Early closure can be prevented by identifying its signs and initiating critical reflection to avoid the foreclosure of ongoing reflexive deliberation (de Jong *et al*., 2017). It is important to keep communication channels open throughout the research and innovation process, and broaden the conversation on problem statements and the potential solutions.
- Adaptation of the framework to the needs of the security field by addressing the specific requirements for projects on security-sensitive issues (Klimburg-Witjes & Huettenrauch, 2021).
- Fostering an open process of security research and innovation while addressing security-sensitive aspects, such as child safety and detecting potential perpetrators. The tension between the openness required by the RRI framework and secrecy practices has also been mentioned in this context (de Jong *et al*., 2017; Klimburg-Witjes & Huettenrauch, 2021).
- Emphasising the importance of balancing ethical considerations (such as data protection and transparency) with security considerations while preventing the abuse of security technologies (von Schomberg, 2011).

4.4 Examples of Implementations of RRI in the Security Domain

- **The Smart Border** – BODEGA, a case study of an EU-funded research project, presents an application of the RRI framework to border security (Klimburg-Witjes & Huettenrauch, 2021). The project presents Automated Border Control systems ("Smart Borders") and eGates at the EU Schengen border. It aims to understand the implications of smart border control and biometrics-based self-service systems for traveller processing. It also addresses the effects of smart borders on the work of border guards. Additionally, it strives to identify possible ways to gain broader social acceptance of this transformation.

This case study in the security field exemplifies the application of the RRI framework. It sheds light on the challenges faced in security innovation, contributing to the ongoing discussion on contextualising the concept for security-related research and innovation. BODEGA tries to address the challenges and benefits encountered by stakeholders involved in the project. Stakeholders in the project presented various tensions, leading to a critical exploration of the potential problems that arise when applying RRI principles to digitising the EU's borders.

- **Scanning Technology for The Detection of Paedophilia** – A potential development of scanning technology for the detection of paedophilia among job applicants in childcare settings is another study case of the implementation of RRI in security (De Jong *et al*., 2017). The study case involves a prefectural thought experiment that extrapolates a potential future scenario from a specific present situation, explicitly focusing on the development of technologies to prevent child sexual abuse. The document emphasises the critical examination of the concept of alignment in RRI. It highlights the implications of early closure, diversity masking, and discursive closure (particularly in the context of taboo topics or influential stakeholders). It underscores the importance of acknowledging stakeholders' diversity and power relations to avoid masking potential conflicts. Diversity masking and early closure are presented as new avenues for RRI research, urging RRI researchers and practitioners to pay attention to this phenomenon.

4.5 Expected Benefits for Security Research and Innovation

By incorporating RRI into security innovation it is possible to develop security technologies that effectively address security concerns while considering the ethical, societal, and privacy implications. Von Schomberg (2011) claims that moral considerations are moving to the forefront using the RRI approach in security advances. The collaborative approach of RRI can result in security technologies that gain greater public trust and ethical approval. Additionally, RRI focuses on enhancing social robustness by aiming for better and more integrated governance of science and technology innovation. RRI can also lead to a more sustainable and socially robust way of life with and using security technologies (von Schomberg, 2011).

Further, von Schomberg presents privacy protection as another key element of RRI, involving integrating privacy concerns into the development process. Collingridge dilemma is mentioned as it implies the benefits of addressing ethical issues during the early stages of technology design and development. Thus, in the context of RRI applications for developing security technologies, privacy benefits from addressing ethical problems early, as RRI requires (von Schomberg, 2011). RRI claimed to be aligned with the fundamental rights of privacy, ensuring that security technologies respect and protect individual privacy. Furthermore, RRI employs anticipatory governance, utilising methods like Technology Foresight, Technology Assessment, and Privacy Impact Assessment (ibid; Stilgoe *et al*., 2013). These methods help predict security technologies' possible positive and negative impacts as a step toward a more ubiquitous technological environment. Lastly, RRI claimed to include market-oriented self-regulation mechanisms, contributing to greater market transparency (von Schomberg, 2011).

According to Stahl (2013), RRI integrates established governance mechanisms like risk assessment for proactive engagement with potential consequences. Foresight activities in RRI focus on future challenges and are integral in addressing grand societal challenges[8]. What grand challenges have in common is how they can profoundly impact how modern societies function (ibid). These challenges represent issues whose solutions stand to gain from advancements in research and innovation. Effectively tackling these grand challenges could lead to a safer existence and enhancing overall quality of life (ibid). The RRI approach broadens stakeholder engagement beyond conventional research circles, encouraging early, midstream, and downstream involvement (Stahl, 2013). It remains receptive to external scrutiny, thereby upholding responsible research practices. Active reflexivity and self-assessment promote coordination and alignment throughout research and innovation processes, aiming for desirable and suitable outcomes (Stahl, 2013).

RRI encompasses fostering inclusive deliberation and aligning diverse stakeholder values for responsible technology development, recognizing the importance of coupling these deliberations with policy and decision-making

[8] Grand challenges include: questions of employment, economic well being and growth, issues of social coherence, and the resilience of democratic societies, demographic developments, social innovations (Stahl, 2013).

processes to uncover relevant values for technology development and implementation (de Jong *et al.*, 2017).

Klimburg-Witjes and Huettenrauch (2021) present the efforts to apply RRI principles as a catalyst for creating spaces for dialogue among stakeholders, enhancing interdisciplinary communication, addressing ethical values, and fostering reflexivity, thus shaping responsible security solutions development. The RRI approach nudges industry actors to reflect on co-developed technologies and their implications. Finally, RRI addresses real-world conditions and challenges, emphasising the need to consider ethical values like fairness and non-discrimination while developing novel security technologies and systems (Klimburg-Witjes & Huettenrauch, 2021).

4.6 RRI tools in security context

Stahl (2013) delves into the intersection of privacy and RRI within the security field, proposing a range of tools to apply RRI principles effectively. This includes a suite of assessment and foresight activities such as risk assessment, privacy impact assessment, ethics impact assessment, and various forms of technology assessment (TA), including participative and constructive TA. Those are considered to be vital for identifying and addressing privacy concerns in developing security technologies. Furthermore, the concept of 'privacy by design' is underscored as a tool for integrating privacy considerations into research and innovation activities.

The author also emphasises the significant role of legislation and regulation in addressing RRI issues, particularly concerning privacy. He cites the European privacy directive (95/46/EC) and the European data protection framework review, highlighting that attention should be channelled to the privacy issues in the security context (Stahl, 2013 and references within).

Von Schomberg (2011) focuses on practical applications, presenting various projects and activities that include recommendations and guidelines for implementing RRI in information and communication technologies and security technologies. PRESCIENT, PATS, ETHICAL, RISE, HIDE, and EFORTT are projects highlighted for their contributions to addressing ethical issues. These projects have been instrumental in developing ethical recommendations, which have been incorporated into codes of conduct, guidelines, and policy briefs, providing a roadmap for integrating RRI principles into technological fields.

The tools mentioned include assessment methodologies, legislative measures, and practical project experiences, all of which can be instrumental in applying RRI in security product development.

4.7 RRI – limitations and challenges

Von Schomberg characterised the concept of RRI as a transparent, interactive process through which societal actors and innovators mutually respond to each other to create sustainable and ethical outcomes (2011). Yet there are limitations of the RRI approach in the security domain, which are highlighted by literature (de Jong *et al*., 2017; Klimburg-Witjes & Huettenrauch, 2021; Stahl, 2013). A recurring criticism of RRI is the absence of a universally accepted definition and a clear implementation method. Critics often describe the framework as "*overly vague*," lacking in specific guidelines and measurement criteria (Wickson & Carew 2014: 256). There is a notable ambiguity and flexibility within the RRI framework. This vagueness challenges establishing measurable criteria and adhering to a consistent approach (Klimburg-Witjes and Huettenrauch, 2021). This lack of a clear definition and ambiguous features allows for a broad range of interpretation:

- What is the normative basis for RRI? The term 'socially desirable' is vague: do the stakeholders involved in the RRI process know what socially desirable is? There is the possibility they have contradicting views of what socially desirable is. Do they have a representative group of stakeholders and plan for end-user and/or citizen engagement to establish it?
- What if something is socially acceptable (or desirable), but unsustainable?

Practical applicability is another concern, especially from an industry-oriented perspective. Blok and Lemmens (2015) criticise the narrow focus on research and innovation activities generally in academic environments, therefore the RRI framework's suitability and effectiveness for business purposes in the private sector are questioned (ibid; Klimburg-Witjes & Huettenrauch, 2021).

The privacy debate has been presented as emphasising the tensions RRI creates under real- world conditions of the security domain. Klimburg-Witjes and Huettenrauch (2021) highlight the clash between RRI values and security

considerations when showing that following RRI can compromise physical security. The framework can be seen as embodying a political agenda, with its central propositions of inclusiveness, openness, and interaction between science, policy, and the public seen as inherently political (Klimburg-Witjes & Huettenrauch, 2021). This aspect may skew the framework's focus and implementation.

A notable challenge within RRI arises when discussions and stakeholder engagement regarding the ethical, social and environmental implications of emerging technologies or scientific research are concluded prematurely. This is known as early closure in the context of RRI and represents a significant challenge (de Jong *et al.*, 2017). Research suggests that an over-reliance on engagement alone could lead to early closure in discussions and policy decisions. This critique emphasises the importance of developing methods to prevent premature conclusions and highlights the essential role of reflexive engagement and inclusive, *continuous* deliberation, especially when dealing with taboo or controversial technologies. Moreover, it underscores how the phenomenon of "black boxing"[9] can influence societal problem definitions and research trajectories, because when issues are simplified or obscured, it can limit the range of possible solutions considered and the depth of analysis applied. This narrowing of discursive space, or the range of ideas and perspectives that are discussed and considered, can lead to incomplete or biased problem definitions (de Jong *et al.*, 2017). In turn, if complex issues are oversimplified, research trajectories may be skewed or limited, focusing on superficial aspects or solutions rather than addressing underlying causes or dynamics. This can result in ineffective or misguided interventions (ibid; Stilgoe *et al.*, 2013).

Finally, a significant challenge facing RRI are the possible contradictions between different stakeholders, which suggest that RRI may not be a one-size-fits-all solution (Stahl, 2013). There may be conflicting interests or perspectives among different stakeholders involved in research and innovation processes (ibid). Furthermore, despite efforts to promote responsible practices, it may not always be possible to prevent all negative

[9] *"Black boxing"* is a term derived from systems theory and cybernetics. It refers to the process by which complex systems or concepts are treated as a single entity or a *"black box,"* with their internal workings hidden or ignored. In societal contexts, this can occur when complex issues are simplified or obscured, leading to a lack of understanding of the underlying mechanisms and dynamics.

consequences or outcomes resulting from research and innovation activities. Von Schomberg (2011) and Stahl (2013) highlight the complexity of RRI in the security domain, emphasising the inherent challenge of predicting the societal impacts of technological advances. The unpredictability of the development trajectory of technology and the difficulty in aligning new technologies with societal needs and values are significant epistemological challenges (van Schomberg, 2011; Stahl, 2013). RRI's epistemological limitations, potential for technocracy, ethical and social challenges, potential stakeholder resistance, and overall limitation as a comprehensive solution need to be considered when implementing RRI (Stahl, 2013).

While RRI serves as an important framework for promoting responsible practices and fostering accountability in research and innovation, it has limitations and challenges that need to be recognized and addressed. This underscores the need for ongoing dialogue and reflection to improve the efficacy, adaptability and applicability of RRI approaches.

5. End-User engagement in security research

5.1 Defining end-users

The term *"end-user"* refers to the individual or group of individuals who ultimately use a product, service, system, process or solution. End-users are the people for whom a design or innovation is created, and their needs, preferences, and experiences are crucial considerations in the design process. Within the security domain, end-users may be:

- **Security personnel** – such as police, border guards or emergency services
- **Other relevant employees** – such as airport staff, city centre managers and service providers
- **Citizens** – including residents and local communities.

End users should be identified in relation to a specific innovation. For example, in relation to Airport Security Screening Technologies (including body scanners and explosive detection systems, enhance the safety and efficiency of airport security procedures), end users comprise airline passengers and airport personnel.

Within the domain of security, "end-users" can include a variety of roles and individuals who interact with or are protected by security measures across different contexts. Some examples include:

1. **Within the Security Profession**
   - **Police Officers** and **Law Enforcement Agents**: They use various security technologies and systems for surveillance, communication, and data analysis to enforce laws and protect the public.
   - **Security Guards**: Personnel who monitor security cameras, patrol premises, and manage access control systems in various settings like corporate buildings, shopping centres, and residential areas.
   - **Military Personnel**: Members of the armed forces who utilise security and surveillance equipment, cybersecurity measures, and intelligence analysis tools in defence operations.

- **Cybersecurity Analysts**: Professionals who use security software and tools to monitor networks for breaches, analyse threats, and protect against cyber attacks.
- **Forensic Investigators**: Specialists who utilise security and forensic software tools to collect, analyse, and preserve evidence from digital devices for legal proceedings.
- **Private Investigators**: They often use surveillance equipment, background check databases, and other security tools to gather information for private clients or corporations.

2. **Physical Security**
   - **Residents** of a secured community or building.
   - **Visitors** to a facility or organisation.
   - **Employees** within an organisation, from executives to entry-level.
   - **Contractors** and **temporary staff** who need access to facilities or resources.
   - **Event attendees** in spaces requiring security measures.

From User-centred to Human-centred design

The shift from *"user-centred"* to *"human-centred"* design reflects a broader and more inclusive approach to designing products, services, and systems. While both methodologies prioritise the end-user's needs and experiences, the choice of terminology signals a difference in focus and scope. Reasons why "human-centred" is increasingly preferred include:

1. ***Its broader scope***

   User-Centred Design (UCD) primarily focuses on optimising the product or service for the *user's* convenience, efficiency, and satisfaction. It's often closely associated with 'usability' and the interaction between the user and the product.

   Human-Centred Design (HCD), on the other hand, extends beyond the immediate user to consider the wider impact on all stakeholders in a designed 'system', including indirect users, communities, and even the environment. It takes into account the human condition, social contexts, and global challenges.

2. ***Its emphasis on inclusivity and empathy***
   HCD emphasises empathy and inclusivity, aiming to understand and meet the needs of all humans affected by the design, not just those who directly interact with it. This approach is particularly important in multicultural contexts where designs must be sensitive to diverse cultures, values, and norms.
   HCD seeks to address the broader human experience, incorporating the consideration of emotional, social, and ethical dimensions into the design process.
3. ***An emphasis on holistic problem-solving***
   HCD is often applied in complex systems and services where the design solution involves more than just interaction with a 'product'. It is well-suited for tackling broad, systemic issues by understanding the interconnectedness of problems and incorporating insights from a wide range of human experiences. HCD promotes a *holistic view* of problem-solving that includes technological, social, cultural, and economic considerations.
4. ***Its consideration of ethical implications***
   By emphasising the "human" aspect, HCD encourages designers and developers to consider the ethical implications of their work, including privacy, accessibility, and sustainability. It prompts a reflection on how design decisions affect societal wellbeing and environmental good.
   This perspective encourages designers to think about the long-term consequences of their decisions and the responsibility they hold towards society and future generations.
5. ***Adaptability and resilience***
   In an era of rapid change and uncertainty, HCD provides a framework that is adaptable to evolving human needs and resilient in the face of global challenges. It encourages continuous learning and iteration of solution designs based on real-world impacts and feedback from a diverse set of stakeholders.

The choice of "human-centred" over "user-centred" reflects a deliberate shift towards a more empathetic, ethical, and comprehensive design approach. While "user-centred" design is not obsolete and remains highly relevant in many contexts, "human-centred" design captures a broader commitment to addressing the complex web of human needs, aspirations, and challenges in the 21st Century.

5.2 Defining end-user engagement

End-user engagement in the design process involves actively involving the individuals who will use the product or service in the development and refinement stages. This approach recognises the importance of understanding end-users' perspectives, preferences, and challenges to create solutions that better meet their needs.

End-user engagement should begin early in the design process and continue throughout. By involving users from the outset, designers can gather insights that inform decision-making and refine concepts iteratively.

5.2.1 End-user research and prototyping

Conducting user research, which may include interviews, surveys, observations, and usability testing, helps designers gain a deeper understanding of end-users' behaviours, preferences, and pain points.

Prototyping allows designers to create early versions of a product or service for testing. By involving end-users in the testing process, designers can identify usability issues, gather feedback, and make improvements before finalising the design.

The design process should be iterative, allowing for adjustments based on end-user feedback. Continuous engagement with end-users ensures design decisions are responsive to evolving needs and preferences.

Effective communication and empathy are essential for understanding users' perspectives and building trust. Designers must listen actively, ask relevant questions, and communicate design decisions in a user-friendly manner.

Depending on a designer's training, experience, design philosophy and the specific context of their work, the concept of 'co-design' or 'co-creation' may be embraced and, where relevant, applied.

What is co-design?

Co-design, also known as participatory design or co-creation, is an approach to the design process that involves collaboration between designers and end-users. It emphasises active involvement of end-users, stakeholders, or community members in the creation and development of products, services, systems, or solutions. Co-design recognises that the

people who will use or be affected by a design have valuable insights and expertise that can contribute to the success of the final outcome.

By incorporating end-user engagement into the design process, designers increase the likelihood of creating products or services that are user-friendly, meet real-world needs, and provide positive user experiences. This approach is fundamental to human-centred design practices and contributes to the overall success and adoption of innovations in various fields.

5.3 End-user engagement in security research

The engagement of societal actors in the field of security, police work, and counterterrorism is an evolving practice and research field that reflects the complexity involved in implementing social theories in the contemporary security domain. It also suggests that end-user engagement in security innovation is effective in terms of security management and can foster positive relationships between security representatives and the public.

Various research projects have engaged end users (police officers, border guards, and other security personnel) in security innovation. The projects range from policing initiatives that aim to improve the effectiveness and delivery of police services / operations, to counterterrorism strategies to improve urban resilience. The active participation of front-line, operational officers in security research benefits from the experience and local insights in improving processes, systems and practice to enhance safety and preparedness. End-user engagement initiatives highlight the value of knowledge sharing and gaining insight from practical experience to security research. Finally, engaging end-user perspectives provides an understanding essential for the effectiveness and practical implementation of innovative security solutions.

End-user engagement practices and challenges presented in this report are based mainly on European security research (Davey & Wootton, 2016; Hemmingsen, 2015; Smithson & Jones, 2021; Muravska *et al.,* 2023; Nederveen *et al.,* 2022; Peak & Glensor, 1999; RAN, 2019; Uhlmann 2015; *OSCE*, 2014), with additional examples from America (Lockridge & Greenwood 2019; Peak & Glensor, 1999; Pockett, 2005) and Israel (Ben Eliyahu *et al.,* 2023, Pockett, 2005, Sharabi & Litmanovich, 2023).

5.4 Objectives of end-user engagement in security innovation

In addressing complex societal challenges, such as those in the security domain, the engagement of end-users and stakeholders throughout the innovation process is crucial — from problem definition to prototyping and implementation. This aligns with the principles of human-centred design and participatory approaches to innovation, where the focus is on creating solutions that are not only effective but also adopted and embraced by those they are designed to help.

5.4.1 End user engagement in technological security solutions

Muravska *et al.* (2023) emphasises the significance of end-user involvement in developing security technologies. End-user involvement is described as crucial throughout the initial research and implementation stages to ensure that *"novel technologies will be accepted"* (sic) and operate efficiently in the field. The uptake increased significantly when survey respondents affirmed that end-users had been involved from the start of the projects, highlighting the significance of engagement in the early stages of an innovation project (which includes problem definition).

Klimburg-Witjes and Huettenrauch (2021) provide additional insights into end-user engagement in developing security technologies. They present perspectives on applying the RRI framework to border security (see Section 4 of this report). The engagement of end-users is highlighted as creating a collaborative setting whereby concerns and ethical values, such as fairness and non-discrimination, can be addressed while developing border management technologies.

5.5 Impact of end-user engagement in Social Innovation

End-user engagement in Social Innovation processes widens the perspective of project consortia, providing access to diverse viewpoints and practical experience (Davey & Wootton, 2016). The engagement of end-users and key stakeholders during solution design and development also addresses problems with end-user acceptance and the appropriateness of new technologies to operational contexts, with end-users more likely to embrace design solutions they have had a hand in shaping. Additionally, it provides opportunities for the sharing of good practices, creating a fertile ground for mutual learning and continuous improvement in the security domain (*ibid*).

5.6 End-user engagement – challenges and considerations

5.6.1 Implementation Challenges

Engaging end-users in developing security solutions is not without its challenges and needs careful navigation. These challenges arise from the complex nature of security issues, the diversity of stakeholders involved, and the sensitive information that often accompanies security work. Common challenges include:

- **Diverse stakeholder interests** – Security solutions often have to cater to a wide range of stakeholders, including law enforcement, private sector entities, community organisations, and the general public. Each group may have different priorities, concerns, and levels of understanding about security issues, making it challenging to develop solutions that satisfy all parties.
- **Confidentiality and sensitivity** – Security-related projects often involve handling sensitive information that cannot be fully disclosed to all participants in the innovation process. This can limit the extent to which certain end-users, especially those from the community or non-specialist backgrounds, can be involved in the development process.
- **Technical complexity** – Security solutions can be technically complex, requiring specialised knowledge that end-users may not possess. There will be a gap in understanding between the developers of security technologies and the intended end-users. However, ensuring end-user needs and preferences are properly considered by developers will minimise the risk that solutions are difficult to use or fail to meet users' actual needs.
- **Resistance to change** – Security organisations and their personnel may be resistant to adopting new approaches or ways of working, particularly if these changes are perceived as disrupting established procedures or hierarchies. Addressing institutional inertia, which may be well-founded, requires early engagement with end-users and the benefits of proposed solutions being well communicated to build trust and buy-in.

5.6.2 Ethical and Legal Considerations

Ethical and legal issues, such as privacy concerns, surveillance, and data protection, are paramount in security solutions (Davey & Wootton, 2016; *OSCE, 2014*). Engaging end-users in a way that respects these concerns while still gathering the necessary insights to inform solution development can be challenging.

6. Citizen, communities and CSO engagement in security research

6.1 Defining citizens, communities and CSOs

In the context of Social Innovation in the security domain, engaging citizens, communities, and Civil Society Organisations (CSOs) is often crucial for developing effective, inclusive, and sustainable security solutions. Defining these groups in a meaningful way can help in understanding their roles and contributions to Social Innovation in security.

- **Citizens** – A citizen is an individual who is a member or inhabitant of a particular country and has certain rights and responsibilities within that nation. Citizenship typically involves legal and political ties to a specific state, entailing both privileges (such as the right to vote) and duties (such as obeying laws).

  Within the security research domain, this group includes the general public, particularly those living in areas affected by security issues or those who are directly impacted by security policies and practices. Engaging citizens can provide valuable insights into the security challenges they face, their perceptions of safety, and their ideas for improvement. Methods for engaging citizens include public consultations, surveys, community meetings, and participatory design sessions.

- **Communities** – A community refers to a group of people who share common characteristics, interests, or geographical location. Communities can be based on various factors, including cultural, social, economic, or professional affiliations. They are often characterised by a sense of belonging and mutual support among their members.

  Within the security research domain, communities may be defined based on geographical locations (such as neighbourhoods or cities), demographics (such as youth, elderly, or minority groups), or shared interests (such as business associations or cultural groups). Communities often have a deep understanding of local security issues

and the social dynamics that influence them. Engaging with communities can be done through community leaders, local CSOs, or through community forums and workshops that encourage collective brainstorming and problem-solving.

- **Civil Society Organisations (CSOs)** – A Civil Society Organisation is a non-governmental and non-profit organisation that operates independently of local and national government. CSOs play a crucial role in society by addressing various issues, advocating for social change, and promoting civic engagement. They can include charities, advocacy groups, and grassroots organisations working to enhance the well-being of individuals and communities.

  Within the security research domain, CSOs may include a wide range of organisations such as non-governmental organisations (NGOs), advocacy groups, professional associations, and charitable organisations that work on issues related to security, human rights, community development, and social justice. CSOs can play a crucial role in Social Innovation in the security domain by acting as intermediaries between citizens, communities, and governmental bodies. They can provide expertise, mobilise resources, advocate for policy changes, and implement community-based projects. Engaging CSOs can be done through partnerships, collaborative projects, and advisory roles.

CSO and NGO – What's the difference?

While Civil Society Organisations (CSOs) and Non-Governmental Organisations (NGOs) share similarities, they are not precisely the same—and should not therefore be used interchangeably.

Civil Society Organisation (CSO) – CSO is a broader term that encompasses a range of organisations. CSOs refer to entities formed by individuals or associations outside of government structures that work towards the betterment of society. This category includes community groups, advocacy organisations, NGOs and more.

Non-Governmental Organisation (NGO) – An NGO is a specific type of CSO. They are independent, non-profit organisations that operate without direct government control. NGOs were first called such in Article 71 in the Charter of the newly formed United Nations in 1945 (see here). NGOs often operate internationally and are recognised for their work across borders,

addressing global issues like human rights, environmental conservation, and humanitarian aid. The rise of NGOs, particularly in the context of globalisation, has been attributed to their ability to fill gaps left by public service cuts from institutions like the World Bank and IMF.

Example security CSO – Neighbourhood Watch

Neighbourhood Watch operates in the UK and is claimed to present the most common local form of community-based crime prevention practice (Peak & Glensor, 1999).

6.2 Engaging the citizen-voice in security research

Various methods can be employed to improve problem definition and increase the uptake/implementation of resulting security solutions:

- **Community surveys and needs assessments** – Conduct surveys and assessments to gather data on the specific security needs and concerns of different communities. This data can inform the problem definition phase of security research and ensure that the projects address the most pressing issues faced by the communities.
- **Public forums and Town Hall meetings** – Host forums and meetings where community members can discuss their security concerns with researchers and innovators. These events provide a platform for open dialogue, helping to align the objectives of security projects with the priorities of the community.
- **Stakeholder Advisory Boards** – Establish advisory boards that include representatives from communities, CSOs, and other relevant stakeholders. These boards can provide ongoing guidance, feedback, and support throughout the research and innovation process.
- **Participatory design workshops** – Organise workshops where citizens, community members, and CSOs can directly contribute their perspectives and experiences to the design of security solutions. These workshops allow stakeholders to co-create solutions that are tailored to their specific needs and contexts, making the solutions more likely to be accepted and implemented.

Example – benefits of design workshops

Creating spaces for engagement and interactions can contribute to the evolution of innovative, practical methods to ensure the sustainability of engagement practices (Peak & Glensor, 1999; RAN, 2019). Urban art and sports workshops, as well as political involvement, allowing marginalised young community members to express their identity and discuss how others perceive them, can reduce alienation and, thus- radicalization (Smithson & Jones, 2021; RAN, 2019). Events like the Bike Rodeo and Coffee with Cops at Georgian College demonstrate practical efforts to provide positive community and police interactions (Lockridge & Greenwood, 2019). Providing leadership training, mentorship, and skills development opportunities for the community members facilitates safer communities and helps at-risk members deal with potentially triggering situations (RAN, 2019). Thematic workshops, discussing inter-community challenges with community members, showed positive outcomes in security-related problem-solving (OSCE, 2014).

- **Pilot testing with community feedback loops** – Implement pilot projects in collaboration with local communities and CSOs. Use feedback loops to collect insights on the usability, effectiveness, and acceptability of the security solutions, and iteratively refine the projects based on this feedback.
- **Digital engagement platforms** – Utilise online platforms and social media to engage a broader audience in the innovation process. These platforms can facilitate crowdsourcing ideas, conducting online consultations, and disseminating information about security projects, thereby increasing community involvement and buy-in. Community participation platforms and frameworks can be used for long-term and continuous involvement and interaction with the community, including beyond project timelines. They can be key to ensuring impact and sustainability (RAN, 2019). The Committee of Terrorism of the International Association of Chiefs of Police defined five levels of engagement, from building established relationships to operating networks (*OSCE*, 2014). Utilising online platforms can facilitate continuous presence and communication (Peak & Glensor, 1999; RAN, 2019). Projects aimed at focused engagement of disadvantaged groups

facilitate empowerment and reduce exposure to radical agendas (Hemmingsen, 2015; RAN, 2019; Smithson & Jones, 2021). Strengthening public governance can increase the impact of engagement activities (Uhlmann, 2015).

- **Civil society engagement** – community engagement allows quick feedback and promotes knowledge exchange, providing a better mechanism for realising anticipated outputs and outcomes (Nederveen *et al*., 2022). The engagement of civil society organisations in security practices and research activities aims to increase their participation in both the shaping and implementation stages and to promote social innovation (Davey & Wootton, 2016).
- **Capacity building and Training** – Offer training sessions and capacity-building workshops for community members and CSOs on security topics. By enhancing their understanding of security issues and solutions, these stakeholders can become more effective partners in the research and innovation process. Training in problem-solving strategies emphasises the importance of dialogue, trust-building, and relationship-building as effective methods for engaging communities in policing efforts (Hemmingsen, 2015; *OSCE*, 2014; Peak & Glensor, 1999).

Broader approaches to gaining the input of citizens to Social Innovation in the security domain, where citizens and community engagement is central include:

- **Collaborative research projects** – Involve citizens, communities, and CSOs as active partners in research projects. This could include co-developing research questions, co-collecting data, and co-analysing findings. Such collaboration ensures that the research process is transparent and inclusive, leading to solutions that are more likely to be embraced by the community.
- **Use of Citizen Science Approaches** – Encourage citizens to contribute to security research through citizen science projects. This can involve citizens in data collection, analysis, and monitoring activities, making them active contributors to the development of security solutions.

It is important to ensure that any engagement methods and strategies are ethical, inclusive, and sensitive to the diverse needs and vulnerabilities of

different community groups. This requires appropriate consideration of gender, age, socio-economic status, and cultural factors in the design and implementation of engagement activities.

Community engagement practices and challenges presented in this report are based mainly on European security research (Davey & Wootton, 2016; Hemmingsen, 2015; Smithson & Jones, 2021; Muravska *et al*., 2023; Nederveen *et al.*, 2022; Peak & Glensor, 1999; RAN, 2019; Uhlmann 2015; *OSCE*, 2014), with additional examples from America (Lockridge & Greenwood 2019; Peak & Glensor, 1999; Pockett, 2005) and Israel (Ben Eliyahu *et al.*, 2023, Pockett, 2005, Sharabi & Litmanovich, 2023).

6.3 Valuing citizen engagement

The involvement of communities in the field of security research and innovation has gained increasing emphasis over time. There has been greater focus on early and ongoing engagement throughout the life-cycle of security solution development — with this being guided by the needs and feedback of citizens, communities and end-users (Nederveen *et al.,* 2022). In addition, the issue of radicalisation, particularly in relation to young people, has increased the need for security researchers to engage with citizen communities and municipalities, as these groups have emerged as central actors in prevention efforts (Uhlmann, 2015; OSCE, 2014).

With regard to research in urban resilience and disaster response, the need for community self-sufficiency in emergencies requires that research and innovation projects are able to access the safety and security perceptions of community members. In addition, cooperation with national law-enforcement organisations in an emergency becomes a source of resilience (Ben Eliyahu *et al.*, 2023, Sharabi & Litmanovich, 2023). The growing attention to these approaches demonstrates an increasing recognition of the importance of community and end-user engagement in addressing security and counterterrorism challenges, emphasising collaboration and citizens' active involvement in shaping and implementing solutions.

6.4 Objectives for community engagement in security innovation

The objectives for community engagement in security innovation projects are multifaceted, aiming to ensure that solutions are effective, sustainable,

and aligned with the needs and values of the communities they intend to serve. Key objectives include:

- **Identifying and Understanding Community Needs** – Engage with communities to identify their specific security concerns and needs. This helps ensure that the innovation projects are directly addressing the real and perceived security issues faced by the community (Ben Eliyahu *et al.*, 2023; Hemmingsen, 2015; Lockridge & Greenwood, 2019; *OSCE*, 2014; Peak & Glensor, 1999; RAN, 2019; Smithson & Jones, 2021; Uhlmann, 2015).
- **Building trust and collaborative relationships** – Establish trust between security researchers, innovators, and community members. Trust is foundational for effective collaboration and for the successful implementation of security solutions within communities. The development of trust between security professionals and communities encourages citizens to actively participate in security research and innovation (Ben Eliyahu *et al.,* 2023; Hemmingsen, 2015; Lockridge & Greenwood, 2019; OSCE, 2014; Peak & Glensor, 1999; RAN, 2019; Sharabi & Litmanovich, 2023).
- **Leveraging Local Knowledge and Expertise** – Tap into the local knowledge, insights, and expertise of community members. This can lead to more culturally sensitive and contextually appropriate security solutions that are more likely to be accepted and adopted by the community. Understanding local needs ensures that security measures and practices are relevant and responsive in the context of a specific community or situation—and are thus sustainable (Davey & Wootton, 2016; Hemmingsen, 2015; Klimburg-Witjes & Huettenrauch, 2021; Lockridge & Greenwood, 2019; Muravska *et al*., 2023; Nederveen *et al.*, 2022; Peak & Glensor, 1999; RAN, 2019; Sharabi & Litmanovich, 2023; Smithson & Jones, 2021; Uhlmann, 2015).
- **Supporting non-technological solutions** – Efforts to engage with civil society aim to promote consideration of non-technological solutions to security problems, recognizing the importance of diverse approaches beyond purely technological, broadening the research topics and the scope of practical solutions (Davey & Wootton, 2016). Non-technological intervention practices can be considered more beneficial (Uhlmann, 2015).

- **Enhancing Solution Acceptance and Adoption** – Increase the likelihood that security solutions will be accepted and adopted by involving community members in the design and decision-making processes. This participatory approach can lead to a greater sense of ownership and responsibility towards the implemented solutions.
- **Promoting transparency and accountability** – Ensure transparency in the development and implementation of security projects. Engaging with the community promotes accountability, as it allows for the monitoring and evaluation of project impacts by those directly affected. Transparency and accountability emphasise democratic ethics and promote openness of security practices (*OSCE,* 2014, Peak & Glensor, 1999, RAN, 2019; Sharabi & Litmanovich, 2023; Uhlmann, 2015).
- **Empowering communities** – Empower community members by involving them in the innovation process. This can enhance their capacity to address their own security challenges and contribute to a more resilient community. For example, local communities play a key role in early Identification of critical situations (Ben Eliyahu *et al.,* 2023; Hemmingsen, 2015; OSCE, 2014, Peak & Glensor, 1999; RAN, 2019; Sharabi & Litmanovich, 2023; Smithson & Jones 2021 Uhlmann, 2015).
- **Facilitating sustainable change** – Support sustainable, long-term improvements in community security by fostering local engagement and commitment. Community involvement can help ensure that security innovations are maintained and adapted over time as needed.
- **Reducing negative impacts and conflicts** – Identify potential negative impacts or conflicts that may arise from the implementation of new security solutions. Community engagement can help mitigate these risks by addressing concerns early in the process.
- **Enhancing social cohesion and collaboration** – Strengthen social cohesion and inter-community collaboration by bringing together diverse groups to work on common security challenges. This can lead to more unified and supportive community dynamics. Inclusivity also ensures that security actions are culturally oriented to diverse communities, minimising discrimination (Davey & Wootton, 2016; Muravska et al., 2023; *OSCE, 2014*; RAN, 2019; Sharabi & Litmanovich, 2023; Smithson & Jones, 2021, Uhlmann, 2015).

- **Informing policy and practice** – Gather insights and evidence from community engagement activities that can inform broader security policy and practice. The lessons learned from engaging with communities can provide valuable feedback for policymakers and practitioners in the security sector.

These objectives reinforce the importance of security innovation projects adopting a holistic, inclusive approach, and recognise the active participation of communities as critical to the design and development of security solutions that — whether technologically advanced or not — are socially relevant and sustainable.

6.5 Examples of community engagement in security innovation

This section provides examples of community engagement in security innovation, including: EU-funded projects, practical tools and toolkits and study cases. The examples come from European initiatives, as well as regional programs in Israel and Austria.

There has been a notable emphasis on innovative approaches to enhance community engagement in recent years. The **SecurePART** initiative, as documented by Davey and Wootton (2016), concentrated on involving civil society organisations (CSOs) in European security research. Initiatives such as **Nicole, Conviction,** and **Pathways** have fostered engagement through artistic activities, as highlighted in the RAN 2019 report.

The **Web Constables** initiative in Estonia exemplifies a novel approach to community engagement that focuses on young people. This initiative, detailed in the RAN 2019 report, is marked by its continuous presence, broad networking, and active political involvement. Web Constables cultivated a collaborative environment tailored to the needs and concerns of the younger demographic.

My City Real World has been pivotal in establishing a platform that facilitates personal contact between authorities and communities (RAN 2019 report). The **Transformative Dialogue Circles** initiative focuses on developing methods to forge relationships through dialogue.

The **Participatory Youth Practice** project, described by Smithson and Jones (2021), involves co-creating a youth justice framework with marginalised

community members. This project underscores the importance of inclusive and participatory approaches in youth justice practices.

In Austria, the **Dialogue Forum**, launched in 2012 by the Austrian Federal Ministry of the Interior in partnership with the Islamic Community, aimed to address issues related to Islam and Muslims in Austria. According to an OSCE (2014) report, this initiative led to the formation of thematic working groups focusing on various topics, including education, integration, and extremism. This forum played a significant role in facilitating discussions and raising awareness about extremism, radicalisation, and Islamophobia.

In Israel, the **Neighbourhood Emergency Squads/Teams**, as described by Ben Eliyahu and colleagues (2023) and further elaborated by Sharabi and Litmanovich (2023), leverage the professional skills of neighbourhood residents. These teams, equipped with specialised training, collaborate with national emergency services to provide prompt local responses in crises. This approach was effective during the terrorist attack on October 7th in Israel, where these teams played a critical role in saving lives. The success of this initiative led to the formation and training of over 800 new teams in the subsequent two months, demonstrating the efficacy and scalability of such community-based emergency response models (Sharabi & Litmanovich, 2023).

6.6 Impact of engagement strategies

The engagement of the communities, citizens and residents, and public groups in security aims to empower the public to recognise and resolve neighbourhood concerns, fostering a sense of responsibility and active participation in enhancing public safety and security. Citizen engagement enhances community problem-solving efforts and helps develop social capital, which is crucial for fostering civic involvement.

Community engagement is instrumental in building trust between citizens and law enforcement agencies, highlighting the importance of public acceptance and collaboration in addressing security-related issues (*OSCE, 2014*).

While focused on preventing crime and disorder, the engagement strategies address broader societal challenges and can endorse ethical and human rights issues in the realm of security (Peak & Glensor, 1999).

Enhancing situation awareness among police workers contributes to the early identification of problems and is considered among the central benefits of the community-policing approach (*OSCE, 2014*).

Supporting the development of innovative, practical solutions to security challenges through social innovation takes this a step further, emphasising the need for fresh, practical approaches.

Community engagement in innovation processes potentially widens the perspective of project consortia, bringing diverse viewpoints and experiences to the table (Davey & Wootton, 2016). Community engagement during the developmental stage also enhances public acceptance of new technologies, as people are more likely to embrace changes they have had a hand in shaping. Additionally, it provides opportunities for networking and sharing good practices, creating a fertile ground for mutual learning and continuous improvement in the security domain (*Ibid*).

6.7 Citizen engagement – limitations and challenges

6.7.1 Implementation challenges

Engaging citizens and communities in the development of security solutions does present some challenges (Nederveen et al, 2022). The sensitive nature of security domains, classified research, and the fast-changing and reactive nature of security technology requirements often restrict open dialogue and public participation. Unfortunately, insufficient information sharing and the reliance on low-quality information can significantly impede collaborative efforts. There may be a tension between sharing information for mutual learning and the need for operational security and confidentiality, especially in security-related projects (Klimburg-Witjes & Huettenrauch, 2021).

On top of this, engaging multiple stakeholders with diverse goals, expectations, and working cultures present a formidable challenge for engagement practices.

6.7.2 Ethical and Legal Considerations

The ethical and legal dilemmas surrounding community engagement in security projects include privacy, human rights, and societal impact (Davey & Wootton, 2016; *OSCE, 2014*). It is crucial to understand that "community" should be distinguished from "minorities," sometimes representing ethical tension (*OSCE, 2014*). Avoiding discriminatory practices can be challenging in

the context of community engagement in crime and terrorism prevention (*ibid*). Ethical dilemmas, possible public resistance, and the potential for unintended consequences can sabotage the efforts for community engagement (Nederveen *et al.*, 2022).

The involvement of civil society organisations (CSOs) in addressing ethical and human rights issues adds further complexity to the security innovation process (Davey & Wootton, 2016). From a legal standpoint, deploying community and end-user engagement in security solution development must be coordinated with existing regulations, which is not always possible (Peak & Glensor, 1999). Maintaining transparency while safeguarding sensitive information complicates engagement efforts (*OSCE, 2014*).

7. Conclusion and discussion

This document has embarked on an extensive journey through the realms of Social Innovation (SI), Responsible Research and Innovation (RRI), and stakeholder engagement, particularly within the security research and innovation domain. The exploration has revealed the multifaceted nature of Social Innovation, underscored by its potential to address complex societal challenges through novel, inclusive, and sustainable approaches. The integration of RRI principles has further emphasised the importance of ethical considerations, societal expectations, and collaborative practices in driving research and innovation processes that are not only responsible but also responsive to societal needs and values.

The discussion on end-user, citizen and community engagement has highlighted the critical role of diverse stakeholders in co-creating security solutions that are not only technologically advanced but also socially acceptable and aligned with ethical standards. This collective endeavour, involving academia, industry, government, and civil society, reflects the quintessential essence of the Quadruple Helix model, fostering a collaborative ecosystem that leverages the strengths and perspectives of each sector to enhance innovation outcomes.

7.1 Modelling Social Innovation — beyond Helical models

The Social Innovation literature presents novel and practical solutions to social problems developed through the collaborative effort of engaged groups. It discusses various collaborative models including the **Triple Helix** (that encompasses universities, businesses, and government), the **Quadruple Helix** (through the addition of civil society to the model), and the **Quintuple Helix** (adding 'environment' to the mix).

The Triple Helix model of innovation originated in the 1990s, focusing on university-industry-government relations to build innovation systems. The model has been criticised, however, for not fully accounting for new and complex factors emerging from societal transformations. We now operate within innovation ecosystems, where collaboration's nonlinear nature is crucial for producing innovations for sustainable development. Efforts to enhance the model's explanatory power include integrating institutional and

social network theories to elucidate Triple Helix interactions and connecting macro and micro levels of analysis (Cai and Amaral, 2022).

While the seemingly ever-expanding range of Helix models seeks to provide a theoretical framework for understanding innovation ecosystems involving academia, industry, government, civil society and the environment, their practical application can be challenging for practitioners due to the models' abstract nature. A more grounded approach to fostering innovation might involve focusing on specific, actionable collaboration strategies, such as:

- *Defining engagement within the design process* – Establishing clear guidance of when stakeholders (end-users; citizens, or others) should be engaged within the problem definition and design development process
- *Designing clear communication channels* – Establishing straightforward mechanisms for communication among stakeholders to facilitate easier exchange of ideas and feedback
- *Creating shared spaces* – Physical or virtual co-working spaces where members from academia, industry, and government can work together on projects
- *Implementing pilot projects* – Small-scale initiatives that allow for testing and refinement of collaborative processes before scaling up.

These strategies emphasise direct action and interaction, making the abstract principles of the Helix models more tangible and practical for everyday application.

7.2 Challenges of scalability, sustainability and measurement

The journey has also illuminated several challenges, including the scalability and sustainability of social innovations, the complexities of measuring their impact, and the hurdles posed by funding constraints, institutional and regulatory barriers, and the intricacies of multi-stakeholder collaboration. Despite these challenges, the potential benefits of social innovation—such as enhanced societal well-being, economic development, and the fostering of a knowledge-based economy—underscore the importance of persevering in these endeavours.

As we look toward the future, it becomes evident that fostering a culture of continuous learning, adaptation, and inclusive innovation is paramount. The advancement of SI and RRI, coupled with effective stakeholder engagement, will require ongoing efforts to refine methodologies, develop supportive policies, and cultivate an ecosystem that encourages collaboration, ethical considerations, and the pursuit of societal impact.

7.2.1 Relevant literature in the security domain

The distribution of available resources in Social Innovation, RRI, and engagement of citizens and end-users in Security research is mapped in figure 1, below. Each section of this document underscores the importance of ethical considerations and inclusive dialogue in security research and innovation actions, highlighting the need for effective dialogue to ensure appropriate, responsive and implementable outcomes.

7.3 Challenges related to RRI

Analysis of Responsible Research and Innovation (RRI) in the context of security research delves into practical aspects, highlighting how RRI frameworks are integrated into security projects, emphasising stakeholder inclusivity, anticipation, reflexivity, and responsiveness. Tools such as stakeholder mapping, interactive workshops, and feedback mechanisms are discussed for implementing RRI principles. RRI emphasises the inclusion of multiple stakeholders, including industry, researchers, research funders, civil society, and policymakers, to ensure societal impact. However, challenges such as ambiguity in its framework, difficulty establishing measurable criteria, and tension between the openness demanded by the RRI approach and the secrecy of security considerations are noted. The critique also addresses challenges like balancing security needs with ethical concerns, the complexity of multi-stakeholder collaborations, problems connected to early closure and stigmatisation, and the difficulties in measuring the impact of RRI in tangible terms. The document underscores the need for continuous dialogue and ethical reflexivity in security research to align technological advancements with societal values and needs.

7.4 Challenges related to citizen engagement

Tools supporting citizen engagement include community surveys, participatory sessions, and self-realisation workshops. A more comprehensive

perspective is engendered in several security research projects through engaging communities in design decision-making. Including underrepresented groups can widen the perspectives even further, enhancing the potential for acceptance of novel solutions by citizens — and their potential impact.

Engaging communities and end-users in security solution development raises significant challenges, including the sensitive nature of security work, the demands of fast-paced technological change, and diverse stakeholder interests — often leading to limited dialogue outside the project team, poor information quality, and conflicting goals. Ethical and legal considerations further complicate this engagement, encompassing complexities relating to privacy, human rights, societal impact and the problem of differentiating community needs from minority interests. The critique also points to other challenges, such as the need to balance diverse perspectives, the risk of tokenistic engagement, the potential for misalignment between research outcomes and end-user needs, and challenges of practical collaboration. There is an argument for more robust, inclusive, and iterative engagement processes to ensure that security research is responsive to the real-world needs and concerns of those it aims to protect.

7.5 End users from the Social Innovation perspective

End-user involvement is crucial for the uptake and successful implementation of security research and innovation outcomes. It is considered a prerequisite for guiding solid requirement specification and innovative procurement, ensuring developers have a clear vision of on-site needs.

The framing of Social Innovation as a process that meaningfully engages a wide range of stakeholders reflects a more sophisticated understanding of innovation as a multifaceted and systemic endeavour. It suggests that the challenge is not about choosing between expert-led or citizen-led innovation but about creating synergies between diverse forms of knowledge, expertise, and experience to develop solutions that are socially robust and widely beneficial.

This perspective encourages a reevaluation of how innovation processes are designed and implemented, advocating for a model of Social Innovation that is truly inclusive, interdisciplinary, and collaborative. Such an approach not

only enhances the potential for innovative solutions to societal challenges but also strengthens the democratic and participatory dimensions of the innovation process itself.

7.6 A call for action

This document's exploration into the state of Social Innovation (SI), Responsible Research and Innovation (RRI), and stakeholder engagement within the security sector brings to light a complex landscape marked by both potential and pitfalls. While Social Innovation presents an avenue for addressing societal challenges through innovative means, its journey is fraught with ambiguity—stemming from a lack of clear definitions, inconsistent implementation strategies, and a tendency for some security projects to employ Social Innovation as mere 'window dressing'. This critique underscores the risk of prioritising technology-centred approaches at the expense of truly human-centred solutions, thus diluting the essence and impact of Social Innovation.

The discourse on Social Innovation and RRI within this context reveals a delicate balance between innovation and its ethical, social, and human implications. The critical view presented emphasises the necessity for a more rigorous, transparent, and accountable framework for defining, implementing, and evaluating social innovation initiatives. This includes a call for a shift towards genuine stakeholder engagement, where the voices and needs of communities are not just heard but are pivotal in shaping security solutions.

In light of these reflections, it becomes imperative to advocate for a reevaluation of how Social Innovation is conceptualised and operationalized within the security domain. The path forward demands a commitment to integrity, where projects genuinely embody the principles of human-centred design and where the label of 'Social Innovation' is reserved for initiatives that truly strive to balance technological advancement with societal well-being and ethical considerations.

In conclusion, this document not only contributes to the body of knowledge on SI, RRI, and stakeholder engagement but also serves as a call to action for researchers, policymakers, practitioners, and society at large to embrace these concepts as integral components of innovation in the security field and beyond. By doing so, we can collectively navigate the complexities of modern

societal challenges, fostering a secure, equitable, and sustainable future for all.

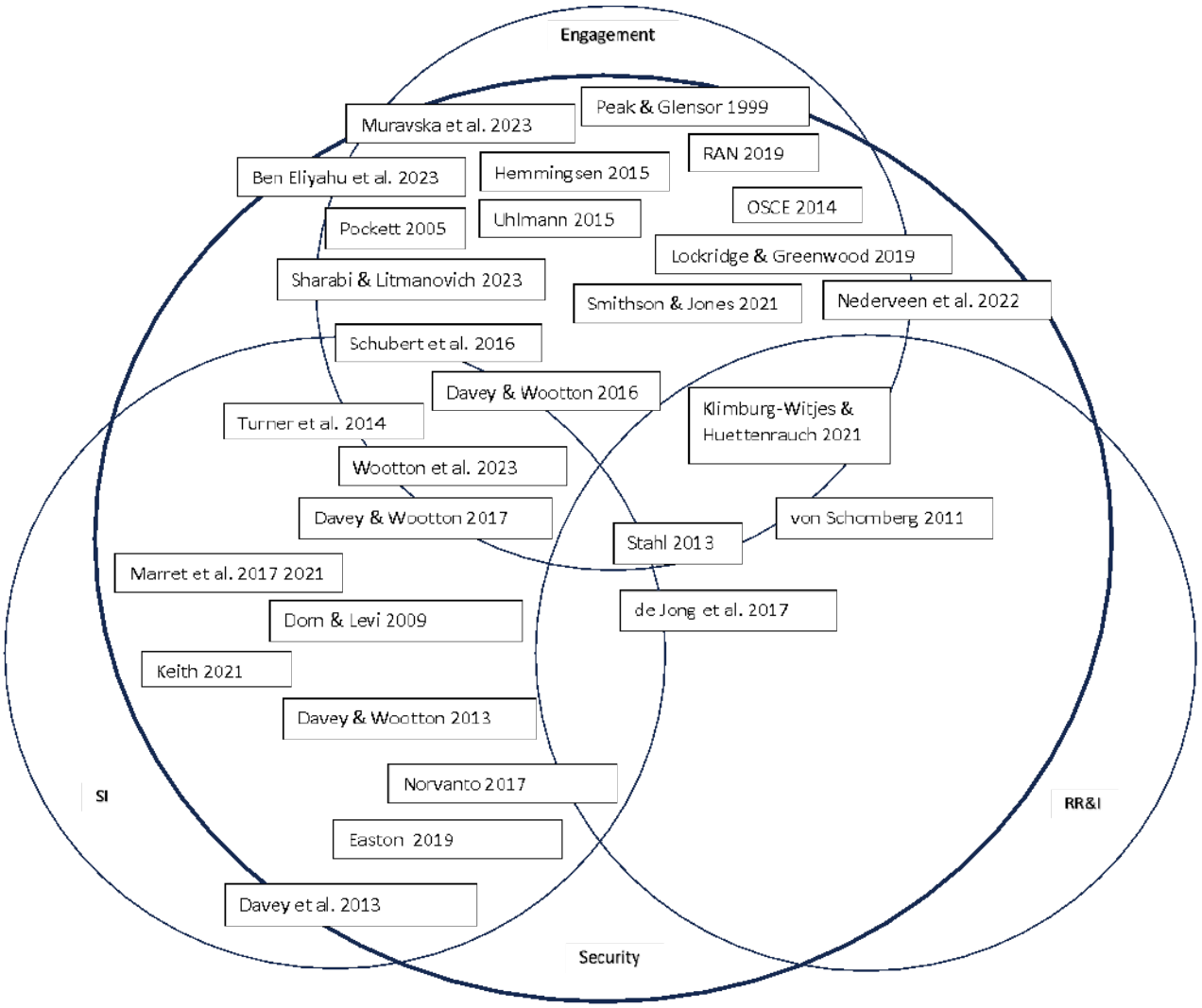

Figure 1. *Mapping of security research references according to the themes emphasised in the E2I project.*

8. References

Abelson, J., & Gauvin, F. P. (2008). *Assessing the Impacts of Public Participation: Concepts, Evidence, and Policy Implications* (Report P 06). Centre for Health Economics and Policy Analysis (CHEPA), McMaster University, Hamilton, Canada, Centre for Health Economics and Policy Analysis Working Paper Series.

Ackermann, Rebecca (2023) "Design Thinking was supposed to fix the world. Where did it go wrong?", *MIT Technology Review*, 9 February 2023.

Ackoff, Russell Lincoln (1974) Redesigning the Future: A Systems Approach to Societal Problems. Wiley-Interscience, New York (US).

Ackoff, Russell L. (1968) "General Systems Theory and Systems Research Contrasting Conceptions of Systems Science." in: *Views on a General Systems Theory: Proceedings from the Second System Symposium*, Mihajlo D. Mesarovic (ed.).

Albury, D. and Mulgan, G. (2003). *Innovation in the Public Sector* (Report: Working Paper Version 1.9). Strategy Unit, UK Cabinet Office. London: TSO.

Aqdas, M., Raj S., Sonali S., & Dakshata L. (2019). Understanding Citizens' Movements. *SSRN Electronic Journal*. Doi: 10.2139/ssrn.3663252.

de Arroyabe, J.C.F., Schumann, M., Vania, S., & Lucas, P. (2021). Understanding the Network Structure of Agri-Food FP7 Projects: An Approach to the Effectiveness of Innovation Systems. *Technological Forecasting and Social Change* 162: 120372. doi:10.1016/j.techfore.2020.120372.

Ashoka website (accessed 23 September 2023) "Bill Drayton: Visionary social impact leader, social entrepreneur", August 3, 2020, available.

Barroca, J., Mikko K., Ilari L., & Victor M. (2017). *FrontEnd Toolkit: A Toolkit to Transform IDEAs into Intelligent Action*. World Bank. https://documents.worldbank.org/curated/en/110931486028590680/pdf/112367-WP-P151932-PUBLIC-FrontEndtoolkit.pdf.

Battisti, S. (2019). Digital Social Entrepreneurs as Bridges in Public–Private Partnerships. *Journal of Social Entrepreneurship* 10(2): 135–58. 10.1080/19420676.2018.1541006.

Beinare, D., & McCarthy, M. (2012). Civil Society Organisations, Social Innovation and Health Research in Europe. *European Journal of Public Health* 22(6): 889–93, doi: 10.1093/eurpub/ckr152.

Ben Eliyahu, A., Zechariya, K., Ben Gal, M. (2023). *Neighbourhood community organisation for times of crisis and emergency: a brief guide to neighbourhoods, from now to now* (Report). The National Knowledge and Research Center for Emergency Readiness & The Community Work Service in the Ministry of Welfare and Social Security. [Hebrew]

Benneworth, Paul & Effie Amanatidou & Monica Edwards Schachter & Magnus Gulbrandsen (2015) "Social innovation futures: beyond policy panacea and conceptual ambiguity," Working Papers on Innovation Studies 20150127, Centre for Technology, Innovation and Culture, University of Oslo.

Berner, Heiko, (in press) “From the bottom to the top. Empowerment as social innovation hub”, Public Administration & Regional Studies.

Billings, C. E. (1996). Aviation automation: The search for a human-centered approach. Mahwah, NJ: Lawrence Erlbaum Associates.

Blok, V., & Lemmens, P. (2015). The emerging concept of responsible innovation. Three reasons why it is questionable and calls for a radical transformation of the concept of innovation. In Responsible Innovation 2 (pp. 19–35). Dordrecht: Springer.

Booher, H.R. (2003) Handbook of human systems integration (Vol. 23). New Jersey, USA: John Wiley & Sons.

Bosworth, G., Rizzo, F., Marquardt, D., Strijker, D., Haartsen, T., & Thuesen., A. A. (2016). Identifying Social Innovations in European Local Rural Development Initiatives. *Innovation: The European Journal of Social Science Research* 29(4): 442–61, doi: 10.1080/13511610.2016.1176555.

Cai, Y., & Amaral, M. (2022). Triple Helix Model of Innovation: From Boundaries to Frontiers. Triple Helix, 9(2), 107-117. https://doi.org/10.1163/21971927-12340007

Cajaiba-Santana, G., (2014). Social Innovation: Moving the Field Forward. A Conceptual Framework. *Technological Forecasting and Social Change* 82: 42–51, doi: 10.1016/j.techfore.2013.05.008.

Campanella, F., Della Peruta, M. R., Bresciani, S., & Dezi, L. (2017). Quadruple Helix and Firms’ Performance: An Empirical Verification in Europe. *The Journal of Technology Transfer* 42(2): 267–84, doi:10.1007/s10961-016-9500-9.

Cangiano, S., Romano, Z., & Loglio, M. (2017). The Growth of Digital Social Innovation in Europe. An Open Design Approach to Support Innovation for the Societal Good. *The Design Journal* 20 (sup1): S3546–59, doi: 10.1080/14606925.2017.1352857.

Carayannis, E. G., Barth, T. D. & Campbell, D. F. J. (2012). The Quintuple Helix Innovation Model: Global Warming as a Challenge and Driver for Innovation. *Journal of Innovation and Entrepreneurship* 1(1): 2, doi: 10.1186/2192-5372-1-2.

Carayannis, E. G., & Campbell, D. F. J. (2011b). Open Innovation Diplomacy and a 21st Century Fractal Research, Education and Innovation (FREIE) Ecosystem: Building on the Quadruple and Quintuple Helix Innovation Concepts and the "Mode 3" Knowledge Production System. *Journal of the Knowledge Economy* 2(3): 327–72. 10.1007/s13132-011-0058-3.

Carayannis, E. G., & Campbell, D. F. J. (2011a). Mode 3 Knowledge Production in Quadruple Helix Innovation Systems. In: *Mode 3 Knowledge Production in Quadruple Helix Innovation Systems*. SpringerBriefs in Business, vol 7. Springer, New York, NY. https://doi.org/10.1007/978-1-4614-2062-0_1

Carayannis, E.G., Campbell, D.F.J. & Grigoroudis, E. (2022). Helix Trilogy: the Triple, Quadruple, and Quintuple Innovation Helices from a Theory, Policy, and Practice Set of Perspectives. *Journal of the Knowledge Economy* 13: 2272–2301. https://doi.org/10.1007/s13132-021-00813-x

Charalabidis, Y., Euripidis L., & Androutsopoulou. A. (2014). Fostering Social Innovation through Multiple Social Media Combinations. *Information Systems Management* 31(3): 225–39. doi:10.1080/10580530.2014.923267.

Chesbrough, H., & Di Minin, A. (2014). Open Social Innovation. In H., Chesbrough, W. Vanhaverbeke, and J. West (Eds.). *New Frontiers in Open Innovation*, Oxford University Press Oxford, 169–89. https://books.google.com/books?hl=en&lr=&id=ySsDBQAAQBAJ&oi=fnd&pg=PA169&dq=Open+social+innovation+network&ots=jNKyQPPqxS&sig=GaFFkbIFuDavv2k92mQL6VNmCC8

Christensen, C. M. (1997). *The Innovator's Dilemma: When New Technologies Cause Great Firms to Fail*. Boston, MA: Harvard Business School Press.

Cooper, R., & Kleinschmidt, E. (1987a). Success Factors in Product Innovation, *Industrial Marketing Management* 16: 215–223. doi:10.1016/0019-8501(87)90029-0.

Cooper, R.. & Kleinschmidt, E. (1987b). New Products: What Separates Winners From Losers? *Journal of Product Innovation Management* 4: 169–184. doi:10.1016/0737-6782(87)90002-6.

CCI (Cutting Crime Impact) (2021a) Toolkits. Available at: https://www.cuttingcrimeimpact.eu/cci-toolkits/ (Accessed 4 April 2023)

CCI (Cutting Crime Impact) (2021b) Policy Briefings. Available at: https://www.cuttingcrimeimpact.eu/resources/policy-briefings/ (Accessed 4 April 2023)

Davey, C. L. and Wootton, A.B. (2014). "The Crime Prevention Capability Maturity Model". *International Perspectives of Crime Prevention 6. Contributions from the 7th Annual International Forum 2013 within the German Congress on Crime Prevention*. Forum Verlag Godesberg Gmbh, Mönchengladbach, Germany.

Davey, C.L & Wootton, A.B. (2016). Transformation Design – Creating security and wellbeing. in W. Jonas, K. Von Anshelm and S. Zerwas (eds), *Transformation Design. Perspectives on a New Design Attitude*. Birkäuser Verlag, Basel, Switzerland. Available at: https://issuu.com/birkhauser.ch/docs/transformation_design

Davey, C. L., & Wootton, A. B. (2017a). *Design Against Crime*. Abingdon, England: Routledge.

Davey, C. L. and Wootton, A.B. (2017b). Prospects for EU-funded security research – The ethics of impact outside the EU discourse. International Perspectives of Crime Prevention 9, Contributions from the 10th Annual International Forum 2016, within the German Congress on Crime Prevention, Germany. Forum Verlag Godesberg, pp. 171–196. https://www.praeventionstag.de/nano.cms/englische-publikationen/buch/21

Davey, C. L., Wootton. A. B., Heinrich, D. P., & Annapureddy, R. (2023). *IcARUS- Tools Defined with a Design Approach* (Report D3.6). Horizon 2020 Research and Innovation Programme.

Davies, A and Simon, J, (2013). Engaging Citizens in Social Innovation: A short guide to the research for policy makers and practitioners. "The theoretical, empirical and policy foundations for building social innovation in Europe" (TEPSIE), EU Commission – 7 Framework Programme.

Dekkers, R. (2011). Perspectives on Living Labs as Innovation Networks. *International Journal of Networking and Virtual Organisations* 9(1): 58. doi:10.1504/IJNVO.2011.040935.

Dionisio, M., & de Vargas, E. R. (2020). Corporate social innovation: A systematic literature review. *International Business Review*. https://doi.org/10.1016/j.ibusrev.2019.101641

Dorn, N., & Levi, M. (2009). Private–Public or Public–Private? Strategic Dialogue on Serious Crime and Terrorism in the EU. *Security Journal* 22(4): 302–16. doi:10.1057/palgrave.sj.8350086.

Easton, M. (2019). Reflections on the Triple Helix as a Vehicle to Stimulate Innovation in Technology and Security : A Belgian Case Study. *International journal of comparative and applied criminal justice*. https://www.semanticscholar.org/paper/Reflections-on-the-triple-helix-as-a-vehicle-to-in-Easton-Dormaels/b07fa02d7c12baf03d7ce5e76ffc9149c09f1541

Edwards-Schachter M., Wallace M. L. (2017). "Shaken, but not stirred": Sixty years of defining social innovation. *Technological Forecasting and Social Change*, 119, 64–79. doi:10.1016/j.techfore.2017.03.012.

Ekengren, M. (2006). New Security Challenges and the Need for New Forms of EU Cooperation: The Solidarity Declaration against Terrorism and the Open Method of Coordination. *European Security* 15(1): 89–111. doi:10.1080/09662830600776728.

Etzkowitz, H., & Leydesdorff, L. (1995). The Triple Helix – University-Industry-Government Relations: A Laboratory for Knowledge Based Economic Development. *EASST Review* 14 (1): 14-19. https://ssrn.com/abstract=2480085

European Commission. (2014) Italian Presidency of the Council of the European Union (2014) *Rome Declaration on Responsible Research and Innovation in Europe,* Available at: https://digital-strategy.ec.europa.eu/en/library/rome-declaration-responsible-research-and-innovation-europe (Accessed 29 February 2024)

European Commission, Directorate-General for Research (2009) New societal challenges for the European Union — New challenges for social sciences and the humanities — Thinking across boundaries Modernising European research. Directorate-General for Research, Communication Unit, Brussels. Available at: https://ec.europa.eu/research/participants/portal4/doc/call/fp7/fp7-ssh-2013-1/32839-booklet-new-societal-challenges_en.pdf (Accesed 4 April 2023)

European Commission (2011) Horizon 2020 – The Framework Programme for Research and Innovation. Brussels: European Union. Brussels, 30.11.2011 COM(2011) 808 final. Available at: https://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2011:0808:FIN:en:PDF (accessed 5 April 2023).

European Commission, Directorate-General for Research and Innovation (2014) Responsible research and innovation : Europe's ability to respond to societal challenges, Brussels: Publications Office. Available at: https://op.europa.eu/en/publication-detail/-/publication/2be36f74-b490-409e-bb60-12fd438100fe/language-en/format-PDF/source-283576074 (Accessed 4 April 2023)

European Commission (2016) Commission presents its evaluation of the 7th Framework Programme for Research, Press release – 25 January 2016. Available at: https://ec.europa.eu/commission/presscorner/detail/en/MEMO_16_146 (Accessed 28 March)

European Commission, Directorate-General for Research and Innovation, (2021) Horizon Europe : strategic plan 2021–2024, Brussels: Publications Office of the European Union. Available at: https://op.europa.eu/en/publication-detail/-/publication/3c6ffd74-8ac3-11eb-b85c-01aa75ed71a1/language-en (Accessed 03 April 2023)

Faems, D., Looy, B & Debackere, K. (2005). Interorganizational Collaboration and Innovation: Toward a Portfolio Approach. *Journal of Product Innovation Management* 22 (3): 238–50. doi:10.1111/j.0737-6782.2005.00120.x.

Falzetti, M. (2013). Europe in a Changing World – Inclusive, Innovative and Reflective Societies. European Commission, HORIZON 2020. doi:10.1037/e503552014-018.

Fayard, A. L., & Fathallah, S. (2024). Design Thinking Misses the Mark. *Stanford Social Innovation Review*, *22*(1), 28–35. https://doi.org/10.48558/G6HQ-RZ22

Feinberg, M. (2016). *Sovereignty in the Age of Global Terrorism: The Role of International Organisations*. Leiden ; Boston: Brill Nijhoff.

Ferrada, F., Camarinha-Matos, L.M. (2012). Emotions in Collaborative Networks: A Monitoring System. In: Camarinha-Matos, L.M., Shahamatnia, E., Nunes, G. (eds) Technological Innovation for Value Creation. DoCEIS 2012. IFIP Advances in Information and Communication Technology, vol 372. Springer, Berlin, Heidelberg. 10.1007/978-3-642-28255-3_2

Franz, H. W., Hochgerner, J., & Howaldt, J. (2012). Challenge social innovation: An introduction. In *Challenge social innovation: Potentials for business, social entrepreneurship, welfare and civil society* (pp. 1-16). Berlin, Heidelberg: Springer Berlin Heidelberg.

van Geenhuizen, M. (2018). A framework for the evaluation of living labs as boundary spanners in innovation. *Environment and Planning C: Politics and Space*, *36*(7), 1280-1298. https://doi.org/10.1177/2399654417753623

Glaser, C. L. (1997). 'The Security Dilemma Revisited'. *World Politics* 50 (1): 171–201.

Graeme, S. (2017). What Is the Spectrum of Public Participation? *Sustaining Community*. https://sustainingcommunity.wordpress.com/2017/02/14/spectrum-of-public-participation/

Grimm, R., Fox, C., Baines, S. and Albertson, K. (2013) 'Social innovation, an answer to contemporary societal challenges? Locating the concept in theory and practice', Innovation: The European Journal of Social Science Research, 26:4, 436–455, DOI: 10.1080/13511610.2013.848163

Gumbo, S., Thinyane, H., Thinyane, M., Terzoli, A., & Hansen, S. (2012). *Living lab methodology as an approach to innovation in ICT4D: The Siyakhula living lab experience*. Paper presented at IST-Africa 2012. 29–74. https://siyakhulall.org/sites/default/files/ISTAfrica_Paper_ref_18_doc_4809_0.pdf

Head, B.W. (2022). The Rise of 'Wicked Problems'—Uncertainty, Complexity and Divergence. In: Wicked Problems in Public Policy. Palgrave Macmillan, Cham. https://doi.org/10.1007/978-3-030-94580-0_2

Hemmingsen, A. S. (2015). *An introduction to the Danish approach to countering and preventing extremism and radicalization* (DIIS Report, No. 2015:15). Danish Institute for International Studies (DIIS), Copenhagen.

Henderson, H. (1996). Social Innovation and Citizens' Movements. In R. A. Slaughter (Ed.). *New Thinking for a New Millennium*. London: Routledge.

Hero, L. M., Pitkäjärvi, M., & Matinheikki, K. (2022). Discovering the effect metrics for innovation projects. *Techne serien - Forskning i slöjdpedagogik och slöjdvetenskap*, *29*(1), 13–27. https://doi.org/10.7577/TechneA.4603

Herrera, M. E. B. (2016). Social Innovation for Bridging Societal Divides: Process or Leader? A Qualitative Comparative Analysis. *Journal of Business Research* 69(11): 5241–5247. doi:10.1016/j.jbusres.2016.04.119.

Hoare, Q., & Nowell Smith, G. (Eds.). (1971). Selections from the Prison Notebooks of Antonio Gramsci. International Publishers Co.

Hogeforster, M. A., & Priedulena, E. (2014). The Significance and Impact of Innovation Networks of Academia and Business with a Special Emphasis on Work-Based Learning. *TalTech Journal of European Studies* 4(2): 69–82. doi:10.2478/bjes-2014-0016.

Howaldt, Jürgen, Kaletka, Christoph, Schröder, Antonius and Zirngiebl, Martha (2019) 'Rethinking Innovation: Social Innovation as an important part of a new innovation paradigm', in Howaldt et al, (2019) 'Atlas of Social Innovation. 2nd Volume: A World of New Practices'. Oekom: Germany, available here.

Howaldt et al, (2019) 'Atlas of Social Innovation. 2nd Volume: A World of New Practices'. Oekom: Germany, available here.

Hubert, A. (2010). Empowering people, driving change: Social innovation in the European Union. BEPA report, available here.

Huddart, S. (2012). Renewing the Future: Social Innovation Systems, Sector Shift, and Innoweave. *Technology Innovation Management Review* (July 2012): 5–9.

IPBES. (n.d.). Marginalized Communities. *IPBES - Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services.* Retrieved from https://www.ipbes.net/glossary-tag/marginalized-community#:~:text=Marginalized%20communities%2C%20peoples%20or%20populations,Centre%20for%20Determinants%20of%20Health (Accessed 27 February 2024).

Line, D. & Hopfner, J. (2016). Social Innovation Index 2016: Old problems, new solutions: measuring the capacity for social innovation across the world. *The Economist, Intelligence Unit*. https://impact.economist.com/perspectives/sites/default/files/Social_Innovation_Index.pdf

Jali, M. N., Deraman, R., Shauri, N. A. A., Samsudin, S., Ghapar, F. A., & Khairuddin, K. S. (2020). The Relationship between Strategic Knowledge Management Processes and Social Innovation. *Journal of Business Management and Accounting*, *10*(2), 1-13.

Jandl, M. (2017). *Towards the Monitoring of Goal 16 of the United Nations' Sustainable Development Goals (SDGs): A Study of the Selection, Rationale and Validity of Indicators with Suggestions for Further Improvements* (Report). Universität Tübingen. doi:10.15496/publikation-24366.

Jen, Natasha (2018a) 'Why Design Thinking is bullshit', It's Nice That, 23 February, Available at: https://www.itsnicethat.com/articles/natasha-jen-pentagram-graphicdesign-230218 (Accessed 27 March 2023)

Jen, Natasha (2018b) 'Design Thinking Is B.S.', Fast Company, 4 September, Available at: https://www.fastcompany.com/90166804/design-thinking-is-b-s (Accessed 28 March 2023)

Jessop, B., Moulaert, F., Hulgård, L. and Hamdouch, A. (2013). Social Innovation Research: A New Stage in Innovation Analysis? in F. Moulaert, D. MacCallum, A. Johnson, W. H. A. (2008). Roles, Resources and Benefits of Intermediate Organizations Supporting Triple Helix Collaborative R&D: The Case of Precarn. *Technovation* 28(8): 495–505. doi:10.1016/j.technovation.2008.02.007.

Jones, R. (2017). Beware a Wholly Inadequate Definition of "Consultation". *The Consultation Institute*.

https://www.consultationinstitute.org/beware-wholly-inadequate-definition-consultation/

de Jong, I. M., Kupper, F., de Ruiter, C., & Broerse, J. (2017). A paedophile scan to prevent child sexual abuse in child care? A thought experiment to problematize the notion of alignment in Responsible Research and Innovation. *Life Sciences, Society, and Policy*, 13(1), 1-25. https://doi.org/10.1186/s40504-017-0049-7

de Jong, J., Orbegozo, E. F. M., Cox, L., Bowles, H. R., Edmondson, A. C., & Nahhal, A. (2023). Cross-Boundary Collaborations in Cities: Where to Start. Stanford Social Innovation Review. https://doi.org/10.48558/D74P-TG75

Kania, J., & Kramer, M. (2011). Collective impact. *Stanford Social Innovation Review*, 9(1): 36–41.

Keith, G. (2021). From harm to hope: A 10-year drugs plan to cut crime and save lives (Report). HM Government.

Klimburg-Witjes, N. and Huettenrauch, F. C. (2021) Contextualizing security innovation: responsible research and innovation at the smart border?, Science and Engineering Ethics, 27), doi:10.1007/s11948-021-00292-y

Kolko, J. (2015). Design Thinking Comes of Age. *Harvard Business Review* (September 2025): 66-71. https://hbr.org/2015/09/design-thinking-comes-of-age (Accessed 27 February 2024).

Krippendorff, K. (1998) 'Design Discourse: A Way to Redesign Design' [1998] Keynote Address to the Society for Science of Design Studies, 6 December 1998 01–5. Available from, Scholarly Commons, University of Pennsylvania.

Levidow, L., & Neubauer, C. (2014). EU Research Agendas: Embedding What Future?. *Science as Culture* 23(3): 397–412. doi:10.1080/09505431.2014.926149.

Ley, T., & Sommerfeld, A. (2013). EU research project SocIEtY "Social Innovation–Empowering the Young for the Common Good. *Soziale Passagen* 5(2): 299–302. doi:10.1007/s12592-013-0153-3.

Lockridge, A., & Greenwood, K. (2019). Barrie Police 2019 Annual Report (Report), Barrie Police, Canada.

MacGregor, S.P. Marques-Gou, P. and Simon-Villar, A. (2010) Gauging Readiness for the Quadruple Helix: A Study of 16 European Organisations. *Journal of the Knowledge Economy*, 1 (3), 173-190. doi:10.1007/s13132-010-0012-9.

Maclean, M., Harvey, C. and Gordon, J. (2012). Social innovation, social entrepreneurship and the practice of contemporary entrepreneurial philanthropy. *International Small Business Journal*, 31(7): 747-763. doi:10.1177/0266242612443376.

Marret, J.L., Bellasio, J., van den Berg, H., van Gorp, A., van Hemert, D., Leone, L., Meijer, R., Warnes, R., Van Wonderen, R. & Longo, C. (2017). *Innovative Methods and Procedures to Assess Counter-Violent-Radicalisation Techniques in Europe: Final Report Providing Background for Using and Further Developing the Validated Toolkit*. (Final Report). IMPACT Europe Consortium.

Maslow, Abraham Harold (1966). The Psychology of Science: A Reconnaissance. Harper & Row. ISBN 978-0-8092-6130-7.

Mastelic, J., Sahakian, M., & Bonazzi R. (2015). How to Keep a Living Lab Alive?. *Info* 17(4): 12–25. doi:10.1108/info-01-2015-0012.

McAdam, M., & Debackere, K. (2018). Beyond "Triple Helix" toward "Quadruple Helix" Models in Regional Innovation Systems: Implications for Theory and Practice. *R&D Management* 48(1): 3–6. doi:10.1111/radm.12309.

Monar, J. (2006). Cooperation in the Justice and Home Affairs Domain: Characteristics, Constraints and Progress. *Journal of European Integration* 28(5): 495–509. doi:10.1080/07036330600979797.

Mehmood and A. Hamdouch (eds) *Handbook on Social Innovation: Collective Action, Social Learning and Transdisciplinary Research*, Edward Elgar, Cheltenham, pp. 110–130.

Moulaert F. (Ed.). (2013). *The international handbook on social innovation: Collective action, social learning and transdisciplinary research*. Cheltenham, UK: Edward Elgar.

Moulaert, F., Martinelli, F., González, S., & Swyngedouw, E. (2007). Introduction: Social Innovation and Governance in European Cities: Urban Development Between Path Dependency and Radical Innovation. *European Urban and Regional Studies* 14(3): 195–209. doi:10.1177/0969776407077737.

Mulgan, Geoff & Tucker, Simon & Ali, Rushanara & Sanders, Ben. (2007). "Innovation: What It Is, Why It Matters and How It Can Be Accelerated". Available here.

Mulgan, Geoff. Social Innovation: How Societies Find the Power to Change. 1st ed. Bristol University Press, 2019. https://doi.org/10.2307/j.ctvs89dd3.

Muravska, J., Guthrie, S., Lucas, R., Virdee, M., Feijao, C., Francombe, J., de Latailllade, C., Fine, H. (2023). *Study on the Factors Influencing the Uptake of EU-Funded*

Security Research Outcomes (Final Report). Publications Office of the European Commission. doi:10.2837/350628.

Murray, Robin, Julie Caulier-Grice, and Geoff Mulgan. "The open book of social innovation." The Young Foundation 1 (2010).

Nederveen, F., Zürcher, E., Eekelschot, L., Leenders, E., Leussink, I., Hoorens, S., (2022). *Naar een evidence-based aanpak van radicalisering en extremisme: Een eerste evaluatie van de gemeentelijke Versterkingsgelden 2020-2021: [Towards an evidence-based approach to tackling radicalisation and extremism: A first evaluation of municipal Reinforcement Funds 2020-2021].* Santa Monica, CA: RAND Corporation. https://www.rand.org/pubs/research_reports/RRA1807-1.html.

Nelimarkka, M., Nonnecke, B., Krishnan, S., Aitamurto, T., Catterson, D., Crittenden, C., Garland, C., Gregory, C., Huang, C.-C. A., Newsom, G., Patel, J., Scott, J., Goldberg, K. (2014). Comparing three online civic engagement platforms using the spectrum of public participation framework. In: Proceedings of the Oxford Internet, Policy, and Politics Conference. University of Oxford, pp. 25–26' https://escholarship.org/uc/item/0bz755bj

Nguyen, H. T., & Marques, P. (2022). The Promise of Living Labs to the Quadruple Helix Stakeholders: Exploring the Sources of (Dis) Satisfaction. *European Planning Studies* 30 (6): 1124–1143. doi:10.1080/09654313.2021.1968798.

Norvanto, E. (2017). Knowledge Creation in Cross-Border and Cross-Sectoral Collaborations - Exploring EU Externally Funded Security Research and Innovation Projects as Communities of Practice. In *Proceedings of the 9th International Joint Conference on Knowledge Discovery*, Knowledge Engineering and Knowledge Management - Volume 3: KMIS, ISBN 978-989-758-273-8, pages 70-82. https://www.theseus.fi/handle/10024/138867

Norman, D. A., & Draper, S. W. (Eds.). (1986). *User Centered System Design: New Perspectives on Human-Computer Interaction*. Hillsdale, NJ: Lawrence Erlbaum Associates.

O'Neill, P., Kimberley, N., & Teng, C. W. (2017). Public University Models for Education–from Innovation to Entrepreneurship. In *Proceedings of the 3rd International Conference on Higher Education Advances* (pp. 520-530). Editorial Universitat Politècnica de València.

OSCE. (2014). *Preventing Terrorism and Countering Violent Extremism and Radicalization That Lead to Terrorism: A Community-Policing Approach.* Organization for Security and Co-operation in Europe. https://www.osce.org/secretariat/111438

Parmentier, G., & Gandia, R. (2013). Managing Sustainable Innovation with a User Community Toolkit: The Case of the Video Game Trackmania. *Creativity and Innovation Management* 22(2): 195–208. doi:10.1111/caim.12021.

Peak, K. J., & Glensor, R. W. (1999). *Community policing and problem solving: Strategies and practices*. Upper Saddle River, NJ: Prentice-Hall.

Penksa, S. E., & Mason, W. L. (2003). EU Security Cooperation and the Transatlantic Relationship. *Cooperation and Conflict* 38(3): 255–280. doi:10.1177/00108367030383004.

Phills, J. A., Deiglmeier, K., & Miller, D. T. (2008). Rediscovering social innovation. *Stanford Social Innovation Review*, 6(4), 34-43.

Pockett, C. B. (2005). *United States and Israeli homeland security: a comparative analysis of emergency preparedness efforts* (No. 33). USAF Counterproliferation Center, Air University. https://media.defense.gov/2019/Apr/11/2002115499/-1/-1/0/33USANDISREALICOMPARE.PDF

Porter, M. E., & Kramer, M. R. (2019). 'Creating Shared Value'. In G. G. Lenssen and N. C. Smith. (Eds.) *Managing Sustainable Business: An Executive Education Case and Textbook*. Dordrecht: Springer Netherlands, 323–346. doi:10.1007/978-94-024-1144-7_16.

Powell, W. W., & Snellman, K. (2004). The Knowledge Economy. *Annual Review of Sociology* 30(1): 199–220. doi:10.1146/annurev.soc.29.010202.100037.

Puślecki, Z. W. (2015). Innovation and Knowledge in Creation of European Union Global Competitiveness and Social Security from Regional Perspective. *Journal of Business Theory and Practice 3*(2): 90–118.

RAN. (2019). Preventing Radicalization to Terrorism and Violent Extremism: Approaches and Practices. RAN Collection of Approaches and Practices. https://home-affairs.ec.europa.eu/system/files_en?file=2021-05/ran_collection-approaches_and_practices_en.pdf.

Rittel, H. W. J., & Webber, M. M. (1973). Dilemmas in a General Theory of Planning. *Policy Sciences* 4(2): 155–169. doi:10.1007/BF01405730.

Robinson, L. (2016. August 2). Is the Spectrum Dead? *Changeology*. https://changeologyblog.wordpress.com/2016/08/02/is-the-spectrum-dead/ (January 5, 2024).

Rogers, E. M. (1962). *Diffusion of Innovations*. New York: The Free Press of Glencoe.

Rogers, Everett M. (2003) Diffusion of Innovations. Fifth Edition. The Free Press of Glencoe, New York. p. 550.

Roman, M., Varga, H., Cvijanovic, V., Reid, A. (2020). Quadruple Helix models for sustainable regional innovation: Engaging and facilitating civil society participation. *Economies* 8(2) doi:10.3390/economies8020048

Rouse, W.B. (2007) People and Organizations: Explorations of Human-Centered Design, Hoboken, New Jersey: Wiley

Rouse, W. B (1991) Design for Success. A Human-Centred approach to Designing Successful Products and Systems, New York: Wiley

Schubert, H., van Soomeren, P., Idrovo, D., Persov, E., Saraiva, M. (2016). Cooperation in Partnerships and Process of CP-UDP. COST Action TU1203 Crime Prevention Through Urban Design and Planning

Schuijff, M., Dijkstra, A.M. (2020) Practices of Responsible Research and Innovation: A Review. *Sci Eng Ethics* 26, pp. 533–574. https://doi.org/10.1007/s11948-019-00167-3. Available at: https://link.springer.com/article/10.1007/s11948-019-00167-3#ref-CR17 (Accessed 29 February 2024)

Schumpeter, Joseph A. (1934) *The theory of economic development: an inquiry into profits, capital, credit, interest, and the business cycle*. New Brunswick, New Jersey: Transaction Books. ISBN 978-0878556984. Translated from the 1911 original German, *Theorie der wirtschaftlichen Entwicklung*

Sharabi, M, & Litmanovich, Y. (2023). Emergency Squads Explainer. Israel Democracy Institute. https://www.idi.org.il/media/22142/emergency-squads-explainer.pdf [Hebrew}

Simmonds, P., Teichler, T., Brown, N., Enberg, J., Hakanson, A., Mallett, O., Stern, P., Swenning, A., Rivoire, L., Yeow, J., Cox, D., Rigby, J., Plances, S., Hausemer, P., Bolchi, M., Rzepecka, J. and Culver, J. (2015a). Final Evaluation of Security Research under the Seventh Framework Programme for Research, Technological Development and Demonstration. Final Report — Executive Summary. 10.2769/46522. (Accessed 27 March 2023).

von Schomberg, R. (Ed.), (2011). Towards Responsible Research and Innovation in the information and Communication Technologies and Security Technologies Fields. European Commission, Brussels. https://data.europa.eu/doi/10.2777/58723

Smithson, H., & Jones, A. (2021). Co-creating Youth Justice Practice with Young People: Tackling Power Dynamics and Enabling Transformative Action. *Children & Society* 35(3): 348–62. doi:10.1111/chso.12441.

Soma, K., van den Burg, S. W. K., Hoefnagel, E. W. J., Stuiver, M., & van der Heide, C. M. (2018). Social innovation – a future pathway for blue growth? *Marine Policy* 87, 363–370. doi:10.1016/j.marpol.2017.10.008

Stahl, B. C. (2013). Responsible Research and Innovation: The Role of Privacy in an Emerging Framework. *Science and Public Policy* 40(6): 708–16. doi:10.1093/scipol/sct067.

Stilgoe, J, Owen ,R.and Macnaghten, P. (2013) "Developing a Framework for Responsible Innovation." *Research Policy* 42 (9): 1568–1580. doi:10.1016/j.respol.2013.05.008. Available at: https://www.sciencedirect.com/science/article/pii/S0048733313000930?via%3Dihub (Accessed 29 February 2024)

Straka, D. A. (2019). Intercultural Communication Between International Military Organizations: How Do You Turn a "No" Into a "Yes"? *Muma Business Review* 3: 071–074.

Stuart, G. (2017, February 14). What is The Spectrum of Public Participation? *Sustaining Community*. https://sustainingcommunity.wordpress.com/2017/02/14/spectrum-of-public-participation/ (Accessed 29 February 2024)

Turner, M., Persov, E., Weitz, Y., Fleishman, H., & Lederman, E. (2014). *DESURBS- New Industrial Design Security Products* (Report d4.1b) .Bezalel Academy of Arts and Design.

Uhlmann, J. (2015). Development Assistance and (de) Radicalization: an Argument for a Holistic Macro and Micro Level Perspective. In *Understanding Deradicalization: Pathways to Enhance Transatlantic Common Perceptions and Practices*. Middle East Institute & Fondation pour la Recherche Stratégique. https://www.mei.edu/publications/understanding-deradicalization-pathways-enhance-transatlantic-common-perceptions-and (January 20, 2024).

Vaughn, L. M., & Jacquez, F. (2020). Participatory Research Methods – Choice Points in the Research Process. *Journal of Participatory Research Methods* 1(1). doi:10.35844/001c.13244.

Viktorova, E. V., Petrenko, D. A., & Gorulev, D. A. (2019). European Experience of University Business Cooperation for Sustainable Development. *Planning and Teaching Engineering Staff for the Industrial and Economic Complex of the Region* (0): 47–49. doi:10.17816/PTES26299.

van Vuuren, J. J., Grobler, M., Leenen, L., & Phahlamohlaka, J. (2014). Proposed Model for a Cybersecurity Centre of Innovation for South Africa. In *ICT and Society: 11th IFIP TC 9 International Conference on Human Choice and Computers, HCC11 2014, Turku, Finland, July 30–August 1, 2014. Proceedings 11* (pp. 293-306). Springer Berlin Heidelberg.

Wickson, F., and Carew, A. L. (2014). Quality criteria and indicators for responsible research and innovation: Learning from transdisciplinarity. Journal of Responsible Innovation, 1(3), 254–273. https://doi.org/10.1080/23299460.2014.963004

Wootton, A. B., Davey, C. L., Heinrich, D., & Querbach, M. (2023). Better Technological Security Solutions through Human-Centred Design and Development. In A. Zwitter and O. J. Gstrein (Eds.). *Handbook on the Politics and Governance of Big Data and Artificial Intelligence*. Edward Elgar Publishing, 245–278. doi:10.4337/9781800887374.00021.

Wootton, A.B. and Davey, C.L. (2011) 'The Triple Diamond' in "Designing Out Crime: A Designers' Guide." London, UK: Design Council, pp. 99–100. Available at: https://www.designcouncil.org.uk/fileadmin/uploads/dc/Documents/designersGuide_digital_0_0.pdf (Accessed 28 March 2023).

Yun, J. J., Park, K., Im, C., Shin, C., & Zhao, X. (2017). Dynamics of social enterprises—Shift from social innovation to open innovation. *Science, Technology and Society*, 22(3), 425–439.. doi:10.1177/0971721817723375.

Yun, J. J., Egbetoku, A. A., & Zhao, X. (2019). How Does a Social Open Innovation Succeed? Learning from Burro Battery and Grassroots Innovation Festival of India. *Science, Technology and Society*, *24*(1), 122-143. https://doi.org/10.1177/0971721818806101

Zeldin, S., Camino, L., & Calvert, M. (2003). Toward an Understanding of Youth in Community Governance: Policy Priorities and Research Directions. Social Policy Report. Volume 17, Number 3. *Society for Research in Child Development*. https://eric.ed.gov/?id=ED595513 (January 2, 2024).

Zhu, K., Dong, S., Xu, S. X., & Kraemer, K. L. (2006). Innovation diffusion in global contexts: determinants of post-adoption digital transformation of European companies. *European journal of information systems*, *15*, 601-616. doi:10.1057/palgrave.ejis.3000650.

Appendices

The review of Social Innovation Security projects appendix was created as a Microsoft Excel database, and is included as an appendix in the following A3 pages .

Publication	Project Years	Locations	Projects	Key Charcteristics	Keywords	Summary	Focus	St element	Engaged Groups	Problem	Benefits	Aims	Study Case	Methodology	Tools	Actions	Results and Findings	Suggestions
Dorn & Levi, 2009	2008–2009	• The School of Social Sciences at Cardiff University in Wales, United Kingdom • The School of Law at Erasmus University Rotterdam in Rotterdam, The Netherlands	• Enhancing Strategic Dialogue on Serious Crime and Terrorism in the EU • Establishment of a "trusted forum" aimed at improving security cooperation	• Security dialog • Trusted forum • Shift of ownership • Informal interactions • Information exchange	• Private security • European Union • Public–private • Private–public • Information sharing • Security cooperation	• Examines the shifting roles and leadership dynamics between the public and private sectors in security dialogue and cooperation • Analyzes various models for structuring EU forums for strategic dialogue • Reflects on the legal and ethical implications of these partnerships	Serious crime and terrorism	Addressing security challenges through cooperation between various stakeholders	Security managers at the European level, private security providers, senior public sector law enforcement personnel, judges, prosecutors, various industry sector representatives	• The need for a trusted forum • The challenges of institutionalizing a trusted forum at a European level • The dilemmas of information exchange	Promoting a "trusted forum" where security professionals exchange knowledge and expertise	• To improve strategic, pan-European security dialogue • To provide a knowledge exchange platform, such as a "trusted forum" • To conceptualize security cooperation as private–public rather than public–private • To address dilemmas related to informal information exchange	EU Trusted Forums	Empirical qualitative: interwiews and policy reading	Trusted Forum to improve dialoge; European Security Research and Innovation Forum (ESRIF); European Organization for Security (EOS)	Forums establishment	• Shift in ownership • Gap in private sector interlocutor • Proposed trusted forum and ESRIF	• Establishment of a "Trusted Forum" and strategic think tank forum to scan emerging security challenges and risks for terrorism and crime • Outline the criteria for membership • Establishment of "information hub"
Davey & Wootton, 2013	2013	Hanover (DE), Manchester (UK), Szczecin (PL), Vienna (AT), Lower Saxony (GER)	• Crime Prevention Capability Maturity Model (CPCMM) • Planning Urban Security (PLuS) research project	• Planning Urban Security (PLuS): developing transferable measures for crime prevention through urban planning and design processes • Explored transferability of best practices • Shifting from reactive crime reduction to proactive crime prevention • Led by the State CID in Lower Saxony in Germany	• Crime Prevention Capability Maturity Model • Planning Urban Security (PLuS) research project • Design Against Crime Solution Centre • Crime Prevention Through Environmental Design (CPTED) • Crime Impact Statement (CIS) • Urban management	• Discusses the integration of crime prevention within urban design and planning • Highlights the Crime Prevention Capability Maturity Model (CPCMM) • Examines the role of design in crime prevention • Presents design-led, proactive approach to crime prevention, contrasting it with reactive methods.	Crime, anti-social behavior, and insecurity	Social Innovation as addressing complex societal challenges related to crime and security	Police, local authorities, city managers, planners, architects, and designers, who work in partnership to address crime and insecurity	• Varied crime issues in urban environment • Transferability of best practices • Context-dependent structures • European standard in urban design and planning not been widely accepted	• Providing framework to improve security for citizens within urban environments by embedding crime prevention within the design and planning • Supports stakeholders in understanding the capabilities required for successful crime prevention implementation	• To address the challenges associated with implementing crime prevention within urban environments by introducing the Crime Prevention Capability Maturity Model (CPCMM) • To improve security by embedding crime prevention within urban planning and design processes	Cases of crime prevention initiatives in specific urban contexts in Hanover (DE), Manchester (UK), Szczecin (PL), Vienna (AT), Lower Saxony (GER)	empirical qualitative research	• Design Against Crime initiative • Design Against Crime Solution Centre • Security Partnership in Urban Development (SIPA) • Greater Manchester Police Design for Security Consultancy Service	• The establishment of the Design Against Crime Solution Centre at the University of Salford in partnership with Greater Manchester Police (GMP) • Improvement of crime prevention services delivered by GMP's Architectural Liaison Unit to planners and architects working in Greater Manchester. • Application of Crime Prevention Maturity Model in the State CID of Lower Saxony, Germany	• The value of considering crime prevention within urban design, planning, and development • The Design Against Crime demonstrates the value of adopting a design-led approach to security • Promoting designers to consider crime prevention within the design process • Embedding crime prevention within urban planning • Illustrates capability levels within the Crime Prevention Capability Maturity Model • Addresses the challenges of transferring best practices across different contexts	• Embedding Crime Prevention in Design Education and Practice • Establishing Solution Centers • Adapting Crime Prevention Through Environmental Design (CPTED) and Situational Crime Prevention (SCP) • Implementing Accreditation Schemes and Consultancy Services
Turner *et al.* , 2014	2014	Bezalel Academy of Arts and Design, Mahane Yehuda Market, Jerusalem	• DESURBS: New industrial design security products project	• Emphasis on urban safety • Collaboration and end-user involvement • Design thinking methodology • Product development progress • Security product in a systems • Innovative technologies • Holistic narrative for safety challenges	• DESURBS project • Industrial design security products • Urban spaces • CitiZen cellular application • Emergency Balloon • Israeli Police • Urban Design Security Index • Eyes research team • Skin research team • Urban resilience • Risk factors • Urban connectivity • Taskit - Crowd control Kit	• Focuses on the development of new security products for urban environments • Incorporates design to improve safety in public spaces • Details the design process, product development, and end-user field research • Includes case studies and discussions on two security products designed for urban spaces, emphasizing their applicability and effectiveness in different scenarios	Suicide bombings, potential terrorist attacks, criminal activities, security-related incidents, esilience aspects within urban spaces	• Involving the community in enhancing the quality and safety of their environment, (CitiZen cellular application) • Democratization of public sphere discourse and urban users' • TASKit maximize strengths and value for end-users • Shift towards inclusive and engaged approach to address security challenges within urban spaces • Identification of unmet needs in various fields of city security • Democratization of public sphere discourse and urban users' • TASKit aims to maximize strengths and value for end-users • Shift towards inclusive and engaged approach to address security challenges within urban spaces	City municipality and city planning, designers, security systems experts, international security consultation, end-users from Israeli Police, community	• Lack of official-civic dialogue interface • Lack of understanding and synchronization within various systems regarding security issues • Limited systems capability in incorporating innovative security products • Lack of ethic dialogue • Anachronistic security mechanisms	• TASKit – "The All Situation crowd control Kit" • Integration of mass wisdom in security strategies • Integration of user-oriented and human-centered design models and double loop strategy in the design process • Democratization of the public sphere discoursing security culture • Cultural marking as a concept • Creating connectivities within the urban fabric	• Addressing the impact of Eyes, Skin, Neck concepts • Development of urban resilience tools such as the CitiZen based on community of active users • Identifying and addressing vulnerable urban spaces • Establishing an informative emergency infrastructure • Integrating design processes in addressing security challenges	• TASKit – "The All Situation crowd control Kit"	Empirical qualitative research: case study analysis, interviews (open-end informal conversations, open-end interviews, and in-depth), user-end panels, field research, incidents analysis	• TASKit – The All Situation crowd control Kit (includes direction balloon, CCTV and GPS applications, barriers, urban connectivity, check points, site management policy) • Urban Design Security Index mapping tool • CitiZen Cellular Application for users reports	• Development of design concept of TASKit "The All Situation crowd control Kit" • Development of design concept of CitiZen cellular application • Conceptual development of directive barriers • Conceptual development of the balloon	• Developing novel approaches for designing security products (e.g., product systems) • Urban 'Onion Metaphor' • End-User Field Research Models that facilitate understanding of the social, cultural, and pragmatic dimensions of urban resilience • Product Development Process that allows co-design with end-users, implemented within the master's program at Bezalel • Urban Design Security Index mapping the optimal location for the deployment of security products	• Utilization of User Oriented Design, Peirce semiotics model application, and Double loop strategy in security innovation • Shift from products to product systems • Product Development Process emphasizing co-creation and phases ("plowing," "sowing," "sprouting," and "budding") • Utilization of "Urban 'Onion Metaphor' for different 'layers' of security systems and artifacts working together on different levels to achieve the greatest impact
Davey and Wootton 2017	2017	• Solution Centre at the University of Salford, UK • Catch22, UK	• Crime prevention through environmental design (CPTED) initiative • Youth Design Against Crime (YDAC) initiative	• Situational Approach • Environmental Design Principles • Design-Led Crime Prevention • Collaborative Approach • Architectural Liaison Service • Engagement of Young People	• Crime prevention through environmental design (CPTED) • Secured by Design accreditation scheme • Crime victimization • Security solutions • Removable hot products • Rational choice perspective	CPTED initiative aims to embed crime prevention within design practice, demonstrating the value of a design-led approach to improving security for everyday urban environments and reducing opportunities for crime and contribute to perceptions of safety and security for individuals within that environment	Theft crime and security	CPTED involves several stakeholders and community engagement	Government and municipal authorities, architects, designers, and planners, Police Architectural Liaison Officers (ALOs), developers and builders, local communities	• Vulnerability of personal space in public spaces • Theft of personal belongings • Targeting of removable "hot products" by offenders • Psychological barriers and environmental factors influencing criminal behavior • The need for design strategies to reduce vulnerability and minimize criminal opportunities	• Reduced Crime • Increased Public Safety • Positive Public Perception • Regulatory Support and Compliance • Collaboration Opportunities	• To demonstrate human-centered design approach for safety and security • To address a range of safety and security concerns within the design process • To emphasize the integration of crime prevention measures into design solutions • Provide a comprehensive understanding of crime-related considerations • To apply creative design thinking, problem-solving, and innovation to societal challenges related to crime and security	Youth Design Against Crime (YDAC) initiative	• Structured interview • Development of a problem profile • Creative ideation and brainstorming methods • Self-report surveys	• Crime Reduction Toolkits • European Standard for The Prevention of Crime guidelines • A&E toolkit	• "Youth Design Against Crime (YDAC)" program focusing on transformative nature of the design process • Reducing violence in hospital accident and emergency (A&E) departments led by professional designers • Preventing handbag theft in bars and cafés led by postgraduate design students	• Insights regarding the impact of design on crime levels, user behavior, and crime hotspots. • Highlights the role of urban design and product design in impacting crime vulnerability. • Identification of "crime hotspots"	• To embrace engagement and empowerment tools in the process of generating design solutions • To include holistic design research process • Designers should consider crime vulnerability of designs and locations • Designers should integrate safety and security issues throughout the design process
Norvanto 2017	2015-2017	European countries (7-15 countires in each project)	• Improving the Effectiveness of Capabilities in EU Conflict Prevention (IECEU) • Gaming for Peace (GAP) • European Union's Information Sharing Environment (EU_CISE_2020) • Maritime Integrated Surveillance Awareness (MARISA)	• Exploratory case study approach • Exploration of practices and community identity artifacts in a natural context • Utilization of qualitative content analysis across multiple cases to uncover the practices of social interaction and community identity artifacts in EU R&I project consortiums • Data was collected from four study cases • Knowledge creation and management strategies were discussed	• Community of Practice (CoP) • Explicit and Tacit Knowledge • EU Externally Funded Research Projects • Exploratory Case Study • Knowledge Creation and Management • Knowledge Transfer	• focuses on knowledge creation within EU security Research and Innovation (R&I) projects, considering them as communities of practice (CoP) • uses a multiple case study design to analyze these projects through the Wenger's framework (domain, community, practice) • explores how explicit and tacit knowledge is created and shared within project consortiums and across different consortiums	crisis management, peace building, security	• emphasizing the role of engagement, socialization, and identity development in knowledge creation • highlights the unique nature of consortiums as knowledge communities, distinct from traditional project organizations	individuals and organizations engaged in project consortia: government agencies, industry, research organizations, universities, organizations and professionals working in cross-border and cross-sectoral collaborations, civil society	• challenges and topics related to security and societal issues: conflict prevention, topics involving secure societies, maritime security, crisis management, and the coordination and support of common security and defense missions • effectiveness of capabilities in EU conflict prevention • gaps in training for the soft skills needed in multicultural EU missions • information sharing in the security environment	consortia addressing security benefits: • access to new professional communities • serve as platforms to facilitate knowledge creation • facilitates development of cross-sectoral multiple identities • emergence of communities working around certain challenges • potential for individuals and organizations to gain practice in a specific professional field	• to explore how knowledge creation in EU externally funded security Research and Innovation (R&I) projects can be understood through the concept of a community of practice (CoP) • to contribute to the understanding of knowledge creation in multidisciplinary project teams • understand the implications of knowledge transfers among consortia projects • to offer new insights into the knowledge creation in cross-border and cross-sectoral collaborations	• Improving the Effectiveness of Capabilities in EU Conflict Prevention (IECEU) • Gaming for Peace (GAP) • European Union's Information Sharing Environment (EU_CISE_2020) • Maritime Integrated Surveillance Awareness (MARISA)	empirical qualitative data anlysis through unstructured informal conversations, documentation, observations, participation in project-related events, workshops, and face-to-face and online meetings	• consortium establishment tools (negotiation processes, joint enterprise, and the formation of a collective identity) • shares knowledge creation and managment • development of innovative base curriculum • use of collaborative working areas, databases, and e-learning tools in the project execution phase	IECEU, GAP, EU_CISE_2020 and MARISA consortiums analysis	• EU Funded R&I projects represent unique forms of knowledge communities, bringing together organizations and professionals • EU R&I highlighted as effective platforms for facilitating knowledge creation, enabling individuals from different organizations to share information and tacit knowledge through regular interactions • participation in EU R&I projects enables consortium members to access new professional communities and facilitating knowledge sharing • highlights the significance of face-to-face meetings in building relationships, trust, information sharing, and knowledge creation within the project consortia	• to facilitate of Community of Practice (CoP) concept • to facilitate of face-to-face meetings for relationship and trust-building, information and knowledge sharing among consortium partners • to enhance the potential for knowledge creation through R&I collaborative projects

Marret et al., 2017	2014-2017	EU	IMPACT Europe project	• present results, outputs and lessons learned from the IMPACT Europe project • present practical evaluation toolkit for evaluating programs and interventions for CVE • address toolkit adaptability	• restorative justice • radicalisation • Countering Violent Extremism (CVE) interventions • Factors Matrix • toolkit adaptability • impact assessment	• focuses on assessing counter-violent-radicalisation techniques • presenting the project's results, lessons learned, and a toolkit for evaluating prevention of violent extremism (CVE)	violent extremism (CVE), radicalization, terrorism	discusses the relevance of social and positive alternatives for evaluation of violent extremism and radicalization interventions: educational and mentoring activities, identification of strategic communications, and use of counter-narratives	government organizations, police, non-governmental organizations, community/grassroots organizations, educational institutions, religious institutions, private sector	• recruitment and radicalization of vulnerable individuals • trends in violent extremist approaches • increasing nationalism and electoral strength in European countries • specific at-risk subgroups • methodological challenges in identifying promising practices in CVE	• improving the user-friendliness • simplifying and shortening the language • improving the accessibility and graphic user interface • providing a quick guide for easy navigation • translating the quick guide into multiple languages • development of training course	• emphasizes the necessity of robust and standard methodologies for evaluating CVE programs • addresses challenges and solutions related to the development and implementation of the toolkit programs aimed at CVE	introduces a variety of study cases related to evaluation methodologies and specific interventions in the field of CVE	• analysis of the state of the art • analysis of study cases • developing a toolkit prototype • analyzing adaptability	• IMPACT Europe toolkit prototype for improving evaluations in the field of CVE • training course and a toolkit manual	• development of evaluation toolkit • implementing scenario planning methodology • focus on first line practitioners • user-friendly toolkit based on end-user feedback to improve user-friendliness • manual and training course	• refinement and stress-testing of the toolkit through the evaluation and synthesis of results from pilot studies and the project as a whole, aiming to evaluate its potential future adaptability • end-users were involved in checking and providing feedback on the toolkit's refinement to establish whether these have improved its user-friendliness and usability • practical actions taken in response to the recommendations provided	• using the toolkit to facilitate the selection and implementation of evidence-based response measures and contribute to the design of better policy programs and interventions • presents a set of recommendations for further developing and implementing the innovative evaluation toolkit and emphasizes its robust and quasi-standardized mode of measuring effectiveness and evaluating programs
Easton 2019	2014-2019	Belgium	Triple-Helix collaboration in Belgian Innovation Centre for Security	• Triple Helix Collaboration • Evolution from State Model to Triple-Helix Model • Demand-Driven Innovation Projects • Focus on Security Challenges	• Triple-helix-Innovation • Technology • Security • Safety • Collaboration • Open innovation • Demand-driven innovation • Interactions between technology, innovation, and security	discusses the triple helix model of collaboration between industry, government, and knowledge institutes while emphasizes this model as a method to foster innovation and technology in safety and security sectors	safety and security	• Social Innovation as a crucial component in the advancement of technology and security • Triple Helix collaboration • Open Innovation as a necessary condition for the triple-helix model	industry, government, and knowledge institutes	• lack of comprehensive collaboration • limited engagement of stakeholders • barriers to triple-helix collaboration • resistance to change and innovation: • inefficiencies and underutilization of technology • challenges related to funding and governmental support	stimulating innovation in technology and security through the triple-helix model	• to analyze the triple-helix collaboration model as a means to stimulate innovation and technology in the field of safety and security • to underscore the significance of the evolution from a state model to a triple-helix model and the paradigm of open innovation • to reflect on the dynamics of the triple-helix collaboration, including its creation, objectives, methodology, partners, and funding • to provide assessment of the triple-helix cooperation in the Belgian context	Belgian Innovation Centre for Security	reflective qualitative research based on empirical evidence	triple-helix collaboration model	INNOS pilot project	discussion regarding various aspects of the triple-helix collaboration model: creation, objectives, ambition, methodology, partners, funding, barriers, and logics used by government as one of the participants	• advocates for more comparative international research to gain insights into the added value of triple-helix collaborations for stimulating innovation and technology in the field of security, including factors influencing their development globally • suggest for stimulate innovation in technology and security through the triple-helix model • to encourage the development of demand-driven innovation projects • to facilitate the exchange of knowledge and identification of needs through seminars and workshops
Keith 2021	2021-2031	UK	From Harm to Hope: a 10-year drugs plan to cut crime and save lives	• comprehensive strategy • multi-agency approach • focus on societal benefit • financial investment • long-term approach • targeted interventions	• project ADDER-Local authorities in England and Wales • drug supply chain • anti-social behavior • tough consequences scheme • targeted behavior change initiatives • Operation Mercury • White Paper • systems map	• outlines a comprehensive strategy by the UK government to combat illegal drug use and its associated social and criminal impacts • presents a 10-year plan focusing on breaking drug supply chains and delivering recovery systems • emphasizes a multi-agency approach	drug-related crime (supply, distribution, use, burglary, robbery, theft, violence, organized crime groups, exploitation of vulnerable individuals, impact on local and national security)	• innovation fund and research projects • testing and learning drug use reduction • addressing drug-related challenges through innovative endeavors • focuses on society benefit	local government authorities, National Crime Agency (NCA), British Transport Police (BTP), law enforcement partners, voluntary organizations, individuals with drug experience, police doctors, health services, education workers, voluntary sector	• high prevalence of drug use • drug related crime • effect of drugs on communities • risks of recreational drug use • vulnerability of children and young people	multi-agency leadership, strategic partnerships, and collaboration for achieving a generational shift in drug demand	• encompass comprehensive approach to combatting illegal drugs • to deliver wide-ranging societal benefits • tackling drug-related crime reduction method • to ensure accountability and progress monitoring through national and local outcomes frameworks • engage in strong partnerships across the government and local levels, • focus on better outcomes for citizens and neighborhoods	Project ADDER (Addiction, Diversion, Disruption, Enforcement and Recovery) initiative	data-driven and evidence-based research, emphasizing testing, and evaluation	• Collaboration frameworks • Break the supply chain plan • Dame Carol Black's review • Secure Stairs • Individual Placement and Support (IPS) • national outcomes framework • local outcomes frameworks: • Systems map • Mapping of "complex needs" authorities	• ADDER initiative • Operation Mercury • behavior change initiative • Secure Stairs • Individual Placement and Support (IPS) • White Paper	• requirement for comprehensive plan through a combination of interventions, enforcement actions, and support services • the need for an integrated approach (including rapid expansion of drug testing on arrest, tough consequences schemes, and targeted behavior change initiatives) • implementation of a framework for integrated care (Secure Stairs) • the proposal to publish a White Paper introducing measures to reduce demand • the recognition of the unique needs of children and young offenders in the justice system • the need for development of evidence-based data base • delivering school-based prevention and early intervention measures	• multi-agency partnership and leadership • data sharing and joint analysis • maturing existing partnerships • national and local outcomes framework • focus on young offenders and vulnerable individuals • cross-government collaboration
Wootton et al., 2023	2023	Lower Saxony (GER)	Cutting Crime Impact (CCI) project	• integrating human-centered design principles in security • predictive policing approach • problem reframing • end-user research • solution design and prototyping development process • technology-led to socially responsible policing	• predictive policing • human-centered design • law enforcement agencies • end-user research • PATROL tool • Triple Diamond model	• examines the role of human-centered design in enhancing technological solutions for security, with a focus on predictive policing • critiques technology-driven approaches • highlighting the benefits of considering human roles, values, and responsibilities in the design process • discusses predictive policing	predictive policing predominantly in relation to burglaries and property crimes	Social Innovation described in the context of socially responsible design, end-user research and collaborative efforts in the field of security	law enforcement agencies (LEAs), policymakers, designers, end-users	• lack of understanding of policing by technologists and software system developers • inability to sell the practical benefits of predictive policing to frontline officers • poor integration of the technological system with the practical job of police patrolling • practical problems on the frontline of predictive policing were not understanding • these problems reflected a lack of understanding of policing by technologists and software system developers • challenges surrounding technology-driven solutions • despite the technological promises, the practical benefits of predictive	• practical problems on the frontline of predictive policing were revealed through the human-centered design approach • addressing the claim that successful solutions are not solely technology-driven but need to be tempered with an appreciation and understanding of the human context	• to address the challenges and opportunities associated with the development and implementation of predictive policing tools within the context of the Cutting Crime Impact (CCI) project, specifically focusing on the work carried out by the LKA in Lower Saxony • adoption of human-centered design approach • reframing the problem statement from a technology-driven focus to a human-centered focus	• Cutting Crime Impact (CCI) project • development of testing of the PATROL tool in Lower Saxony	• Triple Diamond design process model fostering reframing, ideation, prototyping, deployment of solutions	• the PATROL Tool • SKALA to predict the probable risk of offences in districts • KLB-operativ integrates crime-related data from police sources and socio-economic data • KrimPro developed to predicts crimes based on police data, infrastructure, demographic data	• implementation of PATROL tool • the implementation of SKALA, KLB-operativ, KrimPro	• problem exploration and reframing facilitation through designLab collaborative ideation event • Solution Design and Prototyping resulted in a practical solution suited to the problem context • PATROL Tool facilitates the communication of valuable data, information, and experience to police officers during operations and patrol service • successful implementation of a human-centered design approach to develop a practical solution	• to employ human-centered design approach in order to reveal practical problems in the predictive policing • to emphasize the systematic inclusion of information lacking existing predictive policing systems through PATROL tool • to offer practical suggestions and strategies to enhance decision-making processes for police officers with PATROL tool • to reframe the problem from a technology-centered focus on the predictive policing system to a human-centered focus on police patrolling • to conduct end-user research

Davey et al., 2023	2020–2023	Lisbon (PT) Nice (FR) Riga (LT) Rotterdam (NL) Stuttgart (DE) Turin (IT)	IcARUS project	• novelty (in process and in outcome) • effective addressing of social problems • empowerment • collaboration • engagement • design thinking as practical approach	• IcARUS project • European Union • Social innovation • Design thinking • Urban security • Social innovation workshops • Tool specifications • Innovation uptake • Stakeholder engagement • Prototype testing	to develop tools tailored to the specific needs and contexts of six cities' law enforcement agencies and local security practitioners to address security challenges in their respective urban environments using social innovation approach	crime prevention (burglary, theft, harassment, assault, vandalism), violent extremism community safety citizens' perceptions of security	• provides extensive report of social innovation: timeline, advocates, theories • lists aspects of social innovation	police officers, local security practitioners, law enforcement agencies, civil society organizations, youth workers, members of the community: residents, local business representatives, and community organizations, Advisory Board and Consultative Committee	• limitations in identifying problems to be addressed, uncovering potential solution directions, and generating innovative solutions • lack of engagement of appropriate stakeholders for the identified problems, • prevention of juvenile delinquency	• better identification of problems • transformation of organizational culture • definition of the role of stakeholders • focus on human rights and legal compliance	• developing effective tools for social innovation • collaboratively deliberating, co-producing, and implementing interventions • sharing knowledge, expertise, and resources to develop evidence-based intervention strategies • utilizing a digital dashboard for informed decision-making • fostering an inclusive, data-driven approach to improve urban security	Lisbon (PT) Nice (FR) Riga (LT) Rotterdam (NL) Stuttgart (DE) Turin (IT) tools	• state-of-art review on social innovation • design thinking methodology for urban security solutions development	• Stuttgart Tool: mobile performance/workshop aimed at increasing young people's resilience • Turin Tool: to support collaborative decision-making to enable evidence-based interventions • Lisbon Tool: providing a design-oriented approach to engage young people in community safety • Nice Tool: Ask for Angela campaign to keep individuals safe from sexual assault • Rotterdam Tool: The Spaanse Polder Café event, involving collaborative forums to address safety and security issues • Riga Tool: web application to support an evidence-based approach to policing tactics	• workshops, design thinking sessions, and stakeholder engagement events • development and implementation of tools tailored to address specific urban security challenges • definition, prototyping, and adaptation of the tools	• use of a human-centered design tool development process • need for in-depth research and supplementary action to better define the problem context, design requirements, and constraints in various cities • demonstration of impact of the tools on urban security • identification of limitations in the design thinking approach • involvement of different consortium partners to support tool development	• use of a human-centered design in development process • in-depth research and collaborative actions to define the problem context, design requirements, and constraints in various cities • cross-sectors cooperation and knowledge acquisition • iterative development of solutions • design approach adaptation

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Say hi!
info@engage2innovate.eu
www.engage2innovate.eu

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