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Abstract: Urgency and political incentives towards grand challenges, such as anthropogenic climate change, increase the importance of multi-actor and cross-sectoral cooperation approaches. One such approach referred to as mission-oriented innovation (MOI) encompasses multi-actor and cross-sectoral cooperation towards tackling grand challenges. However, there is a significant research gap regarding the engagement of SMEs in MOI. The ability to innovate and adapt makes SME engagement pivotal. This study aims to examine barriers towards SME engagement in MOI. Barriers were uncovered through an inductive qualitative case study. By performing a thematic analysis, barriers regarding lack of communication, resource distribution, and differences between political domains were uncovered. Contributing toward the significant gap in current literature, this study increases the knowledge towards engaging SMEs in MOI.

Keywords: grand challenges; mission-oriented innovation; MOI; public actors; small and medium size enterprises; SMEs; unawareness; resource distribution.

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1   Introduction

Globally, governing bodies are increasingly concerned regarding social challenges, e.g., health in an aging population, gender equality, ending hunger (Jütting, 2020) and environmental challenges (Janssen et al., 2021). Such challenges, often referred to as grand challenges (Mazzucato, 2018a; Wanzenböck et al., 2020) which encompass complexity and multidimensionality. Thus, imposing new demands on policymakers and societies (Janssen et al., 2021; Jütting, 2020). One approach towards addressing current grand challenges concerns mission-oriented innovation (MOI) (Janssen et al., 2021).

Current innovation policies are characterised by attempts to closer align policy with 'grand challenges of our time' such as pollution, anthropogenic climate change or demographic change (Wittmann et al., 2020). Confronted with current grand challenges,

research and innovation, which are expected to deliver solutions to global and urgent challenges (Jütting, 2020), faces new legal and political constraints alongside new demands from societies (Jütting, 2020).

Grand challenges are converted into achievable steps, referred to as missions (Mazzucato, 2018a; Mazzucato et al., 2020), which can be pursued through research and innovation (Jütting, 2020). Due to their complexity and urgency, these missions cannot be solved by one actor – be it politics, research, industry, or civil society – alone (Jütting, 2020). Therefore, missions require multi-actor and cross-sectoral cooperation (Jütting, 2020), consisting of actors ranging from public actors and small to medium size enterprises (SME), alongside innovation policy (Mazzucato, 2018a; Schot and Steinmueller, 2018; Wittmann et al., 2021).

Due to the associated complexity and dependence upon cooperation between several actors, missions must be tackled through a systematic approach (Mazzucato, 2018a; Schot and Steinmueller, 2018; Wittmann et al., 2021). A systematic approach could increase the ability to successfully achieve missions as they are more likely to be successful if actors agree upon the challenges characteristics, what needs to be performed, and how responsibilities should be distributed amongst associated actors (Larsson, 2022).

As multi-actor and cross-sectoral cooperation, alongside the engagement of SMEs are crucial in successfully performing MOI-related activities (Al-Jayyousi et al., 2023), it is pivotal that associated actors are incentivised (Al-Jayyousi et al., 2023; Larsson, 2022). If incentivised adequately, MOI-related activities could contribute towards value chain management. This as tackling missions successfully could act as a catalyst for innovative products and processes, strengthen actor relationships along the supply chain, and deliver long-term value for all associated actors, including end customers.

This study contributes to the field of MOI-research by being the first study which focuses on specific barriers preventing successful SME engagement in MOI-related activities. This study encompasses the perceptions of interviewees representing public actors and SEMs with the purpose of uncovering barriers from their perspective regarding the current difficulty in incentivising and facilitating SME engagement in relation to MOI-related activities. This study, therefore, contributes with empirics regarding barriers which must be overcome to increase SME engagement in relation to MOI-related activities.

The purpose of this study is to examine why SMEs are underrepresented in relation to MOI-related activities. This, as MOI should facilitate and stimulate cooperation between private (SMEs) and public actors. The above described has been condensed into the following research question, "what are the barriers to facilitating cooperation between public actors and SMEs related to MOI?" By performing an inductive qualitative case study and obtaining empirical insights through semi-structured interviews, demarcated within the geographical area of Uppsala region, from an ontological constructionistic (Young and Collin, 2004) and epistemological interpretivist positioning (Bevir and Rhodes, 2012), this study satisfactorily fulfilled the purpose and answered the research question.

Below follows a review of literature regarding the theoretical concept of MOI, its limitations, and criticism. Thereafter SMEs are presented through their role in current financial structures and their capabilities and limitations towards engaging in innovative activities. Following this, the results are presented, obtained through semi-structured

interviews which were thematically analysed. The thematic analysis highlighted three major barriers to facilitating cooperation between public actors and SMEs related to MOI, unawareness, distribution of resources, and domain differences. These barriers are then discussed from the backdrop of the literature reviewed in this study. Lastly, longitudinal and quantitative studies are recommended to examine the efficacy of a systematically structured approach towards MOI. This with the purpose of increasing the future ability to successfully achieve MOI, and to increase SME engagement towards MOI-related activities.

2   Review of the literature

2.1   Mission-oriented innovation

MOI regards a systematic approach towards directing resources to tackle grand challenges (Mazzucato, 2018a; Schot and Steinmueller, 2018; Wittmann et al., 2021). A systematic approach can be realised through innovation policy (Mazzucato, 2018a; Schot and Steinmueller, 2018; Wittmann et al., 2021), incentivising and facilitating multi-actor and cross-sectoral cooperation. Grand challenges entail high levels of complexity (Wanzenböck et al., 2020) and urgency (Mazzucato, 2018a), requiring solutions stemming from technological and non-technological innovation (Wittmann et al., 2021, 2020), through multi-actor and cross-sectoral cooperation. Anthropogenic climate change is an example of an urgent and complex grand challenge facing societies, requiring a systematic approach towards associated missions.

Missions can be interpreted as predetermined and cross sectoral (OECD, 2022) sets of goals which, if successfully accomplished, aid in tackling current grand challenges (Mazzucato et al., 2020). Missions should function as a stimulant towards finding solutions in successfully tackling grand challenges (Mazzucato et al., 2020) facilitated through multi-actor and cross-sectoral cooperation (Jütting, 2020). For missions to function as a positive stimulant, they must be clearly defined, rely on multi-actor and cross-sectoral cooperation and inclusion, and be accompanied with innovation policies relevant for all echelons of actors (Mazzucato, 2018a). Also, enablers of MOI-related activities consisting of rapid diffusion of new technologies, research, curation of innovation ecosystem, smart economic growth and investment, multi-actor and cross-sectoral cooperation, and governance (Al-Jayyousi et al., 2023) must be systematically facilitated.

The level of policy-based governance required may differ depending on the characteristics of the mission (Larrue, 2021; Wittmann et al., 2021). The higher the complexity of the mission, the greater the need for multi-actor and cross sectoral cooperation, resulting in a greater need for policy-based governance (Larrue, 2021; Wittmann et al., 2021). Current innovation policies accompanied by missions and innovations relating to, e.g., sustainability require systemic changes (Hekkert et al., 2020) through societal shifts (Schot and Steinmueller, 2018). Missions can be classified into either accelerator or transformer missions, based upon their complexity and degree of political governance and coordination (Wittmann et al., 2020).

Accelerator missions concern a relatively narrow scope of problems which can often be solved through technological innovations, a limited number of cooperating actors, and limited dependence on political governance and coordination (Wittmann et al., 2020).

Transformer missions relate to problems which can only be solved through societal shifts, encompassing high dependencies on multi-actor and cross-sectoral cooperation, alongside a high degree of political governance and coordination through, e.g., innovation policies (Wittmann et al., 2020).

It should however be addressed that an MOI-approach and associated activates currently encompass limitations and criticisms regardless of being classified as accelerator or transformer missions. As missions often lack directionality, synchronisation of actors (Wanzenböck et al., 2020), and understanding amongst associated actors, they are often not clearly defined (Janssen et al., 2021). Also, missions are often associated with long timeframes (Wanzenböck et al., 2020), typically longer than associated actors would consider as a reasonable return on investment horizon. A lack of clarity regarding mission could contribute to difficulties in formulating efficient innovation policies (Mazzucato, 2018a), applying these policies, and evaluating them (Grillitsch et al., 2019). As policies (including innovation policies) are stipulated by public actors with legal authorisation, political legislation and governance could impose a hindrance as to the transferability of innovation policies between geographical and political domains (Markusen, 2003). This could further impose difficulties in transferring MOI-related activities between domains (Wanzenböck and Franken, 2020).

As MOI is associated with grand challenges encompassing multi-actor and cross-sectoral cooperation (Azzi et al., 2019; Mazzucato, 2018b) alongside innovation policies, political interests and influences may occur. Political involvement could infer difficulties of transferring MOI-related activities, and policies (Larrue, 2019; Markusen, 2003) between domains due to differing political characteristics between domains (Wanzenböck and Frenken, 2020).

MOI suffers from three main weaknesses which could negatively impact successful implementations (Larsson, 2022). A lack of knowledge regarding how MOI is successfully implemented, and which activities should be pursued. Also, a lack of empirical data has decreased the ability to evaluate the efficacy of performed MOI-related activities and their implementation. Lastly, the complexity of MOI and associated activities, alongside a multi-actor and cross-sectoral dependence results in ambiguity regarding the allocation of responsibilities (Larsson, 2022). These weaknesses could stem from an inability to standardise an MOI-approach and associated activities due to complexities, i.e., one size does not fit all (Mazzucato and Macfarlane, 2019; Randles et al., 2022).

The role of governance is integral for successfully achieving MOI-related activities (Wittmann et al., 2020). Emphasising those public actors having to take an active, and leading role in coordinating MOI-related activities. Meanwhile they must also facilitate and incentivise multi-actor and cross-sectoral cooperation, encompassing public actors and SMEs alike. However, this is likely to result in conflicts of interest between associated actors with dominating preferences that may not fully support activities formulated in associated innovation policy (Wittmann et al., 2020).

2.2 *Previous implementations of MOI*

Previous attempts to facilitate MOI towards achieving missions in various domains have, e.g., been conducted within the agri-food sector and energy sector. These implementations, however, were constrained by contextual barriers, decreasing

implementation efficacy. The implementation regarding the agri-food sector was facilitated in New Zealand, with the purpose of increasing local agricultural efficiency through increased technological prevalence (Klerkx et al., 2022; Klerkx and Begemann, 2020). This implementation of MOI-related activities was constrained by differing legislation and regulatory governance between associated domains (Klerkx and Bergmann, 2020). Further constraining this implementation were unclear innovation policies which, due to domain differences in legislation and regulation, were difficult to transfer between domains resulting in weak directionality and coherence (Klerkx et al., 2022).

Attempts of implementing MOI within the energy sector have been facilitated in Germany and Brazil. In Germany the implementation was referred to as Energiewende and concerned policies and activities towards replacing nuclear energy with renewable and sustainable energy sources (Beveridge and Kern, 2013; Mazzucato, 2018b). The goal with Energiewende was to achieve 95% decrease in emissions by 2050. This implementation contained policies which where hastily formulated, contributing to concerns regarding expenditure divisions among the associated actors and the German population (Beveridge and Kern, 2013). Also, the complexity of this mission made it difficult to maintain predetermined timeframes (Beveridge and Kern, 2013).

In Brazil, the implementation of MOI, referred to as, Inova Energia regarded the mission of enabling renewable energy systems via the diffusion of smart energy grids (Mendonça et al., 2018). This implementation was mainly constrained due to the sharp domain differences within the country (Mendonça et al., 2018). These constraints highlighted inadequate abilities of facilitating systematic and transformational changes throughout the society (Mendonça et al., 2018).

The above presented implementations of MOI relate to grand challenges as they encompass complexity and multidimensionality (Mazzucato, 2018a; Wanzenböck et al., 2020) purposefully carried out to tackle societal and urgent challenges. However, it is apparent that the complexity and multidimensionality of these missions, contribute to constraints related to legislation and regulation (Klerkx and Bergmann, 2020), domain differences (Klerkx and Bergmann, 2020; Mendonça et al., 2018), and monetary uncertainties (Beveridge and Kern, 2013).

Regarding previous Dutch-based implementations of MOI it was found that missions within agriculture and energy sectors attract a higher number of participants than non-MOI implementations within these sectors (Wiarda et al., 2023). This could support the difficulty in clearly communicating mission directionality and adequately synchronising participating actors (Wanzenböck et al., 2020). Furthermore, it was found that MOI implementations did not encompass a larger diversity among participating actors nor a larger influence from public actors as opposed to non-MOI implementations within the aforementioned sectors (Wiarda et al., 2023). Diversity through multi-actor and cross-sectoral cooperation and clear leadership from public actors could be argued as crucial for successful MOI implementations (Wittmann et al., 2021, 2020).

By reviewing 49 separate MOI-implementations, it could be argued that MOI-implementations are centred in Europe and North America, together constituting 90% of reviewed implementations (Batbaatar et al., 2024). Furthermore, 33% of the reviewed MOI-implementations were successful, 8% were considered non-successful while 59% were considered ongoing (Batbaatar et al., 2024).

2.3 *The role of SMEs in current economic structures*

In this study SMEs are considered as actors who are privately owned and employ a maximum of 250 individuals (European Commission, 2024), constituting 99% of registered businesses across the European Union (European Commission, 2024). SMEs' role as core innovators is increasingly perceived as fundamental in current economies as they constitute a large part of current economic structures (Gherghina et al., 2020). The ability for SMEs to engage with technological innovation has been proven to be an integral ability, and a determinant for their success (Gherghina et al., 2020). Also, cooperation between SMEs and large actors based on economic incentives is a key enabler for MOI policy (Al-Jayyousi et al., 2023).

SMEs encompass capabilities and limitations, which could increase, or decrease, their ability to engage in MOI-related activities. SMEs tend to utilise financial bootstrapping, i.e., relying on available resources rather than acquiring resources from external parties (Löfqvist, 2014). This emphasises the importance for SMEs to efficiently utilise resources, while, in some cases, resulting in a lack of resources towards development. This is evident as SMEs tend to have insufficient in-house R&D capabilities which decreases their ability to independently produce and develop innovations (Brown, 2021; Isaksen and Nilsson, 2023). Moreover, SMEs often lack internal financial, human, and organisational resources which hinder their capability to develop new products and services (Powell et al., 1996), decreasing their willingness to take risks, as opposed to larger actors (Chesbrough and Crowther, 2006). This drives SMEs to introduce innovations in a more flexible manner adapting to market needs and dynamics (Bresciani and Oliveira, 2007).

SMEs that can secure sufficient resources have proven capable of producing radical, and disruptive innovations (Acs and Audretsch, 1987; Al-Jayyousi et al., 2023). Due to SMEs generally having less resources to utilise than larger actors (Lee et al., 2010; Van De Vrande et al., 2009; Vossen, 1998), innovation processes differ between these types of actors (Bresciani and Ferraris, 2014). SMEs innovation processes are more flexible, faster, and less formal than those of larger actors (Lee et al., 2010; Van De Vrande et al., 2009; Vossen, 1998).

The motivation for SMEs to innovate is highly linked to the capabilities of their management (Lehtimaki, 1991), stemming from three main factors, retaining current customer base, maintaining current cashflow, and solving current customer needs and problems (Löfqvist, 2014). The motivations for SMEs to innovate could be a result of increased competition and rapid progression of technology, forcing SMEs to develop new products quickly and in an efficient manner (Parida et al., 2012).

3 Method

This study was performed as an inductive qualitative case study demarcated within the geographical area of Uppsala region, performed from an ontological constructionistic (Young and Collin, 2004) and epistemological interpretivist positioning (Bevir and Rhodes, 2012). Case studies can help to understand complex phenomena, strengthen previous research (Dooley, 2002), and enhance existing theory by acquiring and contributing knowledge with the purpose of closing existing research gaps (Siggelkow, 2007), through in-depth investigations (Feagin et al., 1991). Qualitative case study

methodology provides tools for researchers to study complex phenomena within real-life contexts when the interface between the phenomenon and the context is not clear (Baxter and Jack, 2008; Yin, 2009).

Uppsala region was selected based on being a relatively typical (or representative case) (Bryman and Bell, 2007; Seawright and Gerring, 2008) region among other Nordic regions with a university and an advanced innovation ecosystem. Thus, it can be assumed that the case region is exposed to typical barriers that SMEs face in relation to MOI-related activities in other Nordic regions, particularly in a Swedish context.

The empirical data which has been used in this study was collected by performing semi-structured interviews with purposefully selected individuals within Uppsala region, a method that was chosen as it allows for in-depth investigations regarding the observed case through the perception of the interviewees (Patton, 2002). The interviewees were selected based upon their current employment with the criteria that the interviewee must currently be employed within Uppsala region and actively work with facilitating innovation-related activities.

The interviews were conducted between 23rd March and 23rd April 2023. All interviews were performed and recorded through conference platforms (Zoom or Teams) in spoken Swedish and directly transcribed and translated to written English, with the approval of the interviewee. The interviewees were given the translated English transcription of their interview which was utilised for analysis after written approval by the associated interviewee. See Table 1 for interview and interviewee characteristics and Appendix Table A1 for the interview guideline. Results based upon interviewees A and B from interview 6 have been combined in this study as they communicated similar perceptions without substantial differentiation. This interview was performed as a group interview due to time constraints on the interviewees part.

Table 1   Interview characteristics

Interview	Duration	Occupation	Actor type	Gender	Age
1	11:00–12:20	Regional innovation support systems	Public actor	Male	47
2	14:00–15:00	Innovation manager and business developer	SME	Male	31
3	10:00–11:00	Technical manager	Public actor	Male	57
4	09:00–10:00	Senior innovation business advisor	SME	Male	61
5	13:00–14:00	Business advisor	Public actor	Female	40
6	09:00–10:00	Interviewee A: business strategist	A: public actor	A: male	A: 57
		Interviewee B: senior environmental strategist	B: public actor	B: male	B: 63
7	12:00–12:00	Senior project manager	SME	Female	32

The empirical data gathered from the interviews conducted (see Table 1) was analysed through thematic analysis. Thematic analysis was chosen as it allows for structuring of obtained data in a systematic manner based upon similarities and patterns, i.e., codes (Braun and Clarke, 2006; Maguire and Delahunt, 2017; Scharp and Sanders, 2019). The

analysis of the gathered empirical data was conducted through the sex steps of thematic analysis (Braun and Clarke, 2006) see Table 2.

Table 2 Performing the thematic analysis

Steps of thematic analysis *(Braun and Clarke, 2006)*		*Performing the steps*
1	Becoming familiar with the data	Transcription of the sound recording directly after performing interview.
2	Generation of initial codes	Thoroughly examine transcriptions, taking notes of similarities and patterns.
3	Theme generation through code grouping	By grouping initial codes, initial themes were generated.
4	Reviewing themes and associated codes	A thorough review of initial themes and associated code groups to ensure that all codes within an initial theme were relevant and contributed to corresponding themes.
5	Concretising themes	Themes were defined and named based upon contextual similarities between corresponding code groups.
6	Communicating performed thematic analysis	After performing the thematic analysis, the results were systematically written to be presented in this paper.

The process of performing the thematic analysis will be exemplified through following a statement from the transcription phase to its contribution in a theme. Upon reviewing the transcriptions, it was noted that interviewee 1 stated "…lacking a clear and communicated definition and contextualization…" in reference to being asked Q1.2 "how have you perceived the ability of Region Uppsala to communicate the mission stated in Q1.1?" (see Appendix Table A1). This statement was noted as is conveyed a strong standpoint towards Q1.2, as the interviewee expressed a lacking ability of Region Uppsala to communicate and define their mission. When diving further into other transcriptions, it was noted that several interviewees had a similar perception, e.g., interviewee 4 stated, "public actors […] do not clearly communicate what they want…" From these and similar statements, it became apparent that an initial code representing the inability of public actors to communicate mission specifics should be created.

The above statements from interviewees 1 and 4 (among others) where gathered under a code named "weak communication of mission(s)." Thereafter, more codes were created in the same manner. Initial codes were then individually reviewed and grouped with other codes, sharing overarching properties. Once reviewing a group of codes [including the code "weak communication of mission(s)"] it became apparent that an initial theme should represent the perception that Region Uppsala had not been able to communicate their complex mission in a satisfactory manner, nor were they aware of how to utilise existing abilities to increase communication output and facilitate cooperation between relevant actors. This was conducted for all groups of codes and initial themes. After this, all initial themes were reviewed to ensure that they pertain to their underlying groups of codes. After reviewing all initial themes, they were defined and named in accordance with the overarching and shared properties among the codes within, i.e., the theme encompassing the above examples, was named 'unawareness' as this was perceived by the authors as the main similarity between the codes within.

Reliability, the ability of research replication (Leung, 2015) has been considered during this study. This, as the manner to which this study was performed, and the steps

taken have been clearly presented, to ensure the replicability of this study therefore increasing the reliability. The validity of this study has been considered as the methodological approach utilised was chosen with the purpose and research question in mind (Leung, 2015). During the data gathering phase and data analysis phase of this study, the interviewees were given full transparency of their contribution, ensuring that due diligence was performed to represent their contribution in a rightful and truthful manner.

External validity refers to the domain in which the results of a study can be generalised (Yin, 2009). According to Yin (2009), generalisation in case studies cannot be based on statistical generalisation but rather on analytical generalisation, where the researcher seeks to generalise the results in relation to relevant theory. After analytically analysing the data obtained, the authors concluded that the domain in which the results of this study could be generalised within regards the Nordic countries. This, as their societal, political, and economic structures are similar alongside similarities regarding the influence and governing authority of public actors. Also, the Nordic countries practice public procurement (Alhola et al., 2017), further strengthening the generalisability of this study within this domain. This, due to public procurement contributing towards similar barriers and opportunities towards SME engagement regarding MOI-related activities within the Nordic countries.

Table 3   Thematic analysis, a summary

Themes		Codes		Explanation
Unawareness				
Interviewee 1: "…lacking a clear and communicated definition and contextualization…"	1	Lack of mission communication	1	Actors are unaware of proposed missions
	2	MOI by cooperation	2	Perceived lack of cooperation incentives
	3	Facilitation of MOI-related activities	3	Capabilities for MOI facilitation are perceived as lacking
Distribution of resources				
Interviewee 7: "…needs to be a greater prioritization…"	1	MOI-resource allocation	1	Resources not prioritised towards MOI-related activities
	2	Lack of MOI-related activates materialising	2	Insufficient resource allocation resulting in inability to perform MOI-related activities
Domain differences				
Interviewee 5: "…politics often act as a barrier to actual change…"	1	Contrasting governance, political interests, and financial abilities	1	Multi-actor and cross-sectoral characteristics of MOI perceived as contributing towards conflicts of interests

4   Results

Presented below are the results of this study, based upon the performed thematic analysis see Table 3 for a summary of the thematic analysis.

4.1 *Actors unaware of proposed missions*

A consensus was observed among all interviewees regarding a lack of communication related to missions, especially communication between public actors and SMEs. Interviewees A and B representing the publicly owned actor, Region Uppsala, expressed a lack of ability in communicating missions amongst relevant actors. This notion was further strengthened by interviewee 4 who stated that there currently is "…no specific entity […] to lead larger multiparticipant projects." The urgency upon which public actors need to increase their ability to communicate multi-actor and cross-sectoral dependence regarding MOI-related activities was clearly expressed by interviewee 1 who states that there is currently "…lacking a clear and communicated definition and contextualization." Supported by interviewee 2 who perceives that "regional actors need to increase communications." and interviewee 4 who stated that "public actors […] do not clearly communicate what they want…"

Interviewees 5 and 7 also indicated that the information communicated regarding the mission was difficult to find. Once this information was found it merely communicated constituents rather than a clear overview of the proposed mission as indicated by interviewee 1. The perception of interviewee 4 differed somewhat from interviewee 1, where interviewee 4 perceived that the information communicated was too vague to act upon, stating "…only communicated the mission as large, not desired directions and/or aims." This perception was shared by interviewee 3 who indicated that coordination of mission-related activities and division of responsibilities was unclear. An absence of a specific entity to manage multi-actor and cross-sectoral projects, as indicated by interviewee 4, could explain the inability to clearly communicate and coordinate MOI-related activities.

Due to this, unclarity, interviewees found that the information communicated (regardless of perception) was difficult to act upon. Interviewee 1 even stated "successful during the pre-study phase, but less successful in the implementation phase", regarding previous attempts of actors within Uppsala region to simulate innovation initiatives. However, interviewees mentioned that communication from public actors seemed to increase once monetary contributions had been made. This could imply that public actors possess the ability to communicate. These abilities were confirmed during interview 6, by the interviewees who mentioned that current communication abilities are not leveraged to a preferred extent. As emphasised by several interviewees, successfully conducting MOI-related activates greatly depends on communication abilities with the purpose of engaging multi-actor and cross-sectoral cooperation. Here all interviewees seem to agree upon cooperation playing an integral role in successfully achieving missions. Interviewee 1 stated "…cross-sectoral cooperation must be facilitated by actors who have resources and mandates…", further strengthening the shared perception among interviewees, that public actors need to take leading role in coordinating and incentivising MOI-related activities.

Interviewee 1 expressed that "innovation is a requirement, but also cooperation", regarding successfully achieving missions. However, a consensus regarding the lack of current cooperation between public actors and SMEs was clear. During interviewee 6 it was stated that "…there could be more cooperation between public and private actors…", meanwhile interviewees A and B from interview 6 acknowledged a "lack of structure in gathering these actors to cooperate." This lack of structure was further emphasised during other interviews, e.g., interviewees 3 and 4 indicated that clear directives and expected

output regarding activities towards achieving the mission are not communicated. The perceived lack of structure could result from differences among actors, as interview 7 stated "…different sectors and actors may have different characteristics…" But could also stem from an inherent resistance, as interviewee 3 stated that there "…must be an increased willingness and courage amongst local politicians and governing bodies" in response to the lacking ability to facilitate MOI-related activities in a systematic manner.

4.2   Allocation of resources perceived as insufficient

A lack of incentive towards multi-actor and cross-sectoral cooperation can be confirmed by interviewee 3, who quoted "…lack of incentive…" regarding resources not sufficiently being allocated towards MOI-related activates. This lack of incentive could be derived from a lack of communication as presented above. Nonetheless interviewees agree that current allocations of resources do not incentivise a greater push towards successfully achieving missions. Interviewee 7 expressed that there "…needs to be a greater prioritization…", agreed upon by interviewee 1 who points out an "…absence of execution and acceleration." However, a perceived lack of resource allocation towards missions could be contributed, in part by an inability to facilitate MOI-related activities on the scale in which they require. Interviewee 4 stated that "…actors who propose missions are lacking resources to facilitate innovations…" in relation to the multi-actor and cross-sectoral dependance in which MOI entails. This further strengthens the perception that MOI-related activities must be facilitated by actors who have resources and mandates, as mentioned by interviewee 1.

Interviewees A and B mentioned "difficulties in finding private actors with […] transformative solutions and technologies…" However, the same interviewees also mention that, typically, cooperation between public actors is stronger than cooperation between public actors and SMEs. This is supported by interviewees 1 and 4 who perceive that the ability to cooperate between public and private actors is insufficient. Interviewee 1 also mentioned a lack of resource allocations towards multi-actor and cross-sectoral innovation efforts. Interviewee 7 also agreed upon this notion quoting that there "…needs to be greater prioritization" regarding resource allocation towards incentivising multi-actor and cross-sectoral innovation efforts. The perception of interviewee 2 was similar but emphasised that "…cooperation exists but lacks a systematic approach" and according to interviewee 7, the existing cooperative activities are not communicated across all relevant actors, hindering the ability to incentivise multi-actor and cross-sectoral cooperation towards achieving the mission.

The current lack of resource allocation was perceived as a pivotal reason for innovation-related activities not materialising as perceived by interviewee 1 that initiatives are often more successful during pre-study phases rather than during the implementation phases. However, several of the interviews agree that sufficient resource allocations are necessary to successfully facilitate multi-actor and cross-sectoral cooperation towards MOI-related activities. A lack of communication, as mentioned above, was also perceived as a contributing factor regarding the currently insufficient allocation of resources and the lack of materialisation of MOI-related activities. MOI-related activities are also associated with risks, which could support the perception of interviewee 5 regarding the lack of willingness and courage to facilitate such activities. Further supported as interviewees agree upon risks associated with resource allocations, often of monetary character.

Furthermore, interviewees perceive that a lack of communication contributes to uncertainty regarding how much resources should be allocated, where to allocate these resources and what allocations could be justified. Regarding this, Interviewee 2 stated that "…actors are unaware of the opportunities available…", unawareness in this case, by both public actors and SMEs alike. Also, this unawareness could contribute to the perception of an "…absence of execution and acceleration…" as stated by interviewee 1. The perceived absence could also support the lack of courage expressed by interviewee 5, as this absence could make it difficult to estimate and/or prolong the time frames associated with MOI-related activities, thus inferring increased risks regarding resource allocations.

4.3 Contextual differences between domains

Due to the perceived multi-actor and cross-sectoral dependence upon achieving MOI-related activities, interviewees are aware that differences between geographical domains could impose a barrier. For instance, interviewees agree that Uppsala region has many advantages towards facilitating MOI-related activities stemming from an active research ecosystem from two universities and the number of potential and local actors, many of which are newly established SMEs, which according to interviewee 1 contributes with "…high mobility between actors." Actors within Region Uppsala have previously proven their ability to facilitate multi-actor and cross-sectoral activities within the medical field. Interviewees A and B state that in "…areas within life science, we have the necessary structures." However they also perceive that the structures enabling multi-actor and cross-sectoral cooperation in the medical field has not been successfully carried over to MOI-related activities. This aligns with the perception of interviewees 4 and 5 who also indicate that the necessary structures have not been carried over.

Although Uppsala region had advantages, there are also disadvantages, interviewee 5 states that "…politics often act as a barrier…" whereas interviewees A and B mention "legal barriers…" and a current inability for the present judicial governance to efficiently facilitate multi-actor and cross-sectoral cooperation in relation to MOI-related activates. Also mentioned by interviewees in relation to multi-actor and cross-sectoral dependence was the decentralisation of responsibilities and authority, interviewee 2 states a "…distance…" between actors which is perceived to contribute towards barriers in relation to facilitating multi-actor and cross-sectoral cooperation. Whereas Interviewee 1 indicated that public management contributes towards resistance, as public actors are often seen as distant from private actors, especially SMEs.

Also, inferred by the number of associated actors is a heightened presence of conflict of interests, Interviewees agree that some areas of interest are given priority and lager resource allocations, this was confirmed by interviewees A and B that state "in some areas of the regional development strategy, there has been more progress than in others." Differentiations regarding governance, financial strength, and political and financial interests, between geographical domains was perceived by interviewees as negatively impacting the ability to efficiently facilitate necessary multi-actor and cross-sectoral cooperation regarding MOI-related activates.

Interviewee 5 related to public procurement as a barrier to incentivising and facilitating necessary multi-actor and cross-sectoral cooperation. Highly affected by legal and financial governance, which could differ between geographical domains, public

procurement was perceived as a good example of how differences between geographical domains could negatively impact the ability to facilitate MOI-related activities.

5   Discussion

This study sought out to answer the following research question, "what are the barriers to facilitating cooperation between public actors and small to medium size enterprises in regard to performing activities related to mission-oriented innovation?" The study concludes that major barriers can be contributed towards a lack of communication, a lack of resources allocated towards MOI-related activities, and contrasting governance, political interests, and financial differences between domains.

5.1   A systematic endeavour

To achieve MOI-related activities, facilitating actors must be systematic in their approach (Mazzucato, 2018a; Schot and Steinmueller, 2018; Wittmann et al., 2021). It could here be argued that a systematic approach should also be taken regarding communication related to the MOI-related activities which are to be performed. An emphasis upon a systematic approach in reviewed literature strengthens the conclusion that a lack of communication between public actors and SMEs poses a barrier towards cooperation regarding MOI-related activities. Also, this conclusion is further strengthened as all interviewees perceive a lack of communication, specifically between public actors and SMEs.

   The perceived lack of communication was also perceived as negatively impacting the cooperation ability between public actors and SMEs. This perception is strengthened as MOI-related activities often lack direction, synchronisation of actors (Wanzenböck et al., 2020), and understanding amongst relevant actors (Janssen et al., 2021). The conclusion that a lack of communication poses a barrier towards cooperation towards MOI-related activities is further reinforced as such activities rely greatly upon the ability of multi-actor and cross-sectoral cooperation (Jütting, 2020; Mazzucato, 2018a; OECD, 2022).

   A systematic approach, which could increase communications with relevant actors, can be realised by appropriate innovation policies (Mazzucato, 2018a; Schot and Steinmueller, 2018; Wittmann et al., 2021). Also, if systematically facilitated, the enablers of MOI-related activities (Al-Jayyousi et al., 2023), could aid in increasing communication capabilities, incentivising SME engagement, and stimulating multi-actor and cross-sectoral cooperation. Innovation policies could also aid in leveraging current communication abilities, perceived as currently underutilised. Furthermore, innovation policies could support and mitigate the currently perceived lack of structure and communication to attract public actors and SMEs, incentivising cooperation. This is supported as clearly communicated and defined missions should stimulate related activities (Mazzucato et al., 2020). Lastly, clear communications alongside a systematic approach towards MOI-related activates successfully facilitating public actor and SME cooperation could aid in tackling grand challenges (Mazzucato et al., 2020) and increase the ability to sufficiently distribute responsibilities amongst associated actors (Larsson, 2022).

5.2   *Requiring sufficient allocation of resources*

As perceived by the interviewees, financial allocations towards MOI-related activities are not sufficient for stimulating and facilitating multi-actor and cross-sectoral cooperation between public actors and SMEs. Given that SMEs constitute much of current economic structures and their high ability to innovate (Hoffman et al., 1998), their involvement in MOI-related activities could be argued as integral for success. Their importance is further supported by the proven ability to contribute with innovations in a range of sectors (Acs and Audretsch, 1987; Hoffman et al., 1998). However, this ability seems to have gone unnoticed as interviewees representing Region Uppsala stated, "difficulties in finding private actors with […] transformative solutions and technologies…" It should be noted here that SMEs should also do their part in incentivising cooperations with public actors, i.e., the responsibility should not solely lie upon public actors. However, increased competition and decreased product lifecycles (Parida et al., 2012) force SMEs to focus current resources towards maintaining competitiveness (Singh et al., 2008). This could contribute to the perceived disconnect between public actors and SMEs.

Moreover, the characteristics of MOI-related activities contradict the main motivations for SMEs to engage with innovation, which are, maintaining current cashflow, retaining current customer base, and to solve current customers problems and/or needs (Löfqvist, 2014). Furthermore, SMEs are often bound by lack of internal resources of financial, human, and organisational characteristics (Powell et al., 1996). This further emphasises the negative impact of the perceived insufficient allocations of resources. Sufficient allocation of resources could also aid in decreasing financial risks associated with MOI-related activities. As SMEs typically are reluctant to take risks (Chesbrough and Crowther, 2006), sufficient resource allocations could imply an increased willingness for SMEs to engage with MOI-related activities, also increasing the ability to be successful through multi-actor and cross-sectoral cooperation.

The characteristics of SMEs require that innovation is conducted in accordance with current market needs and characteristics (Bresciani and Oliveira, 2007), as to enable conformability in accordance with changes in market landscapes. Confirmability could however be reduced when several actors cooperate in MOI-related activities. This could imply an increased risk, especially for SMEs as their limited resources could hinder them from engaging in cooperations with other actors whilst satisfying current customer needs. From the backdrop of this, the importance of resource allocations can be argued as crucial for ensuring that SMEs are granted resources towards engaging with MOI-related activities, while maintaining the current customer base, further decreasing associated risks.

In contrast to public actors, the innovation processes of SMEs are characterised by flexibility and lower levels of bureaucracy, enabling quick decision-making (Bresciani and Ferraris, 2014). This could enable efficient utilisation of resources which in turn could decrease the gravity of resources which must be allocated. The efficiency of innovation processes in SMEs should be leveraged to incentivise, and create prioritisation towards sufficient resource allocation, currently perceived as lacking according to the interviewees. Ultimately this could greatly contribute towards successful multi-actor and cross-sectoral cooperation regarding MOI-related activities.

SMEs would require external resources to enable their engagement with MOI-related activities, in part due to their lack of R&D resources (Lee et al., 2010; Van De Vrande et al., 2009; Vossen, 1998), but also as they suffer liability of smallness if compared to

public actors. As has been discussed above, SMEs are crucial to innovation and can act quickly, relying on internal management and capabilities (Lehtimaki, 1991). The characteristics of SMEs discussed here could contribute greatly towards successfully achieving MOI-related activities. As public actors and SMEs cooperate, they could contribute with their unique strengths. SMEs contributing with quickness and high innovation capabilities, public actors could in turn contribute with their financial capabilities and authority to impact current governance. Preferably, this could increase the frequency of MOI-related activities which come to fruition.

5.3   *Bound by political and financial governance*

As MOI-related activities are performed, the dependance upon multi-actor and cross-sectoral cooperation could contribute towards political conflicts of interest. Therefore, missions associated with policy-based governance (Larrue, 2021; Wittmann et al., 2021) could be argued as being bound by political and financial governance. Current missions and associated MOI-related activities often concern sustainability e.g., anthropogenic climate change, systemic changes (Hekkert et al., 2020), and societal shifts (Schot and Steinmueller, 2018). Therefore, it could be argued that current missions and associated activities encompass a high level of complexity and dependence upon multi-actor and cross-sectoral cooperation including public actors and SMEs, inferring governance by policy-based governance (Larrue, 2021; Wittmann et al., 2021). Therefore, missions relating to current grand challenges could be classified as transformer missions (Wittmann et al., 2020).

Interviewees perceive that societal shifts can only be achieved by multi-actor and cross-sectoral cooperation regarding technological and non-technological innovation. Interviewee 4 stated a "…mixture of technological and non-technological […] towards innovation" supported by interviewee 7 who perceives that both technological and non-technological innovation must be facilitated, stating "…transformative processes via non-technological oriented innovation will be crucial." This further supports the argument that current missions could be classified as transformer missions, as successfully facilitating and achieving transformer missions relies on both technological and non-technological innovation (Wittmann et al., 2021, 2020).

Policy stipulation, performed by governing bodies with legal governance within their respective domains could impact the ability of public actor and SME cooperation between domains. This, as differing policies and legislation could negatively impact the transferability of innovation policies between associated domains (Larrue, 2019; Markusen, 2003). Also, a lack of communication could be argued as negatively impacting the ability to sufficiently formulate (Mazzucato, 2018a), apply, and evaluate (Grillitsch et al., 2019) innovation policies. Furthermore, differentiations in governance between domains could contribute towards difficulties in performing MOI-related activities (governed by policies) between domains (Wanzenböck and Frenken, 2020). These difficulties relate to the dependence upon multi-actor and cross-sectoral cooperation upon which MOI-related activities encompass (Azzi et al., 2019; Mazzucato, 2018b) and reflect that one size does not fit all regarding implementations of an MOI-approach and associated activities (Mazzucato and Macfarlane, 2019; Randles et al., 2022).

As different political domains have different characteristics (Wanzenböck and Frenken, 2020), these differences could also regard political orientations and financial

capabilities, and current interests. This was evident by interviewees who perceived activities regarding healthcare to be given overall higher prioritisation with Uppsala region, as opposed to MOI-related activities. Interviewee 4 perceives that public actors are "…capable at facilitating innovations related to e.g., healthcare", interviewee 5 supports this notion as they perceive abilities to cooperate between public actors and SMEs regarding healthcare not being transferred towards MOI-related activities. It should also be noted that Uppsala region is highly competent regarding the field of healthcare, therefore it comes as no surprise that the region focuses highly on this area of expertise and has been able to develop capabilities and a network of actors. It can also be assumed that Uppsala region allocates, and priorities, resource allocations towards healthcare related activities.

The expertise and allocations of resources in one region could negatively impact the ability to cooperate between regions if there are discrepancies in terms of available knowledge resources. As regions such as Uppsala are, in large part, funded by municipal taxes, income per capita will affect the financial strength within the region. As income per capita can vary between regions it could be argued that regions funded by municipal taxes could therefore vary in financial abilities, resulting in differing abilities towards incentivising and facilitating MOI-related activities.

6   Concluding remarks

In conclusion, this study focuses on the observed research gap regarding the engagement of SMEs in relation to MOI, and the barriers which could contribute towards this underrepresentation. From the data gathered within the Region of Uppsala (Sweden), this study presents three current and pivotal barriers towards SME engagement within MOI-related activities. The barriers regard SME unawareness of MOI-related activities, due to a lack of communication from public actors, resources not being prioritised towards MOI-related activities, and domain differences impacting the ability of actors to engage in MOI-related activities.

These barriers presented, stemming from data gathered within a typical region of Sweden could support the generalisability of the results presented in this study across the domain of Nordic countries. This, as these countries are similar in relation to their social, political, and economical structures. Due to this the influence and governing authority of public actors could also be argued as similar across these countries. Further strengthening the generalisability is the utilisation of public procurement within these countries (Alhola et al., 2017), posing similar barriers as well as opportunities for SME engagement, within the Nordic countries.

7   Future research

The authors suggest that future research should examine how the barriers found in this study could be mitigated by applying the ROAR-framework in relation to MOI-related activities as proposed by Mazzucato (2018a) and Mazzucato et al. (2020). This framework is associated with the characteristics upon which innovation policy should bare, with the purpose of incentivising multi-actor and cross-sectoral cooperation. The

acronym, 'ROAR', stands for routes and direction, organisation of actors, assessments, and risks and rewards (Mazzucato, 2018a; Mazzucato et al., 2020). Due to the long timeframes associated with MOI-related activities (Wanzenböck et al., 2020), the authors propose that a longitudinal study be performed, with the purpose of evaluating the efficacy of the ROAR-framework in relation to MOI-related activities.

Upon performing this study, the authors realised a lack of research regarding SMEs associated with MOI-related activities. Based on this, the authors propose that future research should also examine the role of SMEs, and their possible contribution towards MOI-related activities. As this study has shown, the barriers related to MOI-related activities negatively impact the prevalence of SME engagement. Therefore, future research as proposed could aid in increasing the ability for SME engagement regarding MOI-related activities.

Furthermore, future research could be performed to quantitatively investigate the scale and occurrence of proposed barriers, i.e., allowing for deeper barrier insights and descriptions. This could also guide future research towards specific actors within public and private sectors, broadening the research perspective and knowledge of this phenomenon.

Declarations

All authors declare that they have no conflicts of interest.

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Appendix

Table A1   Interview guideline

Topic	Questions	Purpose of question
General questions (all interviews)		
GQ1	Please confirm that you have been informed of your rights as an interviewee (Y/N).	N/A
GQ2	Please confirm that this interview may be audio recorded (Y/N). If Y, please confirm that the audio recording may be stored electronically until the completion of this study (Y/N).	N/A
GQ3	Please state if you wish to conduct the interview in Swedish or English (S/E).	N/A
GQ4	Please confirm that interview may be transcribed (Y/N).	N/A
GQ5 (if GQ3 = S and GQ4 = Y)	Please confirm that the interview may be transcribe by translating spoken Swedish to written English (Y/N).	N/A
Current ability to achieve missions		
Q1	Q1.1: Are you aware of Uppsala region´s long-term mission of supplying e.g., energy and materials through fossil free technology, infrastructures, and increased utilisation of local rest flows? (Y/N) Q1.2 (if 1.1 = γ): How have you perceived the ability of Region Uppsala to communicate the mission stated in Q1.1?	Gain insight into interviewee perception of mission communication.
Q2	What influence do you perceive innovation will have on the ability for Uppsala region to achieve the stated mission?	Perception of innovation as a driver towards achieving missions.
Q3	What capabilities (technological and/or non-technological) do you perceive currently exist within Uppsala region to achieve the mission stated in Q1.1?	Whether Uppsala region currently possesses capabilities towards achieving the mission stated in Q1.1.
Q4	What barriers do you perceive currently exist within Uppsala region to achieve the mission stated in Q1.1?	Gain insight into empirical barriers related to achieving the mission stated in Q1.1.
Innovation through cross-sectoral cooperation		
Q5	What is your perception of innovation-related activities within Uppsala region towards the mission stated in Q1.1?	Gain insight into current innovation-related activities towards the mission stated in Q1.1.

Table A1   Interview guideline (continued)

Topic	Questions	Purpose of question
Innovation through cross-sectoral cooperation		
Q6	How do you perceive the ability of public and private actors to cooperate in regard to innovation within Uppsala region?	MOI entails cooperation between public and private actors.
Innovation orientation and influence		
Q7	How do you perceive the influence of… a technologically orientated innovation b transformative processes via non-technologically oriented innovation c a mixture of the above-mentioned …on the ability to achieve the mission stated in Q1.1	Gain insight into the perception of a technological, non-technological or combined approach towards achieving the mission stated in Q1.1.