

Innovation
Caucus

FUTURE OF INNOVATION THOUGHT LEADERSHIP PROJECT: THE ROLE OF SOCIAL CAPITAL FOR INNOVATION

Report prepared by:

Professor Kristel Miller
(Ulster University)

Dr Lisa Messina
(Queen's University Belfast)

Dr Grace Carson
(Queen's University Belfast)

In partnership with:



Economic
and Social
Research Council



Innovate
UK

Authors

The core members of the research team for this project were as follows:

- Professor Kristel Miller (Ulster University)
- Dr Grace Carson (Queen's University Belfast)
- Dr Lisa Messina (Queen's University Belfast)

Acknowledgements

This research was commissioned by Innovate UK. We are very grateful to the project sponsors at Innovate UK for their input into this research. The interpretations and opinions within this report are those of the authors and may not reflect the policy positions of Innovate UK.

About the Innovation Caucus

The Innovation Caucus supports sustainable innovation-led growth by promoting engagement between the social sciences and the innovation ecosystem. Our

members are leading academics from across the social science community, who are engaged in different aspects of innovation research. We connect the social sciences, Innovate UK and the Economic and Social Research Council (ESRC), by providing research insights to inform policy and practice. Professor Tim Vorley is the Academic Lead. The initiative is funded and co-developed by the ESRC and Innovate UK, part of UK Research and Innovation (UKRI). The support of the funders is acknowledged. The views expressed in this piece are those of the authors and do not necessarily represent those of the funders.

Disclaimer

The Research Outputs presented in the current study are outcomes of analysis based on statistical data from the Office for National Statistics (ONS) which is subject to Crown Copyright protection. The analysis of the statistical data and the interpretation of outcomes does not imply the endorsement of the ONS.

CONTENTS

Executive Summary	5
Key findings and recommendations	5
1 Introduction and Context	7
2 The Foundations of Social Capital	9
2.1 <i>Relationship between networks and social capital</i>	10
2.2 <i>Perspectives, Types and Dimensions of Social Capital</i>	10
2.2.1 <i>Network perspective</i>	12
2.2.2 <i>Social structure perspective</i>	12
3 Methodology	13
3.1 <i>Critical Literature Review</i>	13
3.2 <i>Review of Innovate UK Programmes</i>	15
4 Findings from Systematic Literature Review	15
4.1 <i>The relationship between social capital and innovation</i>	15
4.2 <i>Measuring social capital</i>	17
4.3 <i>Social Capital and Funding</i>	18
4.4 <i>Social Capital and Business Growth/Performance</i>	20
4.5 <i>Moderators of Social Capital</i>	20
4.5.1 <i>Firm size</i>	21
4.5.2 <i>Regionality</i>	21
4.5.3 <i>Industry</i>	21
4.5.4 <i>Gender</i>	22
5 Findings from Primary Data	23
5.1 <i>Ambiguity over what social capital is</i>	23
5.2 <i>Role of the Knowledge Transfer Network for social capital development</i>	23
5.3 <i>Social capital as an implicit precursor for funding programmes</i>	23
5.4 <i>Challenges in measuring social capital development</i>	24
5.5 <i>Limited details on unsuccessful applicants</i>	24
5.6 <i>Summary of empirical findings</i>	25
6 Recommendations	27
6.1 <i>Recommendations for future research based on systematic literature review</i>	27
6.2 <i>Recommendations for practice, based on findings and prior literature</i>	28
References	31
Appendix 1 Proforma for Systematic Literature Review	35
Appendix 2 Network typologies and indicators relating to collective social capital in cities and regions	36



EXECUTIVE SUMMARY

The overall aim of this study is to develop a comprehensive understanding of social capital, its core dimensions and moderators, and explore the role it plays in enhancing innovation. Social capital has been shown to have value at several levels of the business ecosystem, including breaking information silos, fostering efficiency in operations and production, and leading to higher levels of innovation. Although widespread in its use, the term social capital is elusive in interpretation, particularly around the boundary between social and network capital. Many definitions are complex and conceptual in nature (Lang and Fink, 2019). Furthermore, challenges with measuring social capital have led to mixed findings. There is thus value in a study that takes stock of existing research and offers a clear overview of the role of social capital in enhancing innovation.

This report offers a critical review of the existing literature on social capital. In addition, primary qualitative interviews were conducted with 7 Innovate UK and ESRC programme leaders to map the type and level of social capital present across their programmes. Key recommendations are derived from both the literature and analysis of interviews, based on four fundamental questions:

1. What is social capital and how is it important for innovation?
2. What are the moderators of social capital, as determined by firm size, geographical location, gender, and industry?
3. How is social capital developed and captured in current Innovate UK and ESRC programmes?
4. What recommendations can be made to Innovate UK and the ESRC on how to embed further considerations relating to social capital into programmes?

Key findings and recommendations

Analysis of the critical literature review reveals that social capital is an enduring asset into which other resources can be invested. Over time, social capital has been shown to yield increasing resources and overall benefits. Social capital is an appropriable and convertible resource, as the ties formed across the network can be used for other purposes; e.g. a personal relationship can potentially evolve into a professional one. Social capital has also been shown to complement and/or substitute resources, when other resources are lacking. Other characteristics of social capital include its reliance upon networks, rather than individuals. As such, it requires mutual commitment and cooperation from all parties in order to ensure its maintenance, and periodic reviews to maintain its efficacy (Adler and Kwon, 2002). Following an introduction to the key characteristics of social capital, the report also clearly distinguishes between network and social structure perspectives for understanding social capital, and the review presents a detailed overview of how different types of social capital under these umbrella definitions can alleviate tensions through the development of trust, mutual understanding, and helping goal alignment.

Extant research does identify that social capital potentially plays a valuable role in enhancing innovation, driving business growth, and facilitating funding opportunities; however, there are variances in findings depending on a number of moderating factors. Four key moderators of social capital were found to be:

- Firm size
- Regionality
- Industry
- Gender

The literature review revealed that the role of social capital in helping to achieve funding for innovation remains limited and demands more research. Furthermore, it was identified that it remains hard to measure social capital and track its impact over time.

Feedback from the interviews suggested that there is ambiguity over what social capital is. Innovate UK KTN was identified as an important promoter of social capital. It was also reported that social capital was, in many cases, a prerequisite for successful funding bids; however, the majority of interviewees identified that they don't believe that social capital is explicitly mentioned in the guidance for the evaluation of funding applications or in the project evaluation reporting guidance. It was suggested that demonstrating networks and social capital at the application stage would strengthen an application, and that more information must be gathered on the barriers related to social capital faced by unsuccessful funding applicants.

The report concludes with the following set of recommendations:

- **Social capital awareness:** Increase awareness of what social capital is, the different types of social capital and their relative importance, and the relationship between social capital and networks.
- **Conduct a comprehensive analysis of social capital and the funding process across all UKRI programmes to address the following questions:**
 - i. *Is social capital a pre-requisite for a particular funding programmes (and if it is, what type)?*
 - ii. *Do programmes support social capital development (e.g. can funding within programmes be used to support network and social capital development or are there sufficient training and events to help applicants develop networks and social capital prior to application)?*
 - iii. *How is social capital measured/tracked across programmes?*
- **Social capital measurement:** Develop a process and knowledge management system which explicitly captures current levels of social capital at application stage and measures social capital development over time.
- **Who are the applicants?** Conduct an analysis of the determinants of application success in terms of the moderators of social capital (gender/ethnicity, geographical location, firm size, industry).

1. INTRODUCTION AND CONTEXT

In its simplest form, social capital is centred on the formation of networks and the value which is accrued from reciprocity. It acts as the ‘glue’ in a network of relationships to ensure longevity and offers a key source of competitive advantage. Consequently, social capital underpins the concept of ‘it is not what you know that matters, but who you know’ (Woolcock 2002). There is no clear, undisputed meaning of social capital, most definitions are conceptual and complex in nature (Lang and Fink, 2019). However, a widely used definition provided by Nahapiet and Ghoshal, (1998: 243) identifies social capital to be “the sum of the actual and potential resources embedded within, available through, and derived from the network of relationships possessed by an individual or a social unit. Social capital thus comprises both the network and the assets that may be mobilised through that network”. The OECD defines Social Capital as “networks together with shared norms, values and understandings that facilitate cooperation within or among groups” (OECD, 2001, p 41.).

Social capital offers businesses of all sizes the opportunity to access more diverse resources, break information silos and increase creativity (Inkpen and Tsang, 2005; Perry-Smith and Shalley, 2003). It has also been noted to foster efficiency in operations and production, and lead to higher levels of innovation. This is of critical importance as the adoption and commercialisation of innovative ideas is key to the UK’s economic recovery post Covid-19 and achieving net zero objectives (Department of Business, Energy, and Industrial Strategy (DBEIS), 2021). Consequently, innovation is critical for the future economic growth of the UK. Currently, the UK ranks 4th in the Global Innovation Index. With regard to knowledge diffusion, it ranks 11th but then drops to 27th for knowledge absorption (DBEIS, 2021). The UK has long demonstrated strength in R&D; however, implementation of ideas is lacking, predominantly due to restricted knowledge dispersion, lower-level absorptive capacity and the cost and availability of finance (DBEIS, 2021). Furthermore, across the UK, there are regional disparities that have been acknowledged in the Levelling Up the United Kingdom White Paper (HM Government, 2022). The Levelling Up Agenda identifies six ‘capitals’ which will help drive levelling up: physical capital, human capital, intangible capital, financial capital, institutional capital and social capital. Whilst all capitals are important and mutually reinforcing, social capital helps develop strong communities, relationships and trust, which often underpins the development of other capitals.

Social capital is a highly intangible and tacit concept and despite the recognised clear importance of business collaboration and social relationships, there remains much uncertainty around the meaning of the concept, particularly the differences between social and network capital. There is also ambiguity surrounding the identification of social capital and how it can be improved. Therefore, this report asks four fundamental questions:

1. What is social capital and how is it important for innovation?
2. What are the moderators of social capital, as determined by firm size, geographical location, gender, and industry?
3. How is social capital developed and captured in current Innovate UK and ESRC programmes?
4. What recommendations can be made to Innovate UK and the ESRC on how to embed further considerations relating to social capital into programmes?

To promote the comprehensive understanding of social capital and its role in enhancing innovation, this report offers a critical review of the existing literature on social capital. In addition, interviews were conducted with Innovate UK and ESRC programme leaders to map the type and level of social capital present across their programmes. Key recommendations are derived from both the literature and analysis of interviews. We now proceed by exploring the interdependent relationship between networks and social capital, followed by an outline of social capital's key types and dimensions.

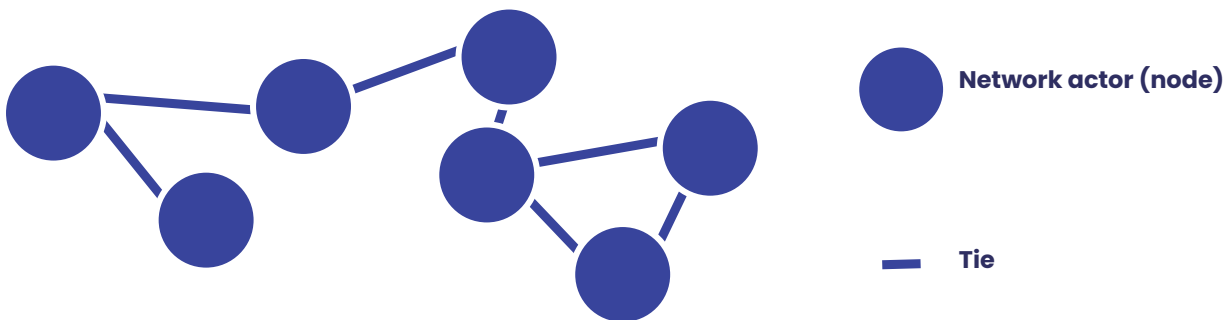


2. THE FOUNDATIONS OF SOCIAL CAPITAL

2.1 Relationship between networks and social capital

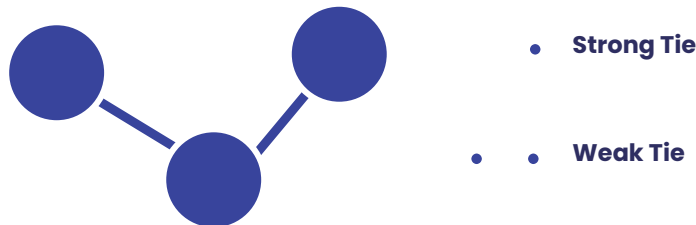
The boundaries between social and network capital are not easily defined and often both concepts are used interchangeably. A network can be defined as a set of actors who are connected by a set of ties (Borgatti and Foster, 2003). Different types of networks, the strength of networks and the combination of different 'ties' between actors within networks, all underpin different types of social capital development.

Actors within a network are often termed "nodes". Most commonly, these are individuals, teams and organisations. Actors are usually connected with each other through relational ties. These can take various forms, e.g. friendship ties, business ties, etc. Figure 1 provides a visualisation of individual network actors (nodes) and the ties which connect them.



Ties can be further broken up into categories, most commonly referred to as being strong, weak or absent (Granovetter, 1983). It is challenging to accurately measure the strength of ties since this may differ according to industry, culture and context (e.g. online, offline, country). Research has often employed a combination of factors including the frequency of actor interactions, the number of different contexts of these interactions, the duration of these interactions, and the emotional intensity of the relationship. Collectively, these variables will determine the 'closeness' between individuals. If closeness generates feelings of trust among individuals, an overlap of social circles and interests, and frequency of interactions (over a period of time), then the tie is viewed as strong. If there is some connection or 'closeness' but trust has not fully developed and there is less frequent interaction or commonality of social circles and interests, then a tie can be considered to be weak. An absent tie is a relationship with an individual which does not hold any significance (at present), due to limited interaction, but can still be regarded as a form of social cohesion; for example, acquaintances or neighbours.

Figure 2: Strong and weak ties



It is suggested that different kinds of ties function differently and may be beneficial at different stages of firm development. For example, during business formation and start-up, entrepreneurs often develop strong personal relationships, characterised by high levels of cohesion, towards looser arm’s-length ties based on socio-economic exchanges (Hite and Hesterly, 2001; Larson and Starr, 1993).

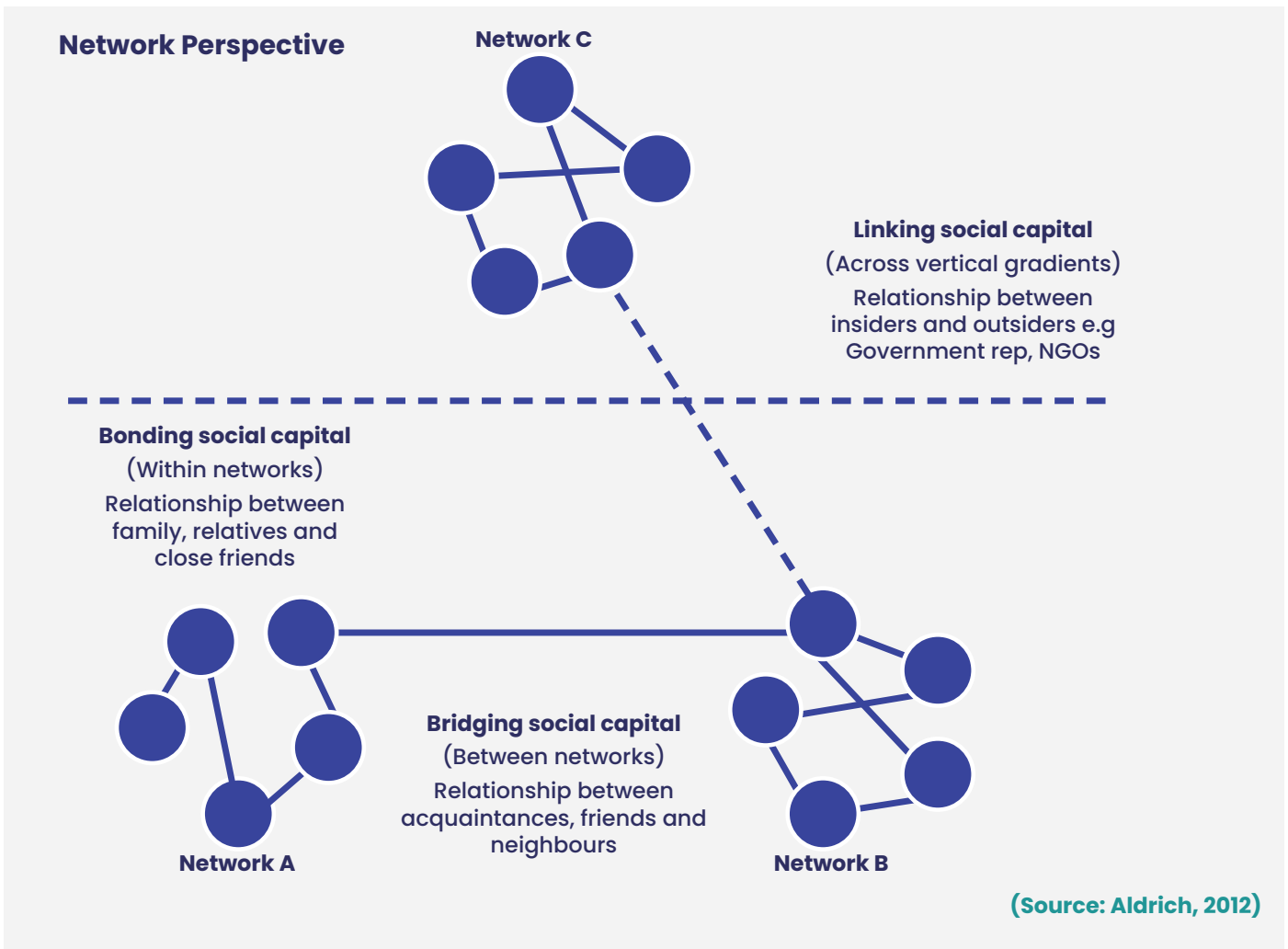
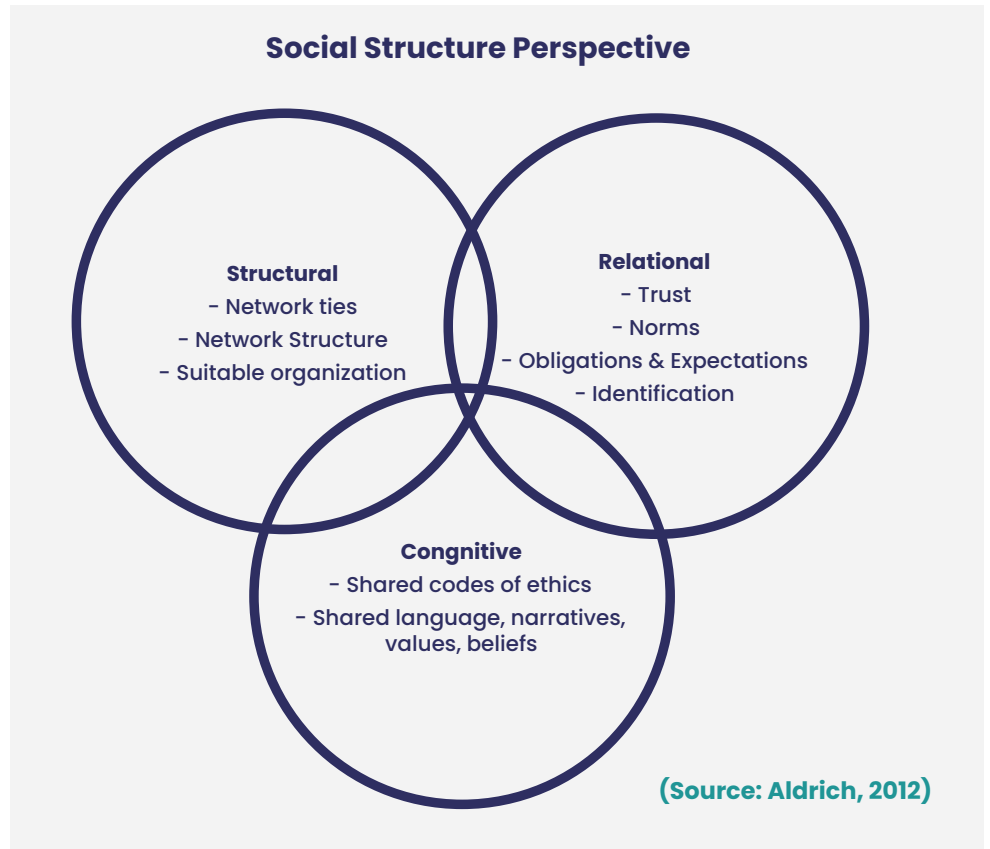
2.2 Perspectives, Types and Dimensions of Social Capital

Adler and Kwon (2002) offer a comprehensive list of the key characteristics of social capital. First, it is identified that social capital is a long-term resource, in that it is an enduring asset into which other resources can be invested in order to gain other resources and benefits over time. Second, it is an appropriable and convertible resource, as the ties formed across the network can be used for other purposes, e.g. a personal relationship can potentially evolve into a professional one. Third, social capital can complement and/or substitute other resources, when other resources are lacking. This could entail, for example, the use of network relationships to gain access to resources, when the firm does not possess sufficient assets. Fourth, social capital requires maintenance, as it requires periodic review and revival in order to maintain its value, similar to physical and human capital; in contrast to these, however, social capital increases with use, rather than depreciating. Fifth, it is a collective good, as no individual network member has ownership over it. The sixth characteristic is the location of social capital, which is found to be in the relations between parties, rather than within the parties themselves. As such, it requires mutual commitment and cooperation from both parties in order to ensure its maintenance. The final characteristic is its difficulty in measurement, due to its intangible nature and lack of clarity surrounding its unique performance effects. These characteristics outline why social capital is a complex concept to identify and manage. However, despite the ambiguity over definitions, scholars have coalesced to identify two key classifications of social capital with associated types and dimensions. The two classifications are the network perspective and the social structure perspective. Figure 3 illustrates both perspectives.

2.2.1 Network perspective

The network perspective views social capital as being within, between and across networks. Consequently, three types are identified. Bonding social capital focuses on the internal characteristics of network actors within a network. It is said to exist between individuals within a network who have

Figure 3: Perspectives, types and dimensions of social capital



similar backgrounds and interests which develops over time into tight knit, trusting relationships based on mutual reciprocity. Bonding social capital is associated with developing deeper connections with those who you already know and therefore it is usually associated with relationships between family, friends and long established business colleagues. The value of bonding capital is access to not only resources, but also emotional support.

Bridging social capital is viewed as being embedded in social relations between dense networks (Baker, 1990). It is said to exhibit weak ties which act as bridges across groups. Therefore bridging social capital can help broker relationships and consequently access to resources. Due to the weak ties, bridging capital does not offer emotional support, which bonding capital can offer. However, it is said to lead to greater breadth and diversity of contacts that may open up more opportunities and ideas than bonding capital.

Linking social capital refers to relationships across networks of types, between individuals who are diverse and have different social hierarchy, social positions or power. It is often thought to be an extension of bridging capital. However, relationships are considered vertical; for example, with government bodies, community organisations, and religious or political organisations. It is centred around the development of relationships with those with more power in order to achieve collective goals (Adler and Kwon, 2002).

2.2.2 Social structure perspective

The social structure perspective of social capital refers to the properties within social systems and networks. It is said to combine both structural and connectiveness elements. From this perspective, Nahapiet and Ghoshal's (1998) conceptualisation is widely adopted, and considers social capital to be formed by relational capital, cognitive capital, and structural capital (e.g. Kwon and Adler, 2014; Huggins and Johnston, 2010). As seen in Figure 3, these dimensions have overlapping qualities.

The relational dimension refers to the nature and quality of personal relationships that are developed through a history of interactions (Granovetter, 1992; Nahapiet and Ghoshal, 1998). The key facets of the relational dimensions, as identified by Nahapiet and Ghoshal (1998) are trust and trustworthiness (Putnam, 1993), norms and sanctions (Coleman, 1990; Putnam, 1995), obligations and expectations (Burt, 1992), and identity and identification.

Structural social capital is a more tangible type of social capital which can be seen in the configuration of linkages between network actors, e.g. who knows who. The most important facets of the structural dimension are the presence or absence of network ties between actors (e.g. Nahapiet and Ghoshal, 1998); the network configuration (Krackhardt, 1990); the morphology describing the pattern of linkages in terms of measures such as density, connectivity, and hierarchy (Tichy et al., 1979); and appropriable organisation (e.g. Coleman, 1988), i.e. the existence of networks that were created for one particular purpose and may be used for another.

Cognitive social capital refers to the shared representations, interpretations and systems of meaning between individuals (Cicourel, 1973). This dimension results in shared language, codes and narratives which enable the smooth transmission of knowledge and intellectual capital. Cognitive embeddedness represents a powerful form of social capital, which is often under-appreciated.

3. METHODOLOGY

This research adopted a mixed methods approach in order to answer the research questions (see section 1). This comprised two stages. Stage one comprised a systematic literature review which was conducted in order to explore the relationship social capital has for innovation. Stage two involved reviewing a sample of Innovate UK and ESRC programmes in order to identify if and how social capital development is supported. Stage three comprised expert interviews with key stakeholders involved in Innovate UK and ESRC programme development, monitoring and promotion. Each of these steps will now be discussed.

3.1 Critical Literature Review

This report is based on a rigorous and systematic review of the extant literature (Tranfield, Denyer, and Smart 2003). A systematic literature review (SLR) is useful to review the large volume of literature and to give structure to the process. Tranfield et al.'s (2003) widely used systematic review process was carried out. Stage one involved a keyword search to define the boundaries of the subject. Experts were consulted who helped to identify keywords which were then developed into Boolean search strings. We used four Boolean search strings to comprehensively search for articles which covered different facets of social capital and innovation. These search strings are shown in Table 1. To ensure quality of sources, we searched in the Business Source Complete database which has over 800 active full text, peer-reviewed journals. To put further boundaries around the topic in order to make it manageable, we searched within journals which are listed in the Chartered Association of Business Schools list of top Entrepreneurship and Innovation journals. Our Boolean search identified 847 papers which met our search conditions. The next stage involved reading each journal abstract in order to determine relevancy for our research questions. This resulted in a final sample of 301 articles (see Table 1).

Stage four involved data extraction. Each of the articles was downloaded and reviewed according to a standardised set proforma (Tranfield et al. 2003). This proforma formed a raw data repository to be utilised in stage 5. Appendix 1 provides the proforma template. In addition, a handful of 'specific' papers were then included if there were two separate references made to their content within the previously selected articles. This ensured the inclusion of seminal content that might be potentially excluded due to being outside of the time window chosen, located in journals from other subjects or arising from important policy documents. This resulted in a total sample size of 328 papers. The final stage involved analysing the data from selected articles to identify core themes.

Table 1: Boolean search strings and relevance

Boolean search strings	Search hits	Relevant papers
("Social Capital" OR "Network") AND ("funding")	66	49
("Social Capital") AND ("Business Growth" OR "Firm Growth" OR "Company Growth")	6	6
("Network*") AND ("Business Growth" OR "Firm Growth" OR "Company Growth")	15	15
("Social capital" OR "network*") AND ("Innovation")	760	231
Total	847	301

3.2 Review of Innovate UK Programmes

Through consultation with key actors in Innovate UK and ESRC, a purposeful sample of 7 programmes were selected which targeted different types of applicants. Table 2 outlines the case programmes.

Table 2: Innovate UK and ESRC Case Programmes

Programme	Description
Innovation to commercialization of university research (ICURe)	An accelerator programme for academic entrepreneurs. Successful applicant research teams receive up to £30,000 to allow the early career researcher (ECR) of the team, to 'get out of the lab' and spend time on market validation. The ECR will receive training and mentorship.
Strength in Places	Supports projects which aim to build on strengths in research and innovation, which can benefit a local economy, within a particular UK region. An overall budget of £316 million was allocated to this programme.
Agri-Tech Centers	Funded four centres focused on research and innovation to support a sustainable agrifood sector. They focus on bringing together science, business and government to facilitate knowledge sharing to inform and influence research and innovation which helps contribute to key industry issues. £120 million in total was invested, with £42 million match funding.
Innovate UK Knowledge Transfer Network	Run events around the UK aimed at communicating briefings of funding opportunities, developing networks between industry, scientists and business, skills development and showcasing events.
Fast Start	Supports small and micro businesses develop new product, process and service innovations. Up to £50,000 of funding available to applicants whose innovations need to fall within the remit of the UK Government's Innovation Strategy.
Longitude Prize on Dementia	Supports the development of innovations which help learn more about dementia and results in assistive technologies for those with dementia. Over £3.1 million of seed funding and grants will be provided and an overall winner prize of £1 million will be awarded in 2026.
Faraday Battery Challenge	Supports projects that seek to conduct research and develop battery technology innovations. Funds projects from £100,000 to £750,000. Total fund of £25 million.

Data was collected via primary qualitative interviews. One representative of each programme involved in the operationalization of the programme was purposefully chosen to take part in the research. Each interview lasted on average 30-40 minutes. 3 of the interviews were recorded and the interviewer took extensive notes for the other 4 interviews which were conducted in situations where it was not possible to record. Respondents were asked a series of questions which included, if social capital is a precursor for success in funding, the initiatives associated with the programme which may lead to social capital development; if social capital building activities are actively supported within funding calls (i.e. it is built into costing allowances and reporting mechanisms); and if programme managers track social capital development over time. Furthermore, each programme call and associated documents were reviewed in order to draw out opportunities and expectations for social capital development. A thematic data analysis process was followed which, combined with stage 2, aided a comprehensive evaluation of how Innovate UK and ESRC programmes enable social capital development. These empirical findings are provided in section 5.

4. FINDINGS FROM SYSTEMATIC LITERATURE REVIEW

4.1 The relationship between social capital and innovation

There has been a vast amount of literature which has sought to explore the relationship between innovation and social capital from various perspectives. However, this relationship is complex due to a range of moderating factors (see section 4.5) and challenges in measuring social capital. Therefore prior research has found mixed findings which will be briefly outlined.

There is a large number of studies that associate a positive relationship between social capital and innovation in general. For example, Linder et al. (2020) identifies that human capital and social capital are determinants of firm survival and that financial capital alone will not ensure new venture success. Subramaniam and Youndt (2005) identify that social capital is important for both incremental and radical innovation. Furthermore, Coleman (1988) stresses that social capital is essential for new venture survival.

Some studies draw out how particular types of social capital aid knowledge sharing and innovation. Bonding social capital has been associated with greater levels of emotional support during business start-up and growth and with higher levels of innovation implementation (Ceci et al. 2019); whereas bridging and linking social capital have been found to lead to greater access to research-based knowledge, financial resources and consequently enhanced innovation (Ruiu et al. 2017). Steinmo (2015) suggests that cognitive and relational social capital can mitigate challenges which firms and universities face when collaborating. These types of social capital can alleviate tensions through the development of trust, mutual understanding, and helping goal alignment.

However, there are scholars who suggest that the relationship between social capital and innovation is not clearcut. For example, Bruderl and Preisendorfer (1998) explored whether social capital can compensate for a lack of human capital or financial capital in firms. Through their sample of 1700 new businesses in Germany, they found that social capital can partially compensate for a lack of human capital but cannot compensate for a lack of financial capital. They did, however, identify that network support does increase the probability of new venture survival and growth.

Many studies do not refer directly to the term social capital but do identify that frequent communication with network members enhances innovation via access to resources. In these studies, the density of networks, strength of ties and the quality of relationships have been identified as core determinants of the value of social capital for innovation. Some studies suggest that having a large breadth of networks, which incorporate loose ties, increases the radicalness of innovation (Landry et al., 2002; Micheels and Nolan, 2016). Other studies suggest that dense network structures will lead to the development of strong ties and that this will in turn result in more effective knowledge diffusion (Ahuja, 2000; Todo et al. 2016; Fritsch and Kauffeld-Monz, 2010). However, there are also studies which found that very dense networks and strong ties may in fact limit innovation due to the sharing of redundant knowledge with partners who are too similar (Burt, 1992) which limits learning due to not expanding their knowledge base (Berliant and Fujita, 2011; Hagedoorn and Frankort, 2008). This suggests that there are diminishing returns over time from dense strong networks, resulting in a

curvilinear relationship (McFadyen and Cannella, 2004). Building on this, scholars identify that expanding diversity of networks over time is important (McFadyen and Cannella, 2004; Perry-Smith, 2006). However, Maghssudipour et al. (2020) caution that there is a need for networks to be complementary if developing multiple diverse networks. It is suggested that diverse networks require relational social capital, particularly, to allow the transference of asymmetrical knowledge (Yang et al. 2014).

Whilst a vast majority of research focuses on social capital at the individual or firm level innovation, there are studies which have sought to explore the role of social capital at the regional and national level, albeit the data here is more limited. The term 'societal social capital' is used to represent social capital at a regional or national level. It has been found to exist between different informal institutions and is an explanatory concept to understand resource mobilisation, knowledge sharing and knowledge spillovers (Kleinhempel et al. 2022; Kwon and Arenius, 2010; Kwon et al., 2013). Societal social capital can create bridging ties between institutions and regional actors (Putnam, 2000). Societal social capital is often considered to be a public good (Coleman, 1988; Kwon et al., 2013; Putnam, 1993; Putnam et al., 2000) which underpins norms relating to collaboration, trust and reciprocity (Putnam, 2000).

Kleinhempel et al. (2022) analysed a novel cross-sectional dataset across 110 regions within 22 European countries. They identify that social capital at a regional level is important for individuals when they are setting up their business, and advancing beyond the notion of wanting to be an entrepreneur. However, they didn't find support that social capital enhances an individual's interest in becoming an entrepreneur or that it impacts upon firm survival beyond 3 years.

Ghazinoory et al. (2014) identify that social capital is important for the main functions of a national innovation system, namely entrepreneurship and knowledge creation. Social capital can help transfer tacit knowledge which requires repeat interactions and trust (Audretsch, 1998; Kobeissi et al. 2022). Institutional trust and networking at a regional level has been found to lead to higher levels of entrepreneurship. Social capital is said to be a core ingredient of an effective innovation milieu within regions. However, Dakhli and De Clercq (2007) identifies that social capital cannot compensate for weak human capital in a region. Indeed, prior researchers have noted that social capital does not necessarily have a positive impact on economic development (Portes 1995, Woolcock 1998). Strong social capital in regions can limit innovation since tight knit groups in some communities can constrain new network members from joining and may prevent members from expanding into more innovative networks (Woolcock, 1998; Doh and Acs, 2010; Kobeissi et al. 2022).

Within regions, the value of innovation brokers is highlighted as being important to help leverage the value of networks and stimulate innovation between network actors. Batterink et al. (2010) identify that innovation brokers can help identify the innovation needs of SMEs and embed them within appropriate social and business networks. However, it is stressed that an innovation broker may lack the orchestration capabilities which are needed to connect network actors and to provide the correct mechanisms for network actors to build relationships and share knowledge (Hurmeliinna-Laukkanen et al. 2022; Poblete et al. 2022; Klerkx and Arts, 2013).

4.2 Measuring social capital

Social capital is a complex construct and within literature and practice, there is a lack of coherent measures and consistency in how social capital

is captured. This makes it challenging to compare studies across countries and leads to confusion over its outcomes (Galaso, 2017; Sabatini, 2009). Furthermore, since social capital can exist at multiple levels, i.e. the individual, group, firm, network, region and national level, then different measures and proxies are used within studies.

A number of studies have used the World Values Survey dataset¹, to measure social capital at the national and regional level. This is collected every 5 years and currently comprises data from 60 countries. Galaso (2017) conducted a review of prior studies to explore how network typologies can be used to measure social capital in cities and regions. These include network size and composition, connectivity, closeness, clustering, small world networks, openness, centralisation and heterophily. For each typology, a number of different indicators were collated, which have been found to provide a positive performance on economic development. Appendix 2 provides their typologies and indicators.

Furthermore, social network analysis across regions and networks is often used as a measurement of social capital due to its ability to map and measure relationships between actors in a network and to explore the knowledge flows and actor centrality in the network (Abbasi et al. 2014). It provides tools which can aid the visualisation, analysis, and understanding of actors in complex networks (Shin, 2021; Dempwolf and Lyles, 2012).

Prior studies have often used single (i.e. trust) or multiple proxies to measure social capital. Proxies can include network assets, relational assets and participation assets (Landry et al. 2002). Other proxies include institutional trust, norms of helping, loyalty, supporting, reciprocity and following rules (Institute for Social Capital, 2022). There are a number of validated surveys within articles which are used to measure proxies, where the type of survey depends on a number of variables such as if you are measuring at a country, regional, firm or individual level of analysis and if you are seeking to measure one point in time or engage in longitudinal research. A combination of surveys and interview data is best used to measure social capital.

4.3 Social Capital and Funding

The literature on social capital and funding is still very limited and has primarily explored private funding contexts, such as venture capital, business angel and crowdfunding sources of finance. While few studies focus on the specific context of public funding, some important insights can be gained by exploring how social capital influences funding across all contexts.

There is a general assumption in the literature that firms, particularly small firms, prefer to invest their own and 'family, friends and fools' (FFF) resources into their business, as opposed to accessing debt or equity investment (Soetanto and van Geenhuizen, 2015). This is largely because debt or equity investment is riskier and often involves external parties gaining equity ownership of the firm. Nevertheless, own or FFF investment is usually limited and insufficient (Soetanto and van Geenhuizen, 2015), resulting in firms seeking other forms of investment, such as government funding. It is suggested that firms' social capital is critical in enabling them to identify and access various types of investment. While some research has explored the role that social capital plays in facilitating access to venture capital and business angel investment, limited knowledge is available on how firms can access government funding through demonstrating their social capital strengths. Here, we highlight three key emergent themes from research on social capital and funding: Social capital's influence on applicant credibility in

the context of funding; its role in affecting the speed of the funding process; and the ambiguous relationship between social capital and funding outcomes. This section then concludes with some limitations affecting this research stream.

Social capital has been found to support firms in accessing funding in several ways. For example, social capital can act as a signal of credibility in the eyes of funding providers (Soetanto and van Geenhuizen, 2015). Many firms are negatively affected by issues of poor legitimacy, credibility and market acceptance (e.g. Messina et al., 2022). Being connected to more reputable parties, such as larger, more established organisations, universities and/or government bodies, has been found to act as an endorsement for firms, reassuring funding providers and helping them to attract private and public forms of funding (Soetanto and van Geenhuizen, 2015). Additionally, social capital increases the amount of diversified resources and knowledge in the network, thus reducing the likelihood of information asymmetry, raising the cost of opportunism and increasing trust among parties (Batjargal and Liu, 2004). This has been found to be a critical consideration in the decision-making process of funders (Haller and Welch, 2013).

An additional way in which social capital has been found to support firms in accessing external funding is by increasing the speed of the funding process, by reducing funders' search costs in screening for deals (Coleman, 1988). While most research has regarded venture financing as an event that takes place at a single moment in time (Wang, 2016), recent studies have called for a processual perspective to funding. In this context, two stages emerge as particularly critical, deal screening and final evaluation. Each stage has qualitatively different characteristics, resulting in social capital playing different roles during each. Wang (2016) and Stuart and Sorenson (2005) investigate these roles and find that social ties can significantly increase funders' awareness of applicants during the deal screening stage, ultimately increasing the speed of the phase as well as positively influencing applicants' chances of reaching the final decision stage. However, during applicants' final evaluation for funding, social capital emerged as a mere secondary consideration (Wang, 2016), where the quality of the proposal and its predicted return on investment took a much more decisive role.

While most research investigating the effects of social capital on funding processes has revealed positive relationships, studies investigating the influence of social capital on funding outcomes have generated more ambiguous results. In particular, studies indicate that social capital and firms' ability to attract funding have an inverted U-shaped relationship (Soetanto and Van Geenhuizen, 2015). This is consistent with the law of diminishing returns and path dependency (Arthur, 1994; Grabher, 1993), where building and leveraging networks results in increasing returns up to an optimum point, after which the benefits of social capital begin to diminish (Maurer and Ebers, 2006). Interestingly, studies also found that, while social capital appears to have an indirect positive effect on funding chances by increasing firms' likelihood of reaching the final evaluation stage of the funding process, it has no significant direct effect on the decision to grant funding (Wang, 2016). Finally, while studies have indicated that social capital does, indeed, raise the cost of opportunistic behaviour (Batjargal and Liu, 2004), it does not guarantee trust among parties and, in fact, may provide opportunities for conflict (Wang, 2016; Granovetter, 1985) by granting parties access to sensitive and otherwise unavailable information.

4.4 Social Capital and Business Growth/Performance

Most studies exploring the relationship between social capital and business growth/performance have placed emphasis on the internationalisation of firms. These studies are largely linked to the international growth of small or family firms due to small firms' dependence on social capital and the economic importance of SME survivability (Menzies et al., 2020).

Research exploring the impact of social capital on business growth and performance generally reveals a positive relationship (Aldrich and Kim, 2007). Social capital has been shown to improve many aspects of economic performance, including sales growth, market share, and success in launching new markets (Hernandez-Carrion et al., 2017). This is subsequent to its ability to provide knowledge, funding and technology (Andersson et al., 2007) and assist in the launch of new products (Simon and Tellier, 2011) and/or market entry (Coviello and Munro, 1997). Studies agree that the benefits of SC on performance do not discriminate on firm age but acknowledge that the dimensions of social capital required will evolve as the business matures (Stam et al., 2014). However, it should be noted that ambiguity does exist. Research warns that knowledge networking activities in certain contexts may be negatively associated with growth outcomes (Huggins and Johnston 2009). Over-reliance on networks or excessive networking can be counter-productive and costly. Research has also found it difficult to determine whether informal relationships provide access to valuable resources (Hernandez-Carrion et al., 2017; Huggins and Johnston 2009). Personal networks offer more generic resources that are less adapted to specific business problems (Bosma et al., 2004). While they may offer benefits in terms of confidence building or moral support, they are generally considered to be of low embedded value and thus offer little impact on competitive advantage (Hernandez-Carrion et al., 2017). This suggests that current research focusing on relational network properties must be supplemented with research that explores the quality of resources and services held by network contacts (Stam et al., 2014).

It is also critically important to note that while small and micro firms appear to benefit from social capital, greater focus needs to be placed on supporting these firms in processing their knowledge resources (Carson et al., 2020). The key assumption in innovation and business development research, that access to diverse knowledge will innately remedy production and market complexities, underestimates how information-based resources can overwhelm small firms. As such, these firms need access to a range of applied insights/training that guides them in converting existing weak capabilities to higher-level ones that aid in upgrading the innovation process (Corredoira and McDermott, 2020). Consequently, further research is required on the mechanisms by which capabilities can be enhanced and information resources appropriately leveraged.

4.5 Moderators of Social Capital

Extant research has identified social capital's valuable role in enhancing innovation, driving business growth, and facilitating funding opportunities. However, the presence and form of social capital is not static across contexts. We highlight four key moderators, derived from the literature, that are found to influence the development of social capital and the dimensions required to harness innovation and improve performance.

4.5.1 Firm size

While social capital is found to benefit firms of all sizes, it is agreed that small and micro firms benefit disproportionately from social capital (Anderson et al., 2007; Baker et al., 2016; Ramos-Rodriguez et al., 2010). SMEs and large firms have inherent differences in their accessibility to internal social capital (Baker et al., 2016). SMEs possess less human capital, which inevitably impacts the diversity of informational inputs used for decision-making (Gao et al., 2013). Given changing external environments and the contextual differences in resource endowments and innovation needs of small and large firms, it follows that the sources and dimensions of social capital also fluctuate (Corredoira and McDermott, 2020). Smaller firms are more likely to engage in local and personal bonding networks, often meaning that the owner/manager's social capital represents that of the organisation's (Hernandez-Carrion et al., 2017; Pirolo and Presutti, 2010). Conversely, large firms are found to source social capital from their internal multi-disciplinary knowledge base, more calculative strategic alliances, and bridging ties (Huggins and Johnston, 2010).

4.5.2 Regionality

Research shows that deprived areas and rural regions experience challenges with resource acquisition. Thus, socially embedded relations can help tackle the multiple obstacles associated with deprivation (Blackburn and Kovalainen 2009). However, it is exactly those local networks, built on trust and sharing, that have been identified as limiting firm learning. Corredoira and McDermott (2020) find that firms consistently drawing from a small, homogenous information pool may limit their conduits of knowledge, ultimately stunting firm innovation and growth. This would indicate a discrepancy in the literature surrounding the preference for either bonding or bridging capabilities in small firms and regional areas. To reconcile this on-going debate, research progressively argues that there is no optimal prescription for social capital application as configurations are highly context dependent and change over time (Stam et al., 2014). While it is advised that smaller businesses integrate more diverse network ties and recognise the importance of professional, institutional, and associational links within a wider community (Hernandez-Carrion et al., 2017; Johannisson, 2008), the requirements of social capital will depend on business goals and objectives. In this aspect, it is critical that supporting bodies and funders are aware of their clients' motivations, so that those with growth ambition can be facilitated with access to more diverse networks. In turn, such resources should not be wasted on small regional firms defying growth logic, who may be better placed in support initiatives that promote strong regional ties.

4.5.3 Industry

To date, research has mostly employed non-comparative single industry samples, with a predominant focus on high-technology industries. Stam et al. (2014) reveals that network diversity, facilitated through bridging and linking capabilities, has stronger positive relationships with the performance of high-tech firms in comparison to low-tech firms. However, considerably more research is required to understand the moderating impact of industry on social capital. Accordingly, future research should identify the most valuable dimensions of social capital under the unique knowledge conditions of different industries and investigate how strong and weak ties might assist firms to navigate a variety of network clusters.

4.5.4 Gender

Literature suggests that women entrepreneurs face difficulty in accessing social capital. Common misconceptions of women entrepreneurs, such as women not possessing the required capabilities to successfully run ventures, to exploit their social capital and raise the required capital (Gatewood et al., 2009) have all been found to impact funding industry dynamics (Malmstrom et al., 2017). Funding industries, particularly private funding (such as Venture Capital and Business Angels) are male dominated and heavily rely on referrals. Women entrepreneurs' networks are less likely to overlap with investors' networks, despite their efforts in expanding their social capital and seeking funding (Gatewood et al., 2009). This results in women-led ventures facing significant challenges in finding substantial sources of capital to grow their businesses (Malmstrom et al., 2017).



5. FINDINGS FROM PRIMARY DATA

The seven programmes reviewed varied in terms of their remit and target applicants. However, common themes did emerge in relation to the research questions. The five key themes which emerged were:

1. ambiguity over what social capital is and how it differs from networking activities
2. role of the knowledge transfer network
3. social capital as an implicit precursor for funding programmes
4. challenges in measuring social capital development
5. limited details on unsuccessful applicants.

Each theme is interdependent upon the others, and will now be discussed.

5.1 Ambiguity over what social capital is

During the interviews, it was highlighted that whilst social capital is a well-known term, the majority of the interviewees were not fully clear on how it was different to developing networks, until the different dimensions of the concept were discussed. It was identified that whilst the development of networks is encouraged throughout all programmes, the important role of building relationships and nurturing those relationships (i.e. the development of social capital) could be more explicitly communicated to applicants. In particular, it was identified that there could be an important education piece relating to the role and importance of different types of relationships and ties between actors in aiding innovation. The exception to this finding was the ICURe programme, which does appear to actively educate and support academic teams to develop both networks and social capital. During ICURe, the term social capital may not be explicitly used; however, the value in developing relationships with industry and potential customers is stressed. Research teams who are part of ICURe receive funding and training in order to undertake customer discovery activities, which involves conducting interviews with potential customers and key industry actors to develop both their networks and social capital.

In relation to the other programmes, it was identified that the remit of the Knowledge Transfer Network (KTN) is to run regional based events that seek to develop relationships and networks between different actors. The KTN's initiatives are aligned to the portfolio of Innovate UK and ESRC programmes and aims to develop the skills, competencies and networks which individuals need prior to applying to a programme. Consequently, networks and social capital are often expected to exist prior to applying for many Innovate UK and ESRC programmes. These two interdependent themes will now be explored.

5.2 Role of the Knowledge Transfer Network for social capital development

The KTN hosts a wide range of regional based events which largely aim to communicate and disseminate calls for funding, provide opportunities for different regional stakeholders to have a voice in regards to what should be a funding priority, and provide opportunities for regional stakeholders to network with each other. The KTN also runs dissemination events to showcase

different research and innovation activities and the impact of their funding. It was identified that business mixer events do help to develop social capital and can lead to the development of consortiums to apply for funding calls and enhance the reach and impact of projects. Furthermore dissemination events and sector specific workshops and conferences all help develop networks and social capital.

A large number of KTN events have remained online since the Covid lockdowns, due to the online format helping to improve accessibility of events by individuals who may be regionally dispersed or have other reasons preventing them from travelling. Furthermore, recordings of webinars are often available on the KTN website. It was discussed that it is challenging to capture whether events online have led to less opportunities to develop social capital. However, it was noted that there has been an increase in the number of in person events over the past year.

5.3 Social capital as an implicit precursor for funding programmes

Many of the programmes reviewed (except ICURe and The KTN) identified that social capital was often needed in order for an applicant to be successful in achieving funding. For example, The Agri-Tech Centres and the Strength in Places programmes required networks between different regional actors to be demonstrated in order to be considered for funding. Furthermore their reporting on dissemination, engagement and impact activities requires them to identify how they are targeting key beneficiaries, developing new networks and collaborations and ensuring wide impact and multiplier effects. It was identified that in quite a few of the applications for the Agri-Tech Centres and Strength in Places programmes, academic institutions did not demonstrate strong engagement and cohesion with the business sector, which resulted in them not achieving funding.

In relation to the Dementia and Faraday Battery Challenge programmes, individual inventors were eligible to apply for the Challenge funds. It was identified that for these individual inventors, they would not necessarily need to demonstrate strong networks as part of their application. However, they would need to demonstrate the ability to progress their ideas and disseminate their research; therefore, some demonstration of social capital may be necessary.

Due to the nature of the Fast Start programme, which targets early stage, small and micro firms, the expectations regarding social capital development varied depending on the focus of the application. However, since the funding being awarded for this programme was lower than some of the other programmes, the expectations regarding demonstration of existing networks and social capital would be lower than in other programmes.

It was identified that for all the programmes, the development of networks was often assumed to be an output of funding. However, the impact of that network development over time was not easy to follow and measure, which will be explored next.

5.4 Challenges in measuring social capital development

The majority of interviewees identified that they don't believe that social capital is explicitly mentioned in the guidance for the evaluation of funding applications or in the project evaluation reporting guidance. It was identified that some programmes do require reporting on the number of individuals

who attend events and the number of companies who join centres or networks. However, it was identified that it is difficult to track social capital development of recipients of awards unless they move on to further funding projects. However, even if they do receive follow-on funding, since different programmes are run by different teams, the connectivity and sharing knowledge across programmes is not always possible. It was highlighted that if a team does not receive follow-on funding, then it is difficult to follow up due to resource challenges. In this case, sometimes staff working on the ICURe programme would hear from their networks about a particular research team becoming successful in the future, but this was through informal channels. The tracking of networks and social capital development across programmes was identified by all interviewees to be a key challenge.

Social capital can take quite a significant amount of time to develop, therefore the benefits of networking activities may not be seen until many years later. Furthermore, different types of social capital may take varying times to develop. It was identified that capturing the long term impact of many of the programmes is challenging due to uncertainty over budgets for programmes, making it difficult to build in longer term tracking of impact and follow up if networks and social capital have led to other benefits.

5.5 Limited details on unsuccessful applicants

It was identified that there were challenges not only in tracking the social capital development of successful applicants, but in tracking the demographics of unsuccessful applicants. Capturing the demographics of applicants would help understand if there are particular groups who need targeted interventions to aid their success with funding opportunities. It would also be helpful to understand if unsuccessful applicants may come from particular regions which could be considered to have less innovation capabilities, support for innovation or access to networks.

5.6 Summary of empirical findings

Overall, it was identified that there are programmes which do not require social capital prior to application if you are a single inventor, e.g. ICURe and some of the challenge funds. However, on the whole, it was suggested that demonstrating networks and social capital at the application stage would strengthen an application. Due to the complexity of different dimensions and types of social capital, without a detailed analysis of each programme, it is challenging to map how they might support social capital development. Furthermore, to do this fully, it would be necessary to capture a base line of what social capital exists prior to funding, or at the start of a project and to then track this development over a project and for a number of years beyond the end of the project.

From this exploratory analysis, combining both the interview findings and an overview of publicly available programme activities, it was possible to provide an indicative map of how the different programmes may lead to the development of different types of social capital within and between networks. The types of social capital which could be derived from the empirical analysis were bridging, bonding and linking social capital, which follows a network perspective of social capital. This analysis is provided in Figure 4. A tick represents that there was evidence (either implicit or explicit) of one or more types of social capital development. A question mark, '?', identified that it was unclear from this scoping review if particular types of social capital are developed as part of the programme. The lack of clarity was due to the wide scope of individuals and projects which these programmes support. For

greater clarity on how social capital is supported and developed across the different heterogeneous programmes, more in-depth analysis is needed (see section 6.2 for practical recommendations).

Figure 4: Types of social capital developed across programmes

Programme	Bridging	Bonding	Linking
ICURe	✓	✓	✓
Strengths in Places	✓	✓	✓
Agri-Tech Centres	✓	✓	✓
Knowledge Transfer Network	✓	✓	✓
Fast Start	?	?	?
Prizes/Dementia Challenge	?	?	?
Faraday Battery Challenge	?	?	?



6. RECOMMENDATIONS

The recommendations section is broken up into two sections. First the recommendations for future research are presented, based on the systematic review of literature. Next, recommendations are made based on the critical analysis of the empirical findings, which are compared and contrasted with prior studies and best practices relating to supporting and measuring social capital.

6.1 Recommendations for future research based on systematic literature review

The review of the literature revealed a range of knowledge gaps that warrant further research attention. It has become clear that among the key challenges affecting the literature is defining and capturing the concept of social capital in a consistent manner, thus facilitating comparability across studies and contexts, and aiding reliable knowledge accumulation (Galaso, 2017; Sabatini, 2009). Efforts should be directed at integrating the body of knowledge in a way that consolidates existing and future work, and minimises its fragmentation into an increasing number of research streams. More broadly, several directions for the enhancement of our understanding and support of social capital development are identified.

First, it would be important to explore the role of human capital, i.e. the resources, skills, knowledge and experiences embedded in people, in influencing how social capital is accumulated and leveraged (Linder et al. 2020). Such an investigation would enhance our understanding of the human characteristics and processes needed to forge relationships, access the resources embedded within them, and process the resources to develop new capabilities, identify profitable opportunities, and gain competitive advantage (Carson et al., 2020). Further, this would inform policy makers as to the people and skill sets best placed to maximise social capital potential and its outcomes.

Second, we identified a distinct gap in the use of longitudinal research designs to map how individuals transition through the venture creation (Kleinhempel et al. 2022) and funding processes (Wang, 2016) and, critically, how their social capital endowments evolve throughout different stages. Understanding the qualitatively different characteristics of social capital at different stages of different entrepreneurial processes can help entrepreneurs and support agencies to better direct their activities in a way that strategically builds and fosters social capital.

Third, exploring the role that context, be it geographic (e.g. deprived urban areas), sector-specific, or relating to private-public spheres, plays as instrumental in understanding how different types of social capital (structural, cognitive and relational) are developed, deployed and valued (Wu, 2021; Lee et al. 2019). Social capital is a heavily contextual resource that is difficult to transfer. Gaining further insight into the types of social capital and their value in a variety of contexts can help firms, individuals and policy makers to manage and shape the various dimensions of social capital in a way that aligns with the setting. This would be particularly important in the context of public funding, where the role and type of social capital needed to maximise success and outcomes is still largely under explored (Murzacheva and Levie, 2020; Wang, 2016).

Finally, further investigation would be needed into how transformation in communication means between actors is affecting social capital development. Indeed, recently, online communication has largely become the norm in professional settings, affecting the strength of the ties being forged between people within and across organisations. It would be reasonable to assume that the resulting transformation in social capital is affecting how resources are acquired and transferred among actors (Tiwari et al. 2019; Lee et al. 2019). It is paramount that we gain a clearer understanding of how we can maximise the opportunities afforded by the technological advancements in communication, while maintaining the value embedded in strong ties, such as trust, knowledge transfer, and endorsement.

6.2 Recommendations for practice, based on findings and prior literature

Based on the empirical data, review of programmes and reflecting on findings from research within the critical systematic literature review, four practical recommendations are suggested. Table 3 outlines the recommendation and gives suggestions on how to operationalize the recommendation.



Table 3: Recommendations on how to advance knowledge and practice relating to social capital development within Innovate UK and ESCR programmes

Recommendation	Rationale	Operationalisation
<p>1. Social capital awareness</p> <p>Increase awareness of what social capital is, the different types of social capital and their relative importance, the relationship between social capital and networks.</p>	<ul style="list-style-type: none"> Findings identified that there is ambiguity over what social capital is and how it differs from networks. 	<ul style="list-style-type: none"> Send communications to educate UKRI/ Innovate UK/ESRC staff on the different types and dimensions of social capital. Communications should identify how structural, relational and cognitive social capital enhance resource acquisition and consequently can be imperative for innovation: large networks, bonding ties, trust, reciprocity, mutual obligations and expectations, and shared language and codes. Communications should identify how different strengths of ties between actors have different benefits. E.g. weak ties expand networks and can facilitate access to a diversity of ideas and resources but strong ties can help provide emotional support. Case studies would be useful to help demonstrate the value of social capital and the different types of social capital. Working groups within different programmes could be formed to reflect on how/if social capital is developed and supported. Communicate and educate potential applicants on the importance of not only networks but also social capital.
<p>2. Social capital and the funding process</p> <p>Conduct a comprehensive analysis across all UKRI programmes to explore:</p> <ol style="list-style-type: none"> If social capital is a pre-requisite for a particular funding programmes (and if it is, what type), If and how programmes support social capital development (e.g. can funding within programmes be used to support network and social capital development or is there sufficient training and events to help applicants develop networks and social capital prior to application) and How social capital is measured/tracked across programmes. 	<ul style="list-style-type: none"> This project provided an exploratory high level analysis of a sample of programmes but requires more in-depth analysis at a programme level. 	<ul style="list-style-type: none"> Commission a large scale project to evaluate social capital development within programmes. This would require full access to data on programmes, including interim and final project reports of funded projects and their outputs, It would also involve quantitative data collection, interviews with principal investigators and core stakeholders involved with programmes, and An evaluation on how knowledge is shared across programmes will be needed.

Recommendation	Rationale	Operationalisation
<p>3. Social capital measurement</p> <p>Develop a process and knowledge management system which explicitly captures current levels of social capital at application stage and measures social capital development over time.</p>	<ul style="list-style-type: none"> • There do not appear to be mechanisms to evaluate and capture social capital development across programmes. 	<ul style="list-style-type: none"> • Embed questions on current levels of social capital into application processes and/or a start of project questionnaire. • Embed questions on social capital development into mid term/end of project evaluations. • Capture whether the presence of social capital pre-funding translates into better outcomes post-award. • Learn from international best practices on how social capital is captured and measured across programmes.
<p>4. Who are the applicants</p> <p>Conduct an analysis on who are the applicants versus those who are successful in terms of the factors which moderate social capital (gender/ethnicity, geographical location, firm size, industry).</p>	<ul style="list-style-type: none"> • The characteristics of unsuccessful applicants across many of the programmes are unclear. Therefore, it is difficult to recommend interventions to help them to apply and hopefully have greater success with future 	<p>This could be part of recommendation 2 (during the commissioning of a large-scale evaluation) or alternatively, each programme could develop a mechanism to collect demographic and/ or locational details at the application stage. Furthermore, it would be beneficial to utilise a short Likert scale survey at applicant stage to understand the level of skills and capability development of the applicant.</p>

8. REFERENCES

- Abbasi, A., Wigand, R.T. and Hossain, L. (2014) Measuring social capital through network analysis and its influence on individual performance. *Library and Information Science Research*, 36 (1), 66-73.
- Adler, P. S. and Kwon, S-W (2002) Social Capital: Prospects for a New Concept. *The Academy of Management Review*, 27 (1), 17-40.
- Aldrich, D. P. (2012), 'Social Capital in Post Disaster Recovery: Towards a Resilient and Compassionate East Asian Community', in Sawada, Y. and S. Oum (eds.), *Economic and Welfare Impacts of Disasters in East Asia and Policy Responses*. ERIA Research Project Report 2011-8, Jakarta: ERIA. pp.157-178.
- Aldrich, H.E. and Kim, P.H. (2007) Small worlds, infinite possibilities? How social networks affect entrepreneurial team formation and search. *Strategic Entrepreneurship Journal*, 1, 147-165.
- Ahuja, G. (2000) The duality of collaboration: inducements and opportunities in the formation of interfirm linkages. *Strategic Management Journal*, 21, 317-343.
- Anderson, A., Park, J., and Jack, S. (2007) Entrepreneurial social capital: Conceptualizing social capital in new high-tech firms. *International Small Business Journal*, 25 (3), 245-272.
- Arthur, M.B. (1994) The boundaryless career: A new perspective for organizational inquiry. *Journal of Organizational Behavior*, 15 (4) 295-306.
- Audretsch, B. (1998) Agglomeration and the location of innovative activity. *Oxford Review of Economic Policy*, 14 (2), 18-29.
- Baker, W. (1990) Market Networks and Corporate Behavior. *American Journal of Sociology*, 96, 589-625.
- Baker, W. E., Grinstein, A., and Harmancioglu, N. (2016) Whose innovation performance benefits more from external networks: entrepreneurial or conservative firms?. *Journal of Product Innovation Management*, 33 (1), 104-120.
- Batjargal, B. and Liu, M. (2004) Entrepreneurs' Access to Private Equity in China: The Role of Social Capital. *Organization Science*, 15 (2), 159-172.
- Batterink, M.H., Wubben, E.F.M., Klerkx, L. and Omta, S.W.F. (2010) Orchestrating innovation networks: The case of innovation brokers in the agri-food sector. *Entrepreneurship and Regional Development*, 22 (1), 47-76.
- Berliant, M. and Fujita, M. (2011). The Dynamics of Knowledge Diversity and Economic Growth. *Southern Economic Journal*, 77 (4), 856-884.
- Blackburn, R. and Kovalainen, A. (2009) Researching small firms and entrepreneurship: Past, present and future. *International Journal of Management Reviews*, 11, 127-148.
- Borgatti, S. P. and Foster, P. C. (2003) The Network Paradigm in Organizational Research: A Review and Typology. *Journal of Management*, 29 (6), 991-1013.
- Bosma, N., van Praag, M., Thurik, R., de Wit, G. (2004) The Value of Human and Social Capital Investments for the Business Performance of Startups. *Small Business Economics*, 23, 227-236.
- Brüderl, J. and Preisendörfer, P. (1998) Network Support and the Success of Newly Founded Business. *Small Business Economics*, 10, 213-225.
- Burt, R.S., 2018. Structural holes. In *Social Stratification* (pp. 659-663). Routledge.
- Carson, G., O'Connor, C. and Simmons, G. (2020) The crucial role of market intelligence in the development of small business marketing capabilities. *Journal of Small Business and Enterprise Development*, 27 (5), 797-816.
- Ceci, F., Masciarelli, F. and Poledrini, S. (2019) How social capital affects innovation in a cultural network: Exploring the role of bonding and bridging social capital. *European Journal of Innovation Management*, 23 (5), 895-918.
- Cicourel, A.V. (1981) The role of cognitive-linguistic concepts in understanding everyday social interactions. *Annual Review of Sociology*, 7, 787-106.
- Coleman, J.S. (1988) Social capital in the creation of human capital. *American Journal of Sociology*, 94, 95-120.
- Coleman, J.S. (1990) 'Foundations of Social Theory'. Belknap Press, Division of Harvard University Press, Cambridge, MA.
- Corredoira, R.A. and McDermott, G.A. (2020) Does size still matter? How micro firms and SMEs vary in network learning. *Industry and Innovation*, 27 (8), 920-952.
- Coviello, N. and Munro, H. (1997) Network relationships and the internationalisation process of small software firms. *International Business Review*, 6 (4), 361-386.

- Dakhli, M. and De Clercq, D. (2004) Human capital, social capital, and innovation: a multi-country study. *Entrepreneurship and Regional Development*, 16 (2), 107-128.
- Dempwolf, C.S. and Lyles, L.W. (2012) The uses of social network analysis in planning: A review of the literature. *Journal of Planning Literature*, 27 (1), 3-21.
- Doh, S. and Acs, Z.J. (2010) Innovation and social capital: a cross-country investigation. *Industry and Innovation*, 17 (3), 241-262.
- Department of Business, Energy and Industrial Strategy (2021) Evidence for the Innovation Strategy. Available from: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1023586/evidence-for-innovation-strategy.pdf [Accessed 06/12/2022]
- Fritsch, M., and Kauffeld-Monz, M. (2010) The impact of network structure on knowledge transfer: an application of social network analysis in the context of regional innovation networks. *The Annals of Regional Science*, 44 (1), 21-38.
- Galaso, B. (2018) Network topologies as collective social capital in cities and regions: a critical review of empirical studies. *European Planning Studies*, 26 (3), 571-590.
- Gatewood, E.J., Brush, C.G., Carter, N.M., Green, P.G. and Hart, M.M. (2009) Diana: a symbol of women entrepreneurs' hunt for knowledge, money, and the rewards of entrepreneurship. *Small Business Economics*, 32, 129-144.
- Gao, S. S., Sung, M. C., and Zhang, J. (2013) Risk management capability building in SMEs: A social capital perspective. *International Small Business Journal*, 31 (6), 677-700.
- Ghazinoory, S., Bitaab, A., and Lohrasbi, A. (2014) Social capital and national innovation system: a cross-country analysis. *Cross Cultural Management*, 21 (4), 453-475.
- Grabher, G. (1993). The Weakness of Strong Ties; the Lock-In of Regional Development in the Ruhr Area. In G. Grabher (Ed.), *The Embedded Firm: On the Socioeconomics of Industrial Networks* (pp. 255-277). Routledge.
- Granovetter, M. (1983) The strength of weak ties: A network theory revisited. *Sociological Theory*, 1, 201-233.
- Granovetter, M. (1985) Economic action and social structure: The problem of embeddedness. *American Journal of Sociology*, 91, 481-510.
- Granovetter, M. (1992) Problems of explanation in economic sociology. y. In N. Nohria and R. Eccles (eds.), *Networks and organizations: Structure, form, and action*, 25-56. Boston: Harvard Business School Press.
- Haller, M. K. and Welch, E. W. (2014) Entrepreneurial Behavior of Academic Scientists: Network and Cognitive Determinants of Commitment to Grant Submissions and Award Outcomes. *Entrepreneurship Theory and Practice*, 38 (4), 807-831.
- Hagedoorn, J. and Frankort, H.T. (2008) The gloomy side of embeddedness: The effects of overembeddedness on inter-firm partnership formation. In *Network strategy*. Emerald Group Publishing Limited.
- Hernández-Carrión, C., Camarero-Izquierdo, C. and Gutiérrez-Cillán, J. (2017) Entrepreneurs' social capital and the economic performance of small businesses: The moderating role of competitive intensity and entrepreneurs' experience. *Strategic Entrepreneurship Journal*, 11 (1), 61-89.
- Hite, J.M. and Hesterly, W.S. (2001) The evolution of firm networks: From emergence to early growth of the firm. *Strategic Management Journal*, 22 (3), 275-286.
- HM Government, (2022). Levelling up the United Kingdom. Available from: <https://www.gov.uk/government/publications/levelling-up-the-united-kingdom> [Accessed 06/12/2022].
- Huggins, R. and Johnston, A. (2010) Knowledge flow and inter-firm networks: The influence of network resources, spatial proximity and firm size. *Entrepreneurship and Regional Development*, 22 (5), 457-484.
- Huggins, R. and Johnston, A. (2009) Knowledge networks in an uncompetitive region: SME innovation and growth. *Growth and Change*, 40 (2), 227-259.
- Hurmelinna-Laukkanen, P., Moller, K. and Natti, S. (2022) Orchestrating innovation networks: Alignment and orchestration profile approach. *Journal of Business Research*, 140, 170-188.
- Inkpen, A. C., and Tsang, E. W. (2005) Social capital, networks, and knowledge transfer. *Academy of Management Review*, 30 (1), 146-165.
- Institute of Social Capital, (2022) Measurement of Social Capital. Available online: <https://www.socialcapitalresearch.com/literature/operationalisation/measurement/> [Accessed 06/12/2022].
- Johannisson, B (2008) "Regional Development as Entrepreneurial Networking: From Rational Choice to Self-Organizing," Chapters, in: Querejeta, M.J.A.,

- Landart, C.I. and Wilson, J.R. (ed.), *Networks, Governance and Economic Development*, Edward Elgar Publishing.
- Kleinhempel, J., Beugelsdijk, S. and Klasing, M.J. (2022) The changing role of social capital during the venture creation process: A multilevel study. *Entrepreneurship Theory and Practice*, 46 (2), 297-330.
- Klerkx, L. and Aarts, N. (2013) The interaction of multiple champions in orchestrating innovation networks: Conflicts and complementarities. *Technovation*, 33(6-7), 193-210.
- Kobeissi, N., Hasan, I., Wang, B., Wang, H and Yin, D (2022) Social capital and regional innovation: evidence from private firms in the US. *Regional Studies*, Early Online.
- Krackhardt, D. (1990) Assessing the political landscape: Structure, cognition, and power in organizations. *Administrative Science Quarterly*, 35 (2), 342-369.
- Kwon, S.W. and Arenius, P. (2010) Nations of entrepreneurs: A social capital perspective. *Journal of Business Venturing*, 25 (3), 315-330.
- Kwon, S.W., Heflin, C. and Ruef, M. (2013) Community social capital and entrepreneurship. *American Sociological Review*, 78 (6), 980-1008.
- Kwon, S.W. and Adler, P.S. (2014) Social capital: Maturation of a field of research. *Academy of Management Review*, 39 (4), 412-422.
- Landry, R., Amara, N. and Lamari, M. (2002) Does social capital determine innovation? To what extent?. *Technological Forecasting and Social Change*, 69 (7), 681-701.
- Lang, R., and Fink, M. (2019) Rural social entrepreneurship: The role of social capital within and across institutional levels. *Journal of Rural Studies*, 70, 155-168.
- Larson, A. and Starr, J.A. (1993) A network model of organization formation. *Entrepreneurship Theory and Practice*, 17 (2), 5-15.
- Lee, R., Tuselmann, H., Jayawarna, D., and Rouse, J. (2019) Effects of structural, relational and cognitive social capital on resource acquisition: a study of entrepreneurs residing in multiply deprived areas. *Entrepreneurship and Regional Development*, 31(5-6), 534-554.
- Linder, C., Lechner, C. and Pelzel, F. (2020) Many roads lead to Rome: How human, social, and financial capital are related to new venture survival. *Entrepreneurship Theory and Practice*, 44(5), 909-932.
- Maghssudipour, A., Lazeretti, L. and Capone, F. (2020) The role of multiple ties in knowledge networks: Complementarity in the Montefalco wine cluster. *Industrial Marketing Management*, 90, 667-678.
- Malmström, M., Voitkane, A., Johansson, J. and Wincent, J. (2020) What do they think and what do they say? Gender bias, entrepreneurial attitude in writing and venture capitalists' funding decisions. *Journal of Business Venturing Insights*, 13, e00154.
- Maurer, I. and Ebers, M. (2006) Dynamics of social capital and their performance implications: Lessons from biotechnology start-ups. *Administrative Science Quarterly*, 51(2), 262-292.
- McFadyen, M.A. and Cannella Jr, A.A. (2004) Social capital and knowledge creation: Diminishing returns of the number and strength of exchange relationships. *Academy of Management Journal*, 47(5), 735-746.
- Menzies, J., Orr, S. and Paul, J. (2020) SME internationalisation: The relationship between social capital and entry mode. *Management International Review*, 60(4), 623-650.
- Messina, L., Miller, K., Galbraith, B. and Hewitt-Dundas, N. (2022) A recipe for USO success? Unravelling the micro-foundations of dynamic capability building to overcome critical junctures. *Technological Forecasting and Social Change*, 174, 121257.
- Micheels, E.T. and Nolan, J.F. (2016) Examining the effects of absorptive capacity and social capital on the adoption of agricultural innovations: A Canadian Prairie case study. *Agricultural Systems*, 145, 127-138.
- Murzacheva, E. and Levie, J. (2020) Entrepreneurial finance journeys: embeddedness and the finance escalator. *Venture Capital*, 22(2), pp.185-214.
- Nahapiet, J., and Ghoshal, S. (1998) Social capital, intellectual capital, and the organizational advantage. *Academy of Management Review*, 23(2), 242-266.
- OECD (2001), *The Well-Being of Nations: The Role of Human and Social Capital*, OECD, Paris.
- Perry-Smith, J. E., and Shalley, C. E. (2003) The social side of creativity: A static and dynamic social network perspective. *Academy of Management Review*, 28(1), 89-106.
- Perry-Smith, J. and Mannucci, P. V. (2015) Social networks, creativity, and entrepreneurship. In C. E.

- Shalley, M. A. Hitt, and J. Zhou (Eds.), *The Oxford handbook of creativity, innovation, and entrepreneurship* (pp. 205–224). Oxford University Press.
- Pirollo, L. and Presutti, M. (2010) The impact of social capital on the start-ups' performance growth. *Journal of Small Business Management*, 48(2), 197-227.
- Poblete, L., Kadefors, A., Radberg, K.K. and Gluch, P. (2022) Temporality, temporariness and keystone actor capabilities in innovation ecosystems. *Industrial Marketing Management*, 102, 301-310.
- Portes, A. (1998) Social capital: Its origins and applications in modern sociology. *Annual Review of Sociology*, 24 (1), 1-24.
- Putnam, R. (1993) The prosperous community: Social capital and public life. *The American Prospect*, 13 (4), 35-42.
- Putnam, R.D. (1995) Tuning in, tuning out: The strange disappearance of social capital in America. *PS: Political Science and Politics*, 28 (4), 664-683.
- Putnam, R. (2000). *Bowling Alone: The Collapse and Revival of American Community*. New York: Simon and Schuster.
- Ramos-Rodriguez, A.R., Medina-Garrido, J.A., Lorenzo-Gómez, J.D. and Ruiz-Navarro, J. (2010) What you know or who you know? The role of intellectual and social capital in opportunity recognition. *International Small Business Journal*, 28 (6), 566-582.
- Ruiu, M.L., Seddaiu, G. and Roggero, P.P. (2017) Developing adaptive responses to contextual changes for sustainable agricultural management: The role of social capital in the Arborea district (Sardinia, Italy). *Journal of Rural Studies*, 49, 162-170.
- Sabatini, F. (2009) Social capital as social networks: A new framework for measurement and an empirical analysis of its determinants and consequences. *The Journal of Socio-Economics*, 38(3), 429-442.
- Shin, B. (2021) Exploring Network Measures of Social Capital: Toward More Relational Measurement. *Journal of Planning Literature*, 36 (3), 328–344.
- Simon, F. and Tellier, A. (2011) How do actors shape social networks during the process of new product development?. *European Management Journal*, 29 (5), 414-430.
- Soetanto, D. and van Geenhuizen, M. (2015) Getting the right balance: University networks' influence on spin-offs' attraction of funding for innovation. *Technovation*, 36–37, 26-38.
- Stam, W., Arzlanian, S. and Elfring, T. (2014) Social capital of entrepreneurs and small firm performance: A meta-analysis of contextual and methodological moderators. *Journal of Business Venturing*, 29 (1), 152-173,
- Steinmo, M. (2015) Collaboration for Innovation: A Case Study on How Social Capital Mitigates Collaborative Challenges in University–Industry Research Alliances. *Industry and Innovation*, 22(7), 597-624.
- Stuart, T.E. and Sorenson, O. (2005) Social Networks and Entrepreneurship. In: Alvarez, S.A., Agarwal, R., Sorenson, O. (eds) *Handbook of Entrepreneurship Research*. International Handbook Series on Entrepreneurship, Springer, Boston, MA.
- Subramaniam, M. and Youndt, M.A. (2005) The influence of intellectual capital on the types of innovative capabilities. *Academy of Management Journal*, 48 (3), 450-463.
- Tiwari, S., Lane, M. and Alam, K. (2019) Do social networking sites build and maintain social capital online in rural communities? *Journal of Rural Studies*, 66, 1-10.
- Todo, Y., Matous, P. and Inoue, H. (2016) The strengths of long ties and the weakness of strong ties: Knowledge diffusion through supply chain networks. *Research Policy*, 45, 9, 189–1906.
- Tranfield, D., Denyer, D. and Smart, P. (2003) Towards a methodology for developing evidence-informed management knowledge by means of systematic review. *British Journal of Management*, 14 (3), 207-222.
- Wang, Y. (2016) Bringing the stages back in: Social network ties and start-up firms' access to venture capital in china. *Strategic Entrepreneurship Journal*, 10 (3), 300-317.
- Woolcock, M. (2002) Social capital in theory and practice: where do we stand. *Social capital and economic development: Well-being in developing countries*, 1 (2), 18-39.
- Woolcock, M. (1998) Social capital and economic development: Toward a theoretical synthesis and policy framework. *Theory and Society*, 27 (2), 151-208.;
- Wu, C. (2021) Social capital and COVID-19: a multidimensional and multilevel approach. *Chinese Sociological Review*, 53:1, 27-54,
- Yang, K-P., Chou, C. and Chiu, Y-J. (2014) How unlearning affects radical innovation: The dynamics of social capital and slack resources. *Technological Forecasting and Social Change*, 87, 152-163.

APPENDIX 1 PROFORMA FOR SYSTEM-ATIC LITERATURE REVIEW

Authors	
Year	
Journal	
ABS ranking	
Number of citations	
Article Title	
Research Question/Aim	
Theoretical gaps which this research uses to frame their study	
Problem which this research uses to frame their study (if different from theoretical gaps)	
Theoretical lens/ theories underpinning research (list)	
Any key themes or takeaways from the literature review (bullet points)	
Sampling Method (quantitative, qualitative, mixed, longitudinal or cross sectional)	
Sample size	
Measure (interviews, questionnaires etc.)	
Country	
Organisation type (family/ non family/ Size)	
Sector/industry	
Data analysis techniques used (list) – in particular, capture any innovative methods)	
Key Findings (challenges/antecedents of social capital, relationship between social capital and innovation, how to measure social capital, differences between how social capital is developed in different groups/regions, etc.)	
Remaining gaps/Areas for future research	
Limitations of their study (if different from areas for future research)	

Typologies	Indicators	Influence on local/regional performance	
		Positive	Negative
1. Size and composition	Number of nodes	Bettencourt et al. (2007); Breschi and Lenzi (2016); Fleming et al. (2007); Feldman and Zoller (2012); Lobo and Strumsky (2008)	
	Number of key nodes	Casper (2013); Feldman and Zoller (2012); Coffano et al. (2017)	
	Presence of key nodes	Coffano et al. (2017)	
2. Connectivity	Size of the largest component	Bettencourt et al. (2007b); Breschi and Lenzi (2015); Casper (2013); Coffano et al. (2017); Feldman and Zoller (2012); Fleming et al. (2007); Graf and Henning (2009); Makarem (2016)	Lobo and Strumsky (2008)
	Density	Fritsch and Kauffeld-Monz (2010)	Bettencourt et al. (2007b); Lobo and Strumsky (2008)
	Percentage of non-isolate nodes	Entwisle et al. (2007); Makarem (2016)	
	Number of links	Bettencourt et al. (2007b)	
	Average degree	Provan and Milward (1995)	
	Number of nodes with high degree	Feldman and Zoller (2012)	
	Percentage of reachable nodes in a path of length one	Entwisle et al. (2007)	
	Network component aggregation	Lobo and Strumsky (2008)	
	Key actors connected to the largest component	Casper (2013); Coffano et al. (2017)	
3. Closeness	Average reach	Breschi and Lenzi (2016)	Breschi and Lenzi (2016)
	Inverse of path length in the largest component	Fleming et al. (2007)	
	Number of cut-points	Crowe (2007)	
4. Clustering	Clustering coefficient	Bettencourt et al. (2007b); Cai et al. (2015); Crespo et al. (2015); Uzzi and Spiro (2005)	Breschi and Lenzi (2016); Shakya et al. (2014); Uzzi and Spiro (2005)
	Number of k-cores	Crowe (2007)	
5. Small world	Av. clustering coefficient/ av. path length	Uzzi and Spiro (2005)	
	Clustering * Reach	Breschi and Lenzi (2016)	
	Number of k-cores + number of cut-points	Crowe (2007)	

Typologies	Indicators	Influence on local/regional performance	
		Positive	Negative
6. Openness	Number and percentage of external nodes	Fleming et al. (2007); Lobo and Strumsky (2008)	
	Average reach to external nodes	Breschi and Lenzi (2015)	
	External links of key actors		
	External links * local centrality of key actors	Coffano et al. (2017)	
	External reach mediated by local gatekeepers	Breschi and Lenzi (2015)	Crespo et al. (2015)
	External reach * internal reach	Breschi and Lenzi (2016)	Coffano et al. (2017)
	Centrality of key local actors in the inter-regional network	Huggins and Prokop (2016)	
7. Centralization	Centrality of key actors	Banerjee et al. (2013); Cai et al. (2015); Coffano et al. (2017); Graf and Henning (2009); Huggins and Prokop (2016); Makarem (2016); Provan and Milward (1995)	
	Slope of degree distribution	Crespo et al. (2015)	
	Centralization	Graf and Henning (2009)	
8. Heterophily	Slope of the degree correlation (-)	Crespo et al. (2015)	
	Links connecting different types of nodes	Casper (2013); Makarem (2016)	

Source: Galaso (2017)

Innovation Caucus

FUTURE OF INNOVATION THOUGHT LEADERSHIP PROJECT:

THE ROLE OF SOCIAL CAPITAL FOR INNOVATION

Innovation
Caucus

✉ info@innovationcaucus.co.uk

🐦 [@innovcaucus](https://twitter.com/innovcaucus)

🏠 innovationcaucus.co.uk

The Innovation Caucus is funded by:

