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Navigating Funding Success: The Role of Human and Social Capital Among Sustainability Startups in Germany

Do founders' experiences and their startups' networks affect funding success?

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Abstract

This study investigates how human and social capital influence funding success for sustainability startups in Germany, addressing the critical research gap regarding structural determinants in sustainability-driven entrepreneurial ventures. Despite their pivotal role in addressing global environmental challenges, sustainability startups often encounter financial and structural barriers due to technological complexity, market uncertainties, and capital intensity. This research aims to analyse how founders' experiences (professional, founding and educational) in sustainability, and startups' network characteristics (size, strength, embeddedness, and CEO-led mobilisation) impact their funding success.

Employing a quantitative, deductive research approach, the study utilises a correlational research design, gathering primary data on 165 sustainability startup founders in Germany via an online questionnaire. Data were analysed through descriptive statistics, correlations, and regression analyses to test hypotheses grounded in human and social capital theories.

Key findings indicate that founders' and CEO-specific professional, founding and educational experiences in sustainability do not significantly enhance funding success. Among network characteristics, only network size and tie strength to financial stakeholders, such as venture capitalists, business angels, and banks, positively and significantly influence funding success. Conversely, tie strength to non-financial stakeholders does not significantly affect funding success. Furthermore, nationally embedded networks compared to local, regional, and international counterparts and CEO-led network mobilisation do not significantly enhance funding success. However, the findings highlight that a broader geographic reach of startup network contacts significantly increases funding success.

These findings suggest critical implications for both theory and practice. Theoretically, the study advances structural determinants of entrepreneurial performance within sustainability contexts. Practically, results provide actionable insights for entrepreneurs on strategically leveraging networks, guide investors in identifying promising ventures, and offer entrepreneurial support organisations and policy makers tailored recommendations for enhancing their support structures. Future research is encouraged to explore longitudinal effects and diverse geographical contexts to deepen understanding of funding dynamics in sustainability entrepreneurship.

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Abbreviations

CEO	Chief Executive Officer
CFO	Chief Financial Officer
CMO	Chief Marketing Officer
COO	Chief Operating Officer
CPO	Chief Product Officer
CSO	Chief Sales Officer
CTO	Chief Technology Officer
CVC	Corporate Venture Capital
ESO	Entrepreneurial Support Organisation
FSN	Financial Support Network
GDPR	General Data Protection Regulation
IEA	International Energy Agency
IPCC	Intergovernmental Panel on Climate Change
LR	Likelihood Ratio
OLR	Ordinal Logistic Regression
OR	Odds Ratio
PO	Proportional Odds
R&D	Research & Development
SE	Standard Error
SDR	Socially Desirable Responding
VC	Venture Capital
VIF	Variance Inflation Factor

1 Introduction

This chapter provides the foundational context for the study. Section 1.1 contextualises the essential role of sustainability startups and highlights the substantial funding gap as well as related financial barriers faced by these ventures. Section 1.2 delineates the specific structural disadvantages confronting sustainability startups and discusses the existing research gap concerning how founders' experience (human capital) and startups' networks (social capital) influence their funding success. Section 1.3 articulates the aim to explore the relationship of founders' backgrounds and startups' network characteristics and the funding success of sustainability startups. Section 1.4 points out the theoretical advancement through examining structural determinants of sustainability startups. Lastly, Section 1.5 provides a detailed overview of how the master's thesis is structured.

1.1 Research Background

The urgency of global sustainability challenges – such as climate change, resource depletion, and environmental degradation – has placed increased pressure on societies to develop innovative and scalable solutions (Chu & Wang, 2024). The need to reduce carbon emissions, improve energy efficiency, and transition to circular systems has become more pressing in light of projections from the Intergovernmental Panel on Climate Change (IPCC). In fact, these estimates warn that without immediate and substantial interventions, global warming is likely to exceed 1.5°C within the next two decades (IPCC, 2022).

Annual climate finance has more than doubled between 2018 and 2022 – from $674 billion to $1.46 trillion. Nevertheless, an additional fivefold increase is still required to reach the $7.4 trillion needed on average each year through 2030 under the 1.5°C scenario (CPI, 2024). Simon et al. (2023) reported similar numbers, stating that the path to net zero by 2050 requires an increase in low-carbon investments from $900 billion in 2020 to $5 trillion annually by 2030. Additionally, the International Energy Agency (IEA) (2021) estimated that annual clean energy investment worldwide must more than triple by 2030 to around $4 trillion to reach net zero emissions by 2050. The IPCC (2023) emphasised that climate finance flows will need to increase by a factor of four to seven in developing countries and by three to five in developed countries to stay on track for net zero.

Overall, this financial gap highlights the crucial role that private-sector innovation – particularly through startup ventures – must play in complementing public efforts toward environmental goals and that greater investments are required to meet the sustainability objectives (Cumming et al., 2016). Environmental sustainability startups are emerging as agile problem-solvers aiming to develop technologies for carbon capture, renewable energy, green materials, and sustainable logistics, among others (Hall et al., 2010; Pacheco et al., 2010). Moreover, environmental sustainability startups – referred to as sustainability startups in this study – play a crucial role in protecting natural resources by driving forward climate-friendly technologies, innovations and business models (Galdeano-Gómez et al., 2017) that reduce CO_2 emissions and help to mitigate global warming (Hall et al., 2010a).

However, translating these innovations into commercially viable and scalable solutions remains a significant challenge since the demand of sustainability startups for high capital investment is not fully met as they tend to attract capital less frequently, which is detrimental to their growth (De Lange, 2017; Mrkajic et al., 2019; Randjelovic et al., 2003). Although the landscape in Germany may have shifted slightly, green tech startups have attracted 25% of all startup investments over the past five years in Germany (Startup Verband, 2024).

Recent data by the German Startup Verband (2024) confirms the momentum and strategic relevance of this sector: around 3,000 green tech startups are currently active in Germany, with the energy sector alone accounting for 26% of these ventures. Compared to startups in general, green tech founders are significantly more innovative, with 33% holding their own patents (vs. 18% overall). University support is widespread (67%), and collaboration with established firms is common (71%). However, the number of new green tech startups has declined sharply from 545 in 2021 to just 303 in 2024. This decline highlights growing entry barriers and the need for targeted support mechanisms, particularly during the early stages.

In this context, the prior experience of founders becomes a critical factor as entrepreneurs with relevant industry or managerial backgrounds are more likely to develop viable strategies, gain the confidence of investors, and avoid common pitfalls (Brattström, 2019; Mrkajic et al., 2019; Trautwein, 2021). Experience enables entrepreneurs to interpret market signals more effectively and to manage complex stakeholder interactions (Carter et al., 2019; de Mol, 2019) – capabilities that are particularly important in sustainability-driven sectors where business and societal objectives are intertwined.

At the same time, networking activities serve as a crucial mechanism for overcoming resource constraints. Startups which maintain diverse and active connections with external actors are better able to access capital, obtain feedback, form strategic alliances, and enhance legitimacy (Batjargal, 2003; Elfring & Hulsink, 2007; Liao & Welsch, 2005). These networks are especially important in the context of sustainability entrepreneurship, where market demand may still be emerging, and regulatory frameworks are in flux.

In summary, despite global climate finance, individual sustainability startups remain capital-constrained. Understanding individual- as well as firm-level drivers of funding outcomes is therefore pivotal to close the macro gap. Human capital through founders' prior experience on the one hand and social capital through startups' networks on the other hand may play a disproportionately important role in bridging the resource gap.

1.2 Research Problem

Sustainability-focused startups are increasingly viewed as essential drivers of innovation for addressing global environmental challenges. Yet, despite their strategic importance, these ventures face major structural barriers. They are typically characterised by limited internal resources, a lack of performance history as well as technological and market uncertainty (Cohen & Winn, 2007; Ginsberg & Marcus, 2018). Sustainability startups' solutions often require long development timelines, high capital intensity, and deep technological expertise (Criscuolo & Menon, 2015; Ghosh & Nanda, 2010).

These challenges make it difficult to attract investors, particularly in the venture capital (VC) space, where they are often reluctant to fund sustainable ventures due to the absence of proven models and the perceived difficulty of generating competitive returns (Criscuolo & Menon, 2015; Ghosh & Nanda, 2010). Although some capital providers aim to integrate environmental considerations into their investment logic, the lack of standardised metrics and sector-specific knowledge makes it difficult to balance impact with profitability (Bocken, 2015; Randjelovic et al., 2003).

Research suggests that two structural factors – founders experience through human capital and startups' network characteristics through social capital – play a particularly important role in overcoming disadvantages. While founders and success factors have been extensively

researched across general contexts (Brattström, 2019), few studies have examined how these insights translate into capital-intensive, sustainability-driven ventures (Carter et al., 2019). Besides that, some of them even provide contradicting results (Piva & Rossi-Lamastra, 2018) and caution that general human capital insights may not apply uniformly across sectors (Demirel et al., 2019).

Equally important are entrepreneurs' networking activities as startups rely heavily on external relationships to access capital, identify collaborators, and gain market knowledge (Aldrich & Zimmer, 1986; Birley, 1985; Granovetter, 1985). Active external communication allows startups to develop strong ties with key stakeholders and access resources (Batjargal, 2003; Elfring & Hulsink, 2007; Liao & Welsch, 2005). Both the *strength* of external engagement and the *diversity* of contacts play a role in building flexible, resilient startup strategies (Raz & Gloor, 2007; Stam & Elfring, 2008). However, literature on networks offers mixed empirical results. While some studies emphasise the benefits of diverse or well-connected networks (Gulati & Higgins, 2003; Raz & Gloor, 2007; Stam & Elfring, 2008; Stuart et al., 1999), others find that network over-embeddedness or poor-quality ties may inhibit innovation and strategic flexibility (Batjargal, 2005, 2010; Johannisson, 1996; Watson, 2007). The relationship between networking and success is not necessarily linear and may depend on the specific structure and purpose of the relationships involved (Bhagavatula et al., 2010; Hoang & Antoncic, 2003; Jack, 2010). Generally, research on sustainable entrepreneurial ecosystems is still at an early stage with mostly qualitative research designs (Volkmann et al., 2021). It is distinguished by a clear lack of studies on social capital and sustainability startups.

Taken together, these findings point to a clear research gap. While existing research primarily underscores the individual significance of founders' backgrounds and networks, few studies have examined their impact on startups' funding success in the context of sustainability ventures. Moreover, most prior studies have focused on general technology startups, offering little insight into how founders in capital-intensive sectors like sustainability startups mobilise resources differently (Bergset, 2015; Parrish, 2010).

1.3 Research Questions

While prior research has often focused on personality traits or motivational factors (Davidsson & Wiklund, 2001; Zahra et al., 2009), there is increasing recognition that observable strategic

behaviours – such as mobilising prior experience or actively engaging with external stakeholders – may offer stronger predictive power in understanding startup performance (Carter et al., 2019; de Mol, 2019). This is particularly relevant in the context of sustainability, where technological complexity, regulatory alignment, and investor scepticism create additional challenges for new ventures (Ghosh & Nanda, 2010; Ginsberg & Marcus, 2018).

Founders with prior managerial, technical, or sector-specific experience are more likely to anticipate risks, develop robust business models, and signal competence to stakeholders (Bocken, 2015; de Mol, 2019). At the same time, access to external networks – including investors, suppliers, mentors, and collaborators – can significantly enhance a startup's resource base (Aldrich & Zimmer, 1986; Batjargal, 2003; Elfring & Hulsink, 2007; Liao & Welsch, 2005).

Given the high capital requirements of sustainability startups and the urgency of sustainable innovation, understanding these mechanisms is essential. In this regard, the funding decision of capital providers (Franke et al., 2008; Shepherd & Zacharakis, 2002) and whether the funding objectives of the founders were met (Calic & Mosakowski, 2016) can serve as a valuable lens for identifying these factors.

To bridge the existing research gap, this study investigates how entrepreneurial experience and startups' networking relate to funding success among sustainability startups in Germany. To guide this research, we pose the following research questions:

> **Research Question 1 (RQ1):** *How do founders' backgrounds within sustainability – including professional, founding and educational experience – affect sustainability startups' funding success?*
>
> **Research Question 2 (RQ2)**: *How do startups' network characteristics – including size, strength, and embeddedness – affect sustainability startups' funding success?*

1.4 Purpose and Contributions

While public attention and policy incentives have increased interest in sustainability-driven ventures, the question of what determines their success remains largely unanswered. VCs and

other stakeholders face difficulties identifying promising opportunities in a field characterised by both financial and societal goals (Bocken, 2015; Randjelovic et al., 2003). This lack of clarity creates barriers not only to funding but to the broader scaling of sustainable innovations. In this context, the purpose of this study is to analyse how founders' experiences and startups' networks influence the funding performance of sustainability startups.

The study offers three distinct contributions. First, theoretically, it advances structural theories of entrepreneurial performance by examining the roles of human and social capital within the unique context of sustainability entrepreneurship. By doing so, it addresses the theoretical gap concerning how capital-based determinants function in sustainability-driven, capital-intensive ventures. Second, empirically, it provides novel quantitative data on 165 German sustainability startup founders. The unique empirical setting contributes to closing the research gap in sustainability entrepreneurship, enhancing understanding of these ventures within Europe's second-largest VC market (Crunchbase, 2025b). Finally, the study offers practical contributions by providing actionable insights for founders on how to leverage their experiences and networks effectively. Additionally, investors gain clear indicators for identifying promising startups, while entrepreneurial support organisations (ESOs) receive targeted recommendations to refine their support programs for sustainability-driven ventures.

1.5 Structure

This thesis is organised to progress systematically from the problem statement to the conclusion of practical implications. Section 2 constructs the theoretical foundation by integrating human and social capital theory with the emergent literature on sustainability-oriented entrepreneurship. This culminates in the formulation of six hypotheses that posit how founders' capabilities and startups' networks influence funding success. Section 3 justifies the empirical design employed to test these hypotheses, including the sampling strategy, the operationalisation of key constructs, and the econometric methods. Section 4 presents the analyses, including descriptive statistics, correlations, multicollinearity checks, and regression outputs, revealing effects of human and social capital on funding outcomes. Section 5 interprets these findings within the theoretical framework and reflects on limitations tempering the generalisability. Section 6 then synthesises the thesis by reiterating the core contributions to entrepreneurship and sustainability scholarship, derives recommendations for founders and investors, and identifies avenues for future research.

2 Theory and Hypotheses

This chapter provides the theoretical background and resulting hypotheses. Section 2.1 conceptualises sustainability startups in the context of entrepreneurship research. Section 2.2 defines environmental sustainability startups, focusing on their distinctive challenges related to technological uncertainty, market constraints, and resource scarcity in achieving scalable growth. Section 2.3 explores funding as a critical indicator of startup success, discussing factors such as investor uncertainty, information asymmetry, and structural barriers. Section 2.4 details the human capital theory linking founders' professional and founding experience as well as education with securing funding for sustainability startups and stating the hypotheses that will be analysed. Besides, section 2.5 outlines social capital theory as it applies to entrepreneurship, focusing on network structures, relational ties and embeddedness crucial for resource acquisition and funding success and stating the resulting hypotheses.

2.1 Sustainability Startups

Entrepreneurship plays a foundational role in identifying and exploiting opportunities that can lead to transformative change in both markets and society. The Schumpeterian school defines entrepreneurship as the act of creating market disequilibrium through innovation (Schumpeter, 1934, 1939), whereas Kirzner (1978) views entrepreneurs as alert individuals who discover and exploit inefficiencies. Building on both views, Shane & Venkataraman (2000) conceptualise entrepreneurship as the process of opportunity recognition and exploitation, a perspective adopted in this study.

Sustainable entrepreneurs pursue both economic and non-economic objectives. Their motivations often stem from a desire to influence or solve systemic social and environmental problems, including climate change, inequality, and resource scarcity (Bocken, 2015; Hoogendoorn et al., 2019). Unlike traditional entrepreneurs, they often see the firm as a means to generate benefit streams through the conservation and sustainable use of natural and human resources (Parrish, 2010). To succeed, sustainable entrepreneurs must possess a broad set of skills that enable them to manage complex trade-offs across multiple domains (Bocken, 2015). Ultimately, their goal is to balance economic viability, environmental stewardship, and social impact (Bocken, 2015; Shepherd & Patzelt, 2011).

Sustainable entrepreneurship, in particular, is rooted in the integration of social, environmental, and economic goals – commonly referred to as the *triple bottom line* (Elkington, 1997; Kuckertz & Wagner, 2010). The term describes entrepreneurial activities that contribute positively to sustainable development and long-term ecological and societal well-being (Kuckertz & Wagner, 2010; Shepherd & Patzelt, 2011). Through this lens, the entrepreneur is not only an innovator or arbitrageur, but also a change agent with the capacity to address systemic challenges such as climate change, poverty, and social inequality (J. K. Hall et al., 2010; Hoogendoorn et al., 2019; Parrish, 2010).

The triple bottom line approach, as proposed by Elkington (1999), offers a comprehensive framework for understanding how businesses can contribute to sustainable development. It suggests that successful ventures must account for three interconnected dimensions: economic viability, social equity, and environmental responsibility. The underlying logic is aligned with the Brundtland Report's definition of sustainable development as "development that meets the needs of the present generation without compromising the ability of future generations to meet their own needs" (Brundtland, 1987, p.16).

According to this view, entrepreneurship has the potential to drive sustainable development by fostering innovations that stimulate markets and shift societal behaviour toward more sustainable practices (Hall et al., 2010). This requires entrepreneurs to master and balance the demands of all three bottom lines: The *social bottom line* includes investments in human and social capital such as public health, education, and community well-being. Further, the *economic bottom line* is measured through physical and financial capital reflecting the venture's ability to maintain profitability and long-term economic sustainability. At last, the *environmental bottom line* refers to the preservation of natural capital – classified as critical, renewable, or substitutable – through environmentally responsible business practices. Each of these domains overlaps in what Elkington (1997) calls *shear zones*, where dilemmas and trade-offs frequently arise.

Various forms of entrepreneurship have emerged that prioritise outcomes beyond profit maximisation. Although distinct in scope, these entrepreneurial types converge in their pursuit of social and environmental value creation alongside economic returns. These include social entrepreneurship (Mair & Marti, 2006; Saebi et al., 2019; Santos, 2012), environmental entrepreneurship (Leendertse et al., 2021; Piwowar-Sulej et al., 2021; Schaltegger & Wagner,

2011), entrepreneurship for the public good (Vedula et al., 2022), and sustainable entrepreneurship (Dean & McMullen, 2007; Johnson & Schaltegger, 2020; Tiba et al., 2021). The terms social entrepreneurship, ecological sustainability entrepreneurship, and responsible entrepreneurship are often used interchangeably (Johnson & Schaltegger, 2020; Piwowar-Sulej et al., 2021; Terán-Yépez et al., 2020, 2020) as they share a common emphasis on addressing societal and environmental challenges through business innovation. Definitions of social entrepreneurship vary, with some limiting it to non-profit entities and others extending it to for-profit firms that prioritise social impact (Mair & Marti, 2006). Regardless of structure, social entrepreneurs typically value social impact over financial gain (Bacq & Janssen, 2011; Dacin et al., 2010; Zahra et al., 2009).

In contrast, environmental entrepreneurship emphasises solutions to ecological problems, often within for-profit ventures (Dean & McMullen, 2007; Hansen & Schaltegger, 2013; Gast et al., 2017; York & Venkataraman, 2010).

2.2 Environmental Sustainability Startups

Environmental sustainability is often operationalised through technologies that preserve natural resources and reduce ecological harm (Galdeano-Gómez et al., 2017; Hall & Helmers, 2013). Although there is no universally agreed-upon definition of environmentally friendly startups (Sdrolia & Zarotiadis, 2019), it can generally be said that they use technologies which produce either direct or indirect environmental benefits – ranging from emissions reduction to pollution mitigation and improved energy efficiency (Hall & Helmers, 2013).

In this study, environmental sustainability startups are coined as sustainability startups that develop or deploy technologies aimed at mitigating the negative environmental impacts of economic activity. These ventures may create direct benefits such as generating renewable energy, or indirect benefits such as reducing the ecological footprint of traditional business models (Hall & Helmers, 2013).

Startups that aim to tackle sustainability challenges operate under a set of conditions that differ fundamentally from those of traditional ventures. These differences manifest in both the nature of their business models as well as the environments in which they attempt to scale. Sustainability startups, particularly those focused on climate and green technology, are

frequently exposed to intensified forms of uncertainty, resource constraints, and capital requirements (Berger & Brem, 2016; De Lange, 2017; Randjelovic et al., 2003).These structural barriers significantly affect their likelihood of securing funding and achieving scalable growth.

A key distinguishing factor is the high degree of technological uncertainty associated with sustainability startups. Many operate in markets where either the technological solutions are still under development, or the infrastructure and policy frameworks required for implementation are not yet in place (Criscuolo & Menon, 2015; Ghosh & Nanda, 2010). These circumstances make forecasting returns difficult and investment decisions riskier compared to digital or service-based startups (Ginsberg & Marcus, 2018). Moreover, sustainability ventures are often involved in hardware-heavy innovations, such as renewable energy infrastructure, circular manufacturing systems, or food and agri-tech solutions, which require extended development timelines and significant upfront research & development (R&D) costs (Evans, 2018; Leendertse et al., 2021; Marra et al., 2015).

In addition to technological risks, market constraints also present ventures with serious challenges. Many sustainability startups operate in imperfect or failing markets, where sustainability benefits are not priced into the value chain and customers may lack purchasing power – especially in emerging economies (Hoogendoorn et al., 2019; Mair & Marti, 2006; Pinkse & Groot, 2015; Tiba et al., 2020). Sustainability innovations may clash with existing regulations, standards, or cognitive frames, further restricting market entry (Smink et al., 2015; Steinz et al., 2016). As a result, these startups often fail to align with traditional investor expectations or mainstream industry metrics, decreasing their visibility and perceived investability (Hockerts & Wüstenhagen, 2010; Juravle & Lewis, 2009).

Another structural challenge relates to resource scarcity. Startups typically lack the capital, legitimacy, and organisational infrastructure that established firms enjoy (Aldrich & Zimmer, 1986). In the case of sustainability startups, these deficits are amplified by their dual mission: to generate profit while creating environmental value. The result is a double burden in which entrepreneurs must convince stakeholders not only of their financial sustainability, but also of their impact potential – often in the absence of clear metrics or market demand (Bocken, 2015; De Lange, 2017).

Moreover, entrepreneurial uncertainty in this context often exceeds calculable risk. As Alvarez & Barney (2007) argue, early-stage ventures frequently operate in environments where not only the outcomes, but the goals themselves are unclear. Entrepreneurs must act without knowing what information they need, or who can provide it (Engel et al., 2017; McMullen & Shepherd, 2006). Under such ambiguity, strategic action has been described as chasing an invisible moving target (Huang & Pearce, 2015).

Despite the strategic relevance of these conditions, existing research often fails to provide adequate depth in understanding how sustainable startups navigate them. As Sandberg & Alvesson (2011) note, the field suffers from an overreliance on trait-based, decontextualised success models that obscure the dynamic and situational factors shaping entrepreneurial performance. A more grounded, context-sensitive approach is needed – one that accounts for how structural constraints shape both entrepreneurial behaviour and outcomes.

2.3 Funding Success of Sustainability Startups

As outlined in the introduction, achieving net-zero targets by 2050 requires annual investments in low-carbon and clean energy to reach between 4 and 7.4 trillion USD (IEA, 2021; IPCC, 2023; Simon et al., 2023). This implies a financial gap of three- to seven-fold. Lerner et al. (2018) and Kerr et al. (2014) have illuminated several factors contributing to funding gaps, especially for early-stage and innovative ventures, and the difficulties entrepreneurs face in obtaining capital.

Kerr et al. (2014) highlight that angel-funded ventures tend to experience better outcomes compared to those that are not funded, suggesting that access to early-stage financing can be pivotal for a startup's success. However, the study also indicates that even ventures with similar observable characteristics can have vastly different funding outcomes. This discrepancy underscores the role of subjective assessments and the challenges financiers face in evaluating potential investments. Furthermore, according to research, angel funding positively correlates with improved survival rates and growth metrics but does not necessarily guarantee access to subsequent financing rounds. This finding indicates that initial funding does not eliminate the challenges associated with securing additional capital (Kerr et al. 2014). Lerner et al. (2018) examine the role of angel investors across different national contexts. They find that in countries with less developed VC ecosystems, startups often face more

significant hurdles in securing funding, leading to pronounced funding gaps. This research emphasises the importance of a supportive financial infrastructure and the challenges that arise in its absence.

According to a report by Borderstep Institut (2024), while green startups in Germany typically find it easier to acquire customers, they frequently encounter greater difficulties in raising capital compared to non-green startups. Given these realities, access to funding emerges not only as a major obstacle but also as a meaningful and multi-dimensional indicator of startups' success. While traditional success measures, such as revenue growth, team size, or founder satisfaction, may offer useful insights, they are often subject to biases related to firm age, founder expectations, and industry norms (Chandler & Hanks, 1993; Witt, 2004). In contrast, funding outcomes provide a more objective and externally validated signal of a startup's perceived potential and viability (Miloud et al., 2012).

It is important to acknowledge that any objective measure of startup success, including funding, growth, or profitability, inevitably reflects the intentions and aspirations of the founders. Prior studies have shown that not all entrepreneurs seek to grow their businesses; for example, Davidsson (1989) found that in 40% of Swedish small firms, there was no growth intention due to concerns over employee well-being and control. Similarly, Smith (1967) highlighted differences in motivation between *profit-oriented* entrepreneurs and *independence-seeking* craftsmen. These findings suggest that variables such as intentions, experience, and identity may influence outcomes, and should be accounted for in empirical models of startup success.

In this study, however, we focus on sustainability startups that actively seek to grow, attract investment, and scale impact – ventures that are typically characterised by an orientation toward financial viability and resource acquisition. This assumption is particularly relevant in the context of sustainability and high-capital startups, which often require external funding and value growth to reach operational viability. As such, using funding as a success metric aligns with the structural constraints these ventures face (Franke et al., 2008; Sahlman, 1990) and with the resource-based view, which suggests that the accumulation and effective deployment of critical resources is central to firm performance (Miloud et al., 2012).

While VCs are commonly regarded as skilled evaluators of startup potential, funding decisions across all investor types, including angel investors, public grant bodies, and corporate backers, often hinge on similar criteria: team strength, technological potential, and market scalability (Franke et al., 2008; Shepherd & Zacharakis, 2002). As such, the success in securing funding, multiple funding rounds or goal-aligned funding objectives can be interpreted as a practical proxy for how well a venture performs under the structural constraints outlined above.

However, access to funding is not solely determined by the presence of promising ideas or credentials. Lin (2002, 2010) and Steier & Greenwood (2000) emphasise the importance of social capital for resource mobilisation, but point out that social capital alone does not guarantee resource mobilisation. Startups must not only possess access to valuable contacts but must also cultivate ties characterised by strength, relevance, and embeddedness.

In the context of this study, we assess startups success using three specific funding-related indicators: *total capital raised, achievement of funding objectives,* and *number of funding rounds completed*. These dimensions capture not only the venture's initial attractiveness to capital providers but also its ability to maintain investor confidence across multiple growth stages and the subjective perception of the founders as to whether the funding objectives have been achieved in the past.

2.4 Human Capital Theory

Entrepreneurial experience is widely recognised as a core factor influencing venture success. Drawing from human capital theory, this section outlines the theoretical and empirical foundations for understanding how founder backgrounds, especially in sustainability sectors, can shape funding outcomes.

Human capital theory (Becker, 1993) posits that individuals accumulate productive capacity through education, experience, and skill development, which in turn influences economic outcomes. Coleman (1988) extends this logic to entrepreneurship by arguing that human capital arises from personal changes that enable individuals to act in new ways. In the context of startups, this means that a founder's accumulated knowledge and abilities can enhance opportunity recognition, resource mobilisation, and venture performance (Anderson & Miller,

2003). The meta-analysis by Unger et al. (2011) reported a very weak positive relationship between human capital and entrepreneurial success.

Lee & Tsang (2001) confirmed that industrial and managerial experience had the strongest effect on venture growth, even more than education or personality traits. Similarly, Franke et al. (2008) found that professional experience, educational background, and founding history were among the top criteria used by investors to assess startup teams. Relevant job experience was particularly valued, as it signals relevant knowledge. This finding is consistent with Gompers et al. (2020), who reported that the most important evaluation criterion for VCs is the management team's quality, including ability, industry experience, and entrepreneurial background. Further, Ko & McKelvie (2018) found that founders' education and prior founding experience have strong positive effects on raising first-round financing, whereas in later funding rounds only the education signal remains powerful. This demonstrates the dynamic, stage-specific value of human capital signals.

Nevertheless, Demirel et al. (2019) caution that such criteria do not apply uniformly across sectors. In capital-intensive or regulated fields like healthcare or sustainability, investors often prioritise sector-specific experience over general credentials. This highlights the need for domain-sensitive evaluations, especially in the context of sustainability startups.

2.4.1 Professional Experience in Sustainability and Funding Success

The literature increasingly points to the positive relationship between founders' industry-specific experience and startup success. Agarwal et al. (2016) assessed that spinouts founded by larger, more experienced employee teams realise significantly higher post-entry performance, indicating that transferable specialist knowledge is a potent quality signal to investors. Entrepreneurs with prior experience are further more likely to anticipate technical or operational challenges, develop robust strategies, and secure investor confidence (Gompers et al., 2020; Wasserman, 2012). This is particularly relevant in the context of sustainability startups, which often involve technically complex products or processes. Compared to software or service ventures, sustainability startups face steeper learning curves and longer development cycles (Demirel et al., 2019). Sector-specific experience allows founders to understand regulatory hurdles, navigate specialised supply chains, and assess feasibility more accurately (Cassar, 2014).

On the contrary, Walsh (1995) argued that low industry experience can foster creativity or openness. Furthermore, Piva & Rossi-Lamastra (2018) examined entrepreneurs in equity crowdfunding campaigns and found that work experience, whether general or industry-specific, did not significantly influence the success of entrepreneurs in these campaigns.

The prevailing evidence, however, suggests that higher domain experience reduces critical risks and supports better opportunity evaluation, especially in environments of technological and regulatory uncertainty (Cassar, 2014; Wasserman, 2012). Therefore, we hypothesise:

> *Hypothesis 1a (H1a): Founders' professional experience in sustainability* ***increases*** *funding success of sustainability startups.*

2.4.2 Founding Experience in Sustainability and Funding Success

Prior founding experience is widely regarded as a valuable form of human capital that enhances an entrepreneur's capacity to navigate the complex realities of launching and growing a new venture. The absence of such experience is associated with a lack of familiarity with critical early-stage dilemmas – such as team formation, strategic planning, and managing risk (Wasserman, 2012). In contrast, founders with previous startup experience are better equipped to make informed decisions, avoid common pitfalls, and maintain momentum under conditions of uncertainty (Nahata, 2019).

Beyond operational capabilities, founding experience also shapes the entrepreneur's psychological resilience and risk posture. As shown by Politis & Gabrielsson (2007), entrepreneurs with prior experience often develop a more constructive attitude toward failure.

In sustainability-driven sectors, these challenges are magnified. Entrepreneurs face long development cycles, ambiguous market signals, and high capital intensity. Hoogendoorn et al. (2019) found that sustainable entrepreneurs are particularly more likely to experience heightened fear of failure, due to both market uncertainty and the dual mission of achieving environmental impact and financial returns. In this context, previous founding experience may not only reduce operational errors but also alleviate the psychological burden of failure, enabling founders to pursue ambitious, transformative goals with greater confidence.

Furthermore, sustainability ventures often require innovative problem-solving, interdisciplinary coordination, and scalable technology deployment. These demands should imply that founding experience in sustainability startups can play a decisive role in ensuring that teams are prepared to operate in complex and evolving environments. In line with the mentioned findings in entrepreneurship research, where experience has consistently been one of the strongest predictors of venture performance (Lee & Tsang, 2001), we therefore expect:

> *Hypothesis 1b (H1b): Founders' prior founding experience in sustainability* ***increases*** *funding success of sustainability startups.*

2.4.3 Education in Sustainability and Funding Success

While there are notable anecdotes of school drop-outs becoming highly successful entrepreneurs, the increasing complexity of the business environment suggests that education plays a critical role in entrepreneurial success. Cooper & Dunkelberg (1987) and Thompson (1987) found that entrepreneurs in their Canadian and U.S. American samples had a significantly higher level of education compared to the general population. This supports the argument that formal education provides entrepreneurs with the necessary tools to succeed in an increasingly complex and competitive world. Similarly, Robinson & Sexton (1994) found that entrepreneurs had higher levels of education than individuals in salaried employment, and their study also showed positive relationships between the level of education and earnings from self-employment. However, Buenstorf et al. (2017) show that although college drop-outs enter entrepreneurship at higher rates, their ventures do not outperform those of graduates once selection is controlled for. These findings indicate that education can influence both the probability of becoming an entrepreneur and the potential financial success in entrepreneurship.

Human capital theory argues that education contributes to the accumulation of explicit knowledge, enhancing individuals' cognitive abilities and thus their productivity and efficiency (Becker, 1993; Mincer, 1974; Schultz, 1959). Formal education, as part of this broader human capital, equips entrepreneurs with skills and knowledge that are often directly applicable to solving business challenges. Empirical research has shown that education can have a nonlinear effect on entrepreneurship success. Studies such as those by Bellu et al. (1990), Davidsson (1995), and Evans & Leighton (1990) demonstrate that education often

supports entrepreneurial activity, but its influence can vary depending on factors such as industry or entrepreneurial stage (Gimeno et al., 1997; Reynolds, 1997).

Research has also suggested that the returns to education in entrepreneurship are contingent on both industry type and the level of education attained (Bates, 1995; Honig, 1998). For male entrepreneurs, higher levels of education, such as a college degree or graduate studies, were particularly beneficial. In contrast, studies showed that female entrepreneurs derived greater benefit from education, emphasising its importance in facilitating their entrepreneurial success (Bates, 1995). Despite these general trends, the relationship between education and entrepreneurial success is not without its contradictions. For instance, Piva & Rossi-Lamastra's (2018) study on entrepreneurs in equity crowdfunding campaigns found that education – whether general or industry-specific – did not significantly influence the success of entrepreneurs in these campaigns.

While the existing literature generally supports a positive relationship between education and entrepreneurial activity, the impact of education is clearly not uniform. The specific context of the startup, such as the industry and technology, may shape the relevance of education to the venture's success. Thus, we presume:

> *Hypothesis 1c (H1c): Founders' educational experience in sustainability* ***increases*** *funding success of sustainability startups.*

2.4.4 CEO Sustainability Experience and Funding Success

In sustainability startups, securing funding is a critical milestone that often hinges on the central role of the CEO's specialised experience in the field. As discussed earlier, prior research grounded in human capital theory has emphasised that the accumulation of professional, educational, as well as founding experience is crucial for strategic decision-making and for signalling competence to investors. In the context of sustainability startups, the concentrated sustainability-specific human capital of the CEO may provide a potent signal of industry insight and legitimacy that is more influential in attracting funding than similar credentials dispersed among other founding team members (Hmieleski et al., 2015).

Consistently, Finkelstein & Boyd (1998) as well Pearce & Zahra (1991) found that the quality and specificity of a CEO's background substantially shape corporate outcomes. Moreover,

Calic & Mosakowski (2016) illustrate that a strong sustainability orientation can enhance funding success through increased project legitimacy and creative approaches to problem solving. In contrast, Hamori & Koyuncu (2015) found that in conventional corporate settings, prior CEO experience can sometimes negatively impact performance due to issues like negative learning transfer and misalignment with firm-specific requirements.

However, in the unique context of sustainability startups, the challenges of complex regulatory environments and rapid technological change may mean that the CEO's sustainability-specific expertise is especially valuable to investors. Moreover, Tzabbar & Margolis (2017) provide evidence that the effect of a founding team's human capital varies with the venture's stage of development and decision-making structure. This variability suggests that the concentrated influence of a CEO's specialised experience may be particularly salient during early funding rounds when investor uncertainty is highest. This leads to the following contingent hypothesis:

> *Hypothesis 2 (H2): The CEO's professional, educational, and founding experience in sustainability has a **more substantial positive influence** on funding success than similar experience among other positions within founding teams.*

2.5 Social Capital Theory

In addition to human capital, entrepreneurs rely heavily on social capital – the resources embedded within their networks and social structures. Social capital theory refers to the ability of actors to access and mobilise benefits from their social connections, memberships, and affiliations (Lin et al., 1981; Portes, 1998). It is a multidimensional concept that exists at both individual and organisational levels and has been broadly used to explain various processes within entrepreneurship, particularly resource acquisition and opportunity recognition (Nahapiet & Ghoshal, 1998).

Given its broad theoretical scope, it is essential to link the definition of social capital with its operationalisation, since it encompasses a variety of network processes and reciprocal relationships. Baron & Hannan (1994) define social capital as the set of tangible or virtual resources that accrue to actors through the social structure, facilitating goal achievement (see also Portes (1998)). In entrepreneurial terms, this refers to the people founders know, or who

are accessible through others in their networks, and who contribute to the attainment of entrepreneurial goals (Burt, 1995).

The importance of social networks to entrepreneurship is well established. Networks provide channels for accessing new knowledge about technologies and opportunities (Agarwal et al., 2010; Owen-Smith & Powell, 2004), influence entrepreneurial outlooks and skill formation (De Carolis & Saparito, 2006), and serve as conduits to essential resources such as financing (Shane & Cable, 2002). However, the effectiveness of these networks depends not only on their presence but on the pre-existing connections between entrepreneurs, investors, and key stakeholders, and the degree of trust that enables the sharing of scarce or sensitive resources (Kwon et al., 2013).

Entrepreneurs typically require information, capital, labour, and skills to initiate and grow a business. While they may possess some of these resources themselves, they often rely on their social ties to supplement what they lack (Aldrich et al., 1991; Aldrich & Zimmer, 1986; Cooper & Dunkelberg, 1987). These contacts – often informal and rooted in both professional and non-professional spheres – form the core of their social capital (Burt, 1995). Entrepreneurial networks can include colleagues, friends from previous jobs, advisors, or members of industry associations and support organisations (Hansen, 1995). Over time, these networks expand and deepen, enabling entrepreneurs to draw from them repeatedly and with increasing efficiency (Hansen, 2001).

Social capital is often operationalised through the identification of *network structures*, with network position and network size, as well as *relational ties*, including tie strength with respect to strong vs. weak ties and tie strength with respect to relationship quality (Semrau & Werner, 2014), that enable entrepreneurs to access key resources. Researchers have argued that social capital within network relationships is important for entrepreneurs' success in all stages of the founding process (Aldrich et al., 1987; Birley, 1985; Hoang & Antoncic, 2003; Stuart & Sorenson, 2007).

Early-stage funding often depends on personal networks, with family and friends acting as primary sources of initial capital (Bygrave et al., 2003; Ruef, 2010). As ventures mature, professional investors, including angel investors and VCs, tend to follow similar patterns: they are more likely to fund entrepreneurs with whom they share prior direct or indirect

relationships (Shane & Cable, 2002; Shane & Stuart, 2002). These relational ties facilitate information exchange during due diligence and improve investors' ability to advise and monitor the venture after funding (Bernstein et al., 2016; Sorenson & Stuart, 2001). However, the reliance on relational proximity in investment decisions can also lead to cognitive biases. VCs may overestimate the capabilities of founders they know, resulting in suboptimal returns (Bengtsson & Hsu, 2015; Gompers et al., 2016).

Prior research addressing the connection between entrepreneurs' network characteristics and their success has produced ambiguous results (Semrau & Werner, 2014). Therefore, in the following, we will focus on three critical dimensions of entrepreneurial networks and their impact on funding success. First, the factor *network size* reflects the number of contacts an entrepreneur maintains and serves as a proxy for potential resource reach. Larger networks allow entrepreneurs to access a broader range of information and potential partners (Greve & Salaff, 2003). Second, the factor *tie strength* from a relationship quality point of view refers to the intensity of a relationship. The existence of a relationship between two individuals does not mean that they will grant each other access to resources but instead, network relationships have to have a certain quality to make this happen (Adler & Kwon, 2002; Krackhardt et al., 1992; McFadyen & Cannella, 2004; Portes, 1998). Third, the factor *social embeddedness*, defined as "the nature, depth, and extent of an individual's ties into an environment, community, or society" (McKeever et al., 2014, p. 222), enhances trust and lowers transaction costs, thereby supporting enterprise development through more efficient access to network benefits (Dushnitsky & Shaver, 2009; Zane & DeCarolis, 2016).

When studying startups over time, it is difficult to keep a clear demarcation between individual and organisational social capital (Adler & Kwon, 2002). We regard our analysis as a test primarily of organisational rather than individual social capital.

2.5.1 Size of Startups' Networks and Funding Success

The structural characteristics of entrepreneurial networks, particularly network size, have received considerable attention in research on new venture success. When considering network size, a larger number of ties is generally associated with broader access to diverse resources, such as knowledge, capital, or client contacts (Aldrich et al., 1987; Liao & Welsch, 2005). The underlying assumption is that people vary in the type and number of resources

they control. Therefore, expanding startups' network increases the range of resources potentially available to the entrepreneurs (Greve & Salaff, 2003). These resources are not limited to information or strategic knowledge. Nascent entrepreneurs often rely on personal contacts, such as family and friends, for emotional support and initial resource access in the early stages of a venture (Brüderl & Preisendörfer, 1998; Elfring & Hulsink, 2003). As ventures develop, however, entrepreneurs must reach beyond pre-existing social ties to satisfy increasingly complex resource needs, such as legal counsel, access to funding, or technological expertise (Hite & Hesterly, 2001; Larson & Starr, 1993).

Despite its apparent advantages, network expansion does not necessarily lead to linear improvements in resource acquisition. While increasing the number of ties in a small network significantly raises the chances of accessing new resources, the marginal returns of additional ties tend to diminish as the network grows (Grandi & Grimaldi, 2003). This is due to rising redundancy – a larger network increases the likelihood that new contacts offer overlapping or duplicated resources, thereby lowering the incremental value of each new connection. However, even in the presence of redundancy, additional ties may still be useful in reducing dependency on any single contact, especially in the case of critical resources like capital (Reagans & Zuckerman, 2008). Accordingly, scholars suggest that larger networks tend to improve access to funding and support, though their incremental benefits decrease with scale (Batjargal, 2003; Greve & Salaff, 2003).

Yet, research addressing the effects of structural network characteristics on entrepreneurs' performance also fails to provide a clear picture (Hoang & Antoncic, 2003; Semrau & Werner, 2014). Contradictory findings may stem from differences in how networks are constructed, the maturity of ventures being studied, or context-specific factors such as industry norms and geographical proximity. There has been no research at all analysing the network characteristics of sustainability startups and in relation to their funding success.

Taken together, we expect that startups with larger networks are more likely to connect with potential funders, thereby improving their funding success. Yet beyond a certain threshold, additional connections may not yield proportionate gains. Thus, we hypothesise:

> *Hypothesis 3 (H3): There is a **positive but concave** relationship between a startup's network size and its funding success.*

2.5.2 Strength of Startups' Ties and Funding Success

In addition to the structural features of entrepreneurial networks, the quality of relationships captured by the concept of tie strength plays a critical role in determining how effectively entrepreneurs can access resources. Prior literature has emphasised the importance of having numerous ties for accessing diverse and nonredundant information (Ahuja, 2000; Baum et al., 2000; Cross & Cummings, 2004; Levin & Cross, 2004). Further research also highlights the importance of investing time and effort into developing high-quality ties that facilitate trust, reciprocity, and reliable support in the venture process (Adler & Kwon, 2002; Krackhardt et al., 1992; McFadyen & Cannella, 2004; Portes, 1998).

Network ties exist along a continuum from market-based to relational exchange, depending on the quality of the relationship – the extent to which a tie is rooted in mutual obligation and trust (Hennart, 1993). High quality ties can influence economic decisions, as entrepreneurs may prioritise the preservation of valued relationships over purely economic considerations (Granovetter, 1985; Portes & Sensenbrenner, 1993; Staber & Aldrich, 1995; Uzzi, 1996, 1997; Williamson, 1979). This also implies that high quality ties are governed through informal mechanisms, such as trust-based expectations and mutual understanding, rather than formal contracts (Bradach & Eccles, 1989; Macneil, 1977; Zaheer & Venkatraman, 1995).

Empirical findings confirm that high-quality relationships provide entrepreneurs with access to strategic opportunities and resources, including financial capital, knowledge, and partner networks (Anderson & Miller, 2003; Batjargal, 2003; Hite & Hesterly, 2001; Larson, 1992; Shane & Venkataraman, 2000). Through these relationships, entrepreneurs gain a vantage point to identify and refine opportunities that may not be visible to outsiders (Hennart, 1993; Jarillo, 1989; Powell & Smith-Dor, 1994), and to access resources that would otherwise be unaffordable or inaccessible via traditional market exchange (Dubini & Aldrich, 1991; Portes & Sensenbrenner, 1993; Starr & MacMillan, 1990).

Entrepreneurs often spend significant time identifying trustworthy partners, reconnecting with dormant contacts, or maintaining relationships that are critical for resource access (Granovetter, 1973; Nardi et al., 2003). Spending time together strengthens mutual trust and commitment, which in turn motivates network partners to grant access to resources under more favourable conditions (Krackhardt et al., 1992; McFadyen & Cannella, 2004; Steier &

Greenwood, 2000). Over time, such interactions also establish shared norms and common understandings that facilitate smoother communication and more efficient resource exchange (McFadyen & Cannella, 2004; Uzzi, 1997).

However, similar to findings on network size, the relationship between tie quality and resource access is not linear. Initially, improving a tie quality can significantly enhance the likelihood of accessing key resources. Yet, as relationship quality reaches a certain threshold, the marginal benefit of further time investment diminishes (Semrau & Werner, 2014). This could even result in additional efforts no longer enhancing resource availability or access.

In conclusion, what matters is not only the existence of a relationship, but its quality which determines how efficiently the relationship facilitates the exchange of capital, information, and opportunities. There may be limits of this effect; after reaching a threshold, additional efforts may no longer enhance resource availability or access. Accordingly, we expect:

> *Hypothesis 4a (H4a): There is a **positive but concave** relationship between a startup's network strength and its funding success.*

2.5.3 Strength of Startups' Ties to Specific Network Stakeholders and Funding Success

Sustainability startups are a highly heterogeneous group in terms of their goals, strategies, and organisational forms (Bergset & Fichter, 2015; Ebrahim & Rangan, 2014; Schaltegger & Wagner, 2011). Yet despite their diversity, these ventures face shared challenges (Hoogendoorn et al., 2019): market barriers, institutional barriers and capital intensity.

From a market perspective, sustainability startups often operate in imperfect or failing markets where public value is insufficiently reflected in prices (Hoogendoorn et al., 2019; Pinkse & Groot, 2015). This makes them less attractive to traditional investors (De Lange, 2017; Wüstenhagen & Teppo, 2006). Additionally, institutional barriers such as regulations and cognitive misalignment further reduce their ability to compete with conventional firms (Smink et al., 2015; Steinz et al., 2016). Sustainability startups typically have high burn rates due to long R&D phases and production setup costs (Bjornali & Ellingsen, 2014; Evans, 2018; Leendertse et al., 2021; Marra et al., 2015; Martin & Moser, 2016; Zhang et al., 2013). In

such environments, building and maintaining strong ties with key network stakeholders may be more critical than others to scale the startup.

Financial support networks (FSNs) include a diverse range of stakeholders such as VCs, CVCs, business angels, banks, and public investors. These actors not only provide funding but also business knowledge, strategic advice, and access to secondary networks (Clarysse et al., 2014; Clarysse & Bruneel, 2007; Ter Wal et al., 2016). VCs are particularly pivotal for transforming scientific innovations into scalable enterprises. They often work as coaches, supporting startups beyond mere capital provision (Moore & Wüstenhagen, 2004). Their embeddedness in both the financial and entrepreneurial subsystems gives them the ability to act as gatekeepers for funding access (De Clercq et al., 2006; Powell et al., 2005). Strong social ties – often mediated through introductions by other entrepreneurs or intermediaries – help reduce information asymmetries and build the trust necessary for risky investments (Engel et al., 2017; Fritsch & Schilder, 2008; Shane & Cable, 2002). Informal investors like friends and family rely heavily on trust within their social relationships to ensure proper use of their funds (Steijvers et al., 2010), while VCs align more structured evaluation criteria with personal referrals and shared social circles. This network-centric process is particularly relevant in the case of sustainable VC investments, which require balancing financial performance with environmental objectives (Bocken, 2015; Bürer & Wüstenhagen, 2009).

ESOs, including incubators, accelerators, and venture builders, serve as intermediary platforms designed to foster entrepreneurial success (Bergman & McMullen, 2022). ESOs support startups by facilitating access to business development resources, professional networks, and early-stage funding opportunities (Bergek & Norrman, 2008; Hansen et al., 2000). Incubators in particular offer not only physical infrastructure and one-on-one support, but also help startups establish ties to investors and mentors (Bank et al., 2017; Eveleens et al., 2017). Incubators help build network embeddedness by offering a socio-spatial structure where founders can construct opportunity-relevant relationships (Dutt et al., 2016; Sapsed et al., 2007). This facilitation of networks – rather than direct services – has become a defining feature of modern incubation models (Giudici et al., 2018; Harper-Anderson & Lewis, 2018). However, despite these benefits, studies have also shown that not all incubated startups outperform their non-incubated counterparts (Amezcua, 2010; Schwartz, 2013), raising questions about the consistent long-term impact of such support mechanisms.

Universities, research labs and knowledge institutions function as sources of innovation and provide startups with technological legitimacy. Social networks between these institutions and startups facilitate knowledge spillovers and link scientific advancement with entrepreneurial action (Owen-Smith & Powell, 2004). Startups often rely on such partnerships to access technical expertise, validate their innovations, and enhance credibility with funders (Powell et al., 2002).

Government and regulatory agencies also support these connections by removing institutional barriers and creating programs such as incubation spaces and networking events (Feldman & Francis, 2004).

Strategic alliances, meaning formal or informal partnerships with other firms, serve as critical ties enhancing a startup's legitimacy, resource base, and adaptability (J. A. C. Baum et al., 2000; Mitchell & Singh, 1996). Especially during environmental shocks, alliances with external partners increase firm survival, as firms with broader networks are less dependent on one actor (Singh & Mitchell, 1996). The process of alliance formation is strongly path-dependent, often based on prior relationships and trust (Gulati, 1995, 1999; Gulati & Gargiulo, 1999). Shared cultural understandings and institutional environments ease interfirm cooperation and normalise practices such as knowledge sharing and firm mobility (Gertler, 2003; Henry & Pinch, 2001), or act as barriers to this kind of activity (Saxenian, 1996; Staber, 2007).

Taken together, startups are embedded in a web of network stakeholders, including customers, suppliers, competitors, and the previously discussed actors, that differ in their roles, structures, and influence on resource acquisition. While each stakeholder group contributes to the development and scaling of a venture, high quality ties to FSNs, particularly to VCs, business angels, and related intermediaries, may be especially critical for the funding success of sustainability startups. Therefore, we posit:

> *Hypothesis 4b (H4b): A startup's network strength to financial support networks has a* ***more substantial positive impact*** *on its funding success than to other stakeholders.*

2.5.4 Geographic Embeddedness and Funding Success

Entrepreneurs and their ventures are embedded not only within social structures but also within geographical contexts, where proximity plays a central role in shaping the nature and impact of social interactions. Research showed that networks are often locally focused, with the strongest and most frequent ties being forged through repeated face-to-face interactions (Allen, 1984; Schutjens & Völker, 2010). These dense local networks generate a regional buzz, an ongoing exchange of knowledge and information, that entrepreneurs can tap into (Bathelt et al., 2004). This local concentration of economic and organisational activities (Folta et al., 2006), often referred to as a *cluster*, enhances knowledge spillovers, labour pooling, and the availability of specialised services (Audretsch & Feldman, 1996; Krugman, 1992; Porter, 1998; Pouder & John, 1996).

Social embeddedness, as a theoretical lens, explains how startups' ability to access and utilise resources is shaped by their positioning within a broader social and spatial structure (Johannisson et al., 2002; McKeever et al., 2014; Uzzi, 1999). This embeddedness involves a two-way developmental process between structure and agent (Johannisson et al., 2002; Lyons et al., 2012), whereby knowledge and experience are accumulated within their local environment, and where social relationships helping entrepreneurs thrive are established and sustained (McKeever et al., 2014; Zahra, 2007). Entrepreneurs not only absorb knowledge and experience within a socio-spatial context, but also actively interpret, navigate, and reframe their environment through agency (Fligstein, 2001). Local networks tend to evolve organically, driven by opportunities for interaction and the low cost of maintaining relationships in close proximity (Sorenson, 2018). The likelihood of meeting others, whether casually or through planned encounters, increases the closer individuals work to one another.

However, embeddedness again has its limitations. While local ties support trust and facilitate information exchange, over-embeddedness within a narrow, closed regional network can result in cognitive lock-in and reduced adaptability (Busch, 2014; Maurer & Ebers, 2006; Uzzi, 1996). Supporting this idea, Boschma (2005) argues that geographical proximity per se is neither a necessary nor a sufficient condition for learning and may even induce lock-in when excessive, implying a curvilinear rather than linear relationship between local embeddedness and venture performance. When startups depend too heavily on local actors, they risk being constrained by redundant ideas or missing out on external opportunities.

Furthermore, young clusters, such as in emerging industries including sustainability startups, may lack key institutional actors or diverse knowledge bases**,** limiting their effectiveness as comprehensive support systems (Al-Laham & Souitaris, 2008). At the same time, Lorenzen et al. (2020) further caution that intense international connectedness can crowd out local relational infrastructures and create local disconnectedness, underscoring the need for startups to balance global reach with place-based ties when seeking funding.

Taken together, empirical studies have consistently shown that moderately embedded firms outperform both poorly embedded and overly embedded ones. For instance, Uzzi (1996) found that apparel contractors with a balanced mix of strong and 'arm's-length' ties exhibited better economic performance than those operating exclusively through either close or distant relationships. These findings point to the importance of maintaining both local embeddedness and external connectivity, a dynamic balance that enables entrepreneurs to benefit from the trust and social capital of their community while also importing novel knowledge and resources from outside (Bathelt et al., 2004).

In sum, geographical network embeddedness contributes significantly to resource acquisition, particularly through dense local ties and repeated interactions. However, its value is contingent on achieving the right degree of openness and structural diversity within the local community. Therefore, we propose that startups with nationally embedded network relationships, rather than those limited to local, regional or international embeddedness, are more likely to achieve greater funding success:

> *Hypothesis 5 (H5): There is a* ***more substantial positive*** *relationship for startups with national network embeddedness on their funding success than for others.*

2.5.5 CEO-Led Network Mobilisation and Funding Success

In sustainability startups, the ability to tap into external resources often hinges on the founder who most visibly embodies the firm's vision, its CEO, activating personal ties to secure legitimacy and capital. In entrepreneurial contexts, CEOs occupy a unique position of managerial discretion and symbolic leadership, enabling them to bridge networks, span across different groups to provide novel information and access to external actors (Nahapiet & Ghoshal, 1998), more effectively than other co-founders (Finkelstein & Boyd, 1998).

Empirical studies showed that CEOs' social competence such as accuracy in perceiving others, impression management, and adaptability directly correlates with financial success through their ability to convert network contacts into tangible endorsements and referrals (Baron & Markman, 2003). In new ventures, CEOs' bridging social capital with external stakeholders such as investors, corporate partners, and research institutions amplifies the reach and credibility of funding appeals (Cao et al., 2015).

Moreover, when CEOs systematically mobilise their diverse ties throughout the venture's lifecycle – leveraging strong relational bonds for initial trust and weak ties for later-stage information – they facilitate the flow of referrals that lead directly to capital commitments (Chollet et al., 2014). This dynamic use of personal networks is further shown to enhance venture creation by heightening founders' cognitive biases like the illusion of control and risk propensity, which in turn drives more effective opportunity exploitation and resource acquisition (De Carolis et al., 2009; Hmieleski et al., 2015).

In contrast, when network mobilisation is decentralised among other co-founders, the absence of a single, visible champion can dilute external perceptions of legitimacy and slow funding progress (Stam & Elfring, 2008). Founding teams' demographic status and prior roles may supplement or substitute for network effects, but the CEO's concentrated social capital remains the most potent signal of venture quality to investors (Packalen, 2007).

Finally, regional social capital shapes entrepreneurs' capacity to launch ventures but is insufficient by itself – CEO-led mobilisation of personal networks is the critical catalyst for actual funding success (Jonsson & Lindbergh, 2013; Kleinhempel et al., 2022). Consequently, this reflects a governance structure in which the CEO's social capital becomes the principal catalyst for overcoming information asymmetries and resource constraints (Nahapiet & Ghoshal, 1998). Such CEO-led network activation is therefore expected to translate into superior funding success for sustainability startups. Consequently, we hypothesise:

> *Hypothesis 6 (H6): Startups in which the CEO as a co-founder has mobilised the most contacts throughout the startup's lifecycle have a **higher** funding success than those where this is not the case.*

Figure 1 summarises the study's conceptual framework, positing that founders' human capital (professional, founding and educational experience as well as CEO-specific experience in sustainability) and startups' social capital (network size, strength, embeddedness and CEO-led mobilisation) influence the overall funding success.

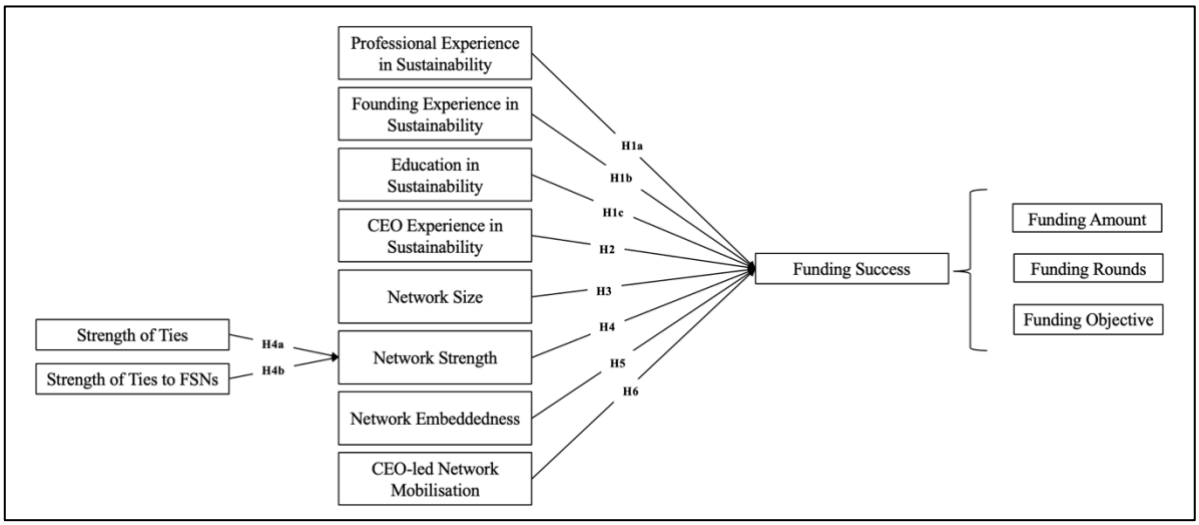

Figure 1: Schematic representation of the hypotheses

3 Methodology

The following section presents the research methodology intended to empirically test the relationships between founder and network characteristics and funding success among sustainability startups. Section 3.1 describes the deductive, quantitative research approach, employing a correlational design to systematically examine associations among defined theoretical variables through statistical analysis. Section 3.2 details the purposive sampling strategy used to identify relevant sustainability startups in Germany, leveraging multiple data sources to enhance sample robustness. Section 3.3 explains the online questionnaire utilised to collect primary data and outlines the measures employed to operationalise key theoretical constructs. Section 3.4 presents ethical procedures, including consent, anonymity, data confidentiality, and GDPR compliance. Section 3.5 identifies methodological limitations such as sampling bias, self-selection, visibility bias, and common method variance, while also outlining strategies employed to mitigate these issues. Section 3.6 explains the operationalisation and measurement of dependent, independent, and control variables, detailing how each was quantified for statistical analysis. Section 3.7 outlines the analytical method, detailing the data preparation process, coding schemes, interaction terms, and strategies employed to handle incomplete data.

3.1 Research Design

The study employs a quantitative, deductive research approach. Given the predefined hypotheses and the reliance on data collected via a structured survey, we follow a deductive reasoning framework, testing assumptions based on theory through empirical analysis. The deductive approach is appropriate to explain causal relationships between the variables by systematically evaluating their statistical associations (Bell et al., 2022). Through inferential statistical analysis, we aim to support or reject our proposed hypotheses, contributing to the theoretical understanding of funding success in sustainability startups.

A correlational research design is utilised to examine the relationships between founder characteristics, network characteristics, and startup funding success. This approach allows for identifying statistical associations between independent and dependent variables (Baron & Tang, 2009; Unger et al., 2011). While an experimental or longitudinal design could provide stronger causal inferences, these approaches were not feasible given the study's focus on real-

world entrepreneurial settings, where manipulating variables such as founder characteristics or network structures is impractical (Edmondson & McManus, 2007). Additionally, a purely descriptive study would not have allowed for hypothesis testing.

3.2 Sample Selection

We employed a non-probability sampling method, specifically purposive sampling, to identify sustainability startups in Germany. This technique was chosen due to the focus on a specific subset of startups – those engaged in sustainability-related industries founded since January 1, 2018 (Zahra & George, 2017). Specifically, a purposive sampling method was employed to target startups operating in sustainability-related industries – a method widely used when focusing on niche or sector-specific populations (Marshall, 1996) and well established in entrepreneurship research where representative frames are unavailable (Anderson et al., 2019). Germany constitutes an optimal empirical context because its mature sustainability-oriented entrepreneurial ecosystem (Borderstep Institut, 2024), coupled with our nationality-based linguistic and network advantages, affords access to startup founders and sufficient data.

The sampling frame was constructed using Crunchbase (2025a), filtering for startups across 21 sustainability-related industries, them being: Biofuel, Biomass Energy, Carbon Capture, Clean Energy, CleanTech, Energy Efficiency, Environmental Engineering, Geothermal Energy, Green Building, Green Consumer Goods, GreenTech, Hydroelectric, Natural Resources, Organic, Pollution Control, Recycling, Renewable Energy, Solar, Sustainability, Waste Management, Water Purification, Wildlife Conservation and Wind Energy. This resulted in a dataset of 545 startups which was retrieved on 21st February 2025. Founder's names were partially retrieved from Crunchbase and supplemented through North Data, yielding a total of 902 founders. The website North Data providing publicly available company information on owners and founders, was used to search for startup specific information (North Data, 2025).

Furthermore, the sustainability startup portfolios of two accelerators, one incubator, one foundation, one founder platform, and two venture capitals were used to further complete the list of sustainability startups established since 2018 and their respective founders and to ensure multiple information sources: Start Green (2025), the online information and networking

portal of the Borderstep Institute for Innovation and Sustainability dedicated to the green startup scene in Germany; Deutsche Bundesstiftung Umwelt (DBU) (2025), one of Europe's largest foundations supporting environmental projects; Smart Green Startup Accelerator (2025), Germany's largest accelerator focused on sustainable startups; Impact Factory (2025), Germany's leading incubator and accelerator for startups addressing social and environmental challenges; High Tech Gründer Fonds (HTGF) (2025), a public-private venture capital firm investing primarily in high-potential high-tech startups; Planet A (2025), an investment fund collaborating specifically with European green tech startups; RESPOND Accelerator (2025), a six-month accelerator program aimed at fostering responsible leadership and supporting startups transitioning towards a net-zero economy.

Relying on Crunchbase, portfolios of sustainability startups from ESOs, network organisation platforms and public registries aligns with best practices for building diverse, robust samples (Aldrich et al., 1989). Although purposive sampling may reduce generalisability (Coviello & Jones, 2004), it enhances alignment with our study goals by increasing inclusion of startups that match specific theoretical criteria (Aldrich et al., 1989).

3.3 Data Collection

To empirically investigate the relationships between founder characteristics, network attributes, and funding outcomes, this study employed primary data collection via a structured online questionnaire. This approach ensured alignment between the research questions and the specific constructs measured, thereby allowing for the development of precise operational definitions suited to the study's theoretical framework (Coviello & Jones, 2004; Zahra & George, 2017). While secondary data sources such as Crunchbase, portfolios of ecosystem facilitators, and public registries can offer financial or structural indicators, they often lack nuanced, founder-specific and network-based information required to test hypotheses involving subjective assessments and behavioural constructs (Aldrich et al., 1989). Further, while some startups had publicly available funding data through Crunchbase, others lacked such information; therefore, we relied only on self-reported funding data in the survey. This choice mitigates potential sample biases related to data availability, as emphasised by Podsakoff et al. (2003) regarding the risks of common method variance in organisational research. The full questionnaire is reproduced in Appendix A.

The survey was administered through the online survey platform Qualtrics. Key constructs, such as network strength and founder expertise in sustainability, were translated into quantifiable formats through Likert scales and categorical brackets. This translation of abstract theoretical concepts into measurable indicators aligns with established practice in entrepreneurship research (Anderson et al., 2019; Zahra & George, 2017), and facilitates statistical analysis while maintaining conceptual clarity (Coviello & Jones, 2004).

To maximise response rates and reach relevant participants, we contacted 820 founders directly through LinkedIn using personalised messages containing the survey link. These contacts were identified based on their affiliation with startups included in a curated Crunchbase dataset, filtered for the 21 sustainability-related industries. 82 individuals were excluded from outreach due to profile irrelevance or lack of contact data. In addition to the sustainability founders found on Crunchbase, 457 sustainability startups established since 2018 and their respective founders, were identified using the above-mentioned databases of sustainability startup portfolios (see Section 3.2). Again, these founders were contacted directly through LinkedIn. Furthermore, Impact Factory, Smart Green Startup Accelerator, Start Green and the dena (German Energy Agency, 2025), which calls for startups that are driving forward the energy transition through their Start-up Energy Transition Hub project, shared the survey with their founder networks via newsletters, LinkedIn posts, or on their website (see Appendix I). All respondents reached through these databases of sustainability startup portfolios received the identical survey including an initial screening question to ensure eligibility as founders of sustainability-oriented ventures established since 2018. A total of 181 survey responses were collected, of which 165 were deemed valid and fully completed. The final sample comprises 97 startup founders identified via Crunchbase (11.8% response rate), and 68 founders sourced from curated databases of sustainability-focused startup portfolios.

3.4 Ethical Considerations

This study follows strict ethical guidelines to ensure privacy, confidentiality, and voluntary participation. Due to the sensitive nature of the data, especially regarding startup founders' personal and financial information, ethical safeguards were implemented throughout the research process.

Participants received an information letter detailing the study's objectives, data handling procedures, and their rights before completing the survey. Participation was voluntary and respondents could withdraw at any time without consequence. Explicit consent was obtained through the voluntary completion of the survey. Personally identifiable information was only collected if explicitly provided by respondents. All collected responses were anonymised before analysis, ensuring data confidentiality and preventing individual association. Moreover, participants retained full control over their data with the right to access, correct, delete, or withdraw their responses at any time.

In line with the General Data Protection Regulation (GDPR) and institutional ethical standards (European Commission, 2016), data was collected via the GDPR-compliant survey platform Qualtrics, stored securely and accessible only to the research team. The research was reviewed by the Data Protection Services at the Norwegian Agency for Shared Services in Education and Research (Sikt), ensuring compliance with data processing requirements. All data will be permanently deleted upon the project's conclusion after June 1, 2025.

3.5 Methodological Limitations

To ensure the credibility of this research, this study adopts strategies designed to enhance reliability, validity, and generalisability, while systematically addressing common sources of research bias.

Reliability was addressed through using standardised survey instruments. Each item was formulated to align with established constructs and maintain consistency across responses. A pilot test involving a subset of participants was conducted prior to full distribution. This pre-test allowed for refinement in the wording, structure, and logical flow of the questions, thereby enhancing clarity. By reducing ambiguity and increasing internal consistency, the survey instrument met key criteria for reliable data collection (Saunders et al., 2015).

To secure *construct validity*, we operationalised abstract theoretical concepts, such as founder experience, network characteristics, and funding outcomes, using multiple indicators derived from prior research in entrepreneurship as well as social and human capital theory (Anderson et al., 2019; Arenius & Clercq, 2005). This multi-indicator design aligns with recommendations by Podsakoff et al. (2012), who emphasise that the use of diverse and

theoretically anchored items helps ensure that the measures truly reflect the underlying constructs being studied.

External validity was enhanced by sampling across a broad range of sustainability startups in Germany, covering 21 distinct industry categories within the environmental and clean-tech sectors. This diversity contributes to the generalisability of the findings, particularly within the sustainability entrepreneurship ecosystem (Zahra & George, 2017).

Self-selection bias, endemic to voluntary online surveys, was reduced through direct, personalised invitations sent via LinkedIn and the support of reputable ESOs, which increased participation rates and engaged a broader founder demographic (Rogelberg & Stanton, 2007; Anderson et al., 2019).

At the same time, contacting participants based on the information on Crunchbase introduced the possibility of *visibility bias:* startups and founders visible on professional platforms may possess above-average external orientation and resource access, potentially inflating observed network characteristics and funding levels. To counteract the visibility bias, the sampling frame was triangulated across multiple data sources. Next to Crunchbase, the study incorporated North Data and manual web searches to counterbalance the risk of visibility bias.

To reduce *source bias*, the study leveraged multiple databases and directories of ESOs next to Crunchbase, which enhances sample diversity and compensates for the limitations of any one dataset (Aldrich et al., 1989; Coviello & Jones, 2004).

Common method bias represents another key challenge in self-report research, particularly when the same respondents report both independent and dependent variables (Podsakoff et al., 2003). The questionnaire therefore imposed psychological separation between thematic blocks, interspersed Likert-type items, and avoided evaluative or leading language. Sensitive outcomes, e.g., funding amounts, were collected in categorical brackets, thereby limiting impression management tendencies associated with exact financial disclosure. These procedural remedies align with the recommendations by Steenkamp et al. (2010) for mitigating socially desirable responding (SDR) in entrepreneurial research. They noted that SDR can distort data in studies involving personal achievement or financial success. Our

study therefore deliberately avoided direct requests for exact performance measures and allowed respondents to remain anonymous.

Finally, the risk of *nonresponse bias* was addressed through multi-phase monitoring of survey distribution and feedback mechanisms. Drawing on Rogelberg & Stanton (2007), the study recognises that even high-quality surveys may suffer from unit-level bias if key subgroups are underrepresented. To address this risk, respondent characteristics were monitored throughout the collection period, and efforts were made to send out reminders to maximise the sample's heterogeneity. While residual bias cannot be completely eliminated, transparent acknowledgment of limitations and the application of recommended mitigation strategies help ensure that the study's research design remains robust and credible (Anderson et al., 2019).

3.6 Variables and Measures

3.6.1 Dependent Variables: Funding Success

Funding success in startup research is widely recognised as a multidimensional construct, reflecting the complex and varied pathways through which new ventures achieve financial sustainability and growth. The use of multiple indicators to capture funding success aligns with long-standing theoretical and empirical arguments that no single metric can sufficiently encapsulate the heterogeneous outcomes, goals, and stages of startup financing.

Begley & Boyd (1986) were among the first to emphasise the importance of using multiple measures to evaluate small business outcomes, arguing that entrepreneurs often pursue divergent goals – some oriented toward growth, others toward independence or stability. Smith & Miner (1983) noted that entrepreneurs differ in their aspirations, making a single success metric inadequate. Consistent with this view, Calic & Mosakowski (2016) highlight that entrepreneurial funding success cannot be adequately captured through a single outcome variable. Their study, examining how sustainability orientation affects funding outcomes, employs both the absolute amount of capital raised and goal achievement status as distinct dependent variables. Their empirical findings confirm that these dimensions are not redundant but rather reveal complementary facets of what constitutes funding success in early-stage ventures.

Building on Calic & Mosakowski (2016)'s approach, in this study the dependent variables aim to capture the multidimensional construct of funding success. Funding success was measured through self-reported funding amounts (FUND), the number of funding rounds secured (FUND_ROUNDS), and the extent to which their funding objectives (FUND_OBJ) were met in the past. The first indicator, total funding secured, is operationalised through self-reported categorical brackets ranging from *below €100,000* to *more than €50 million*. The brackets were chosen in alignment with the reported funding amount data of our Crunchbase sample. The second indicator, the number of funding rounds completed, allows respondents to report *zero* to *eleven* rounds, thereby reflecting the frequency of external investment engagement. The third indicator, funding objective attainment, assesses the extent to which startups met their pre-defined financing targets in prior rounds on a five-point Likert scale from *Always* to *Never*. Together, these three measures provide complementary perspectives on funding outcomes, integrating both quantitative magnitude and qualitative goal fulfilment.

3.6.2 Independent Variables: Human Capital and Social Capital

The key independent variables fall into two broad categories: founder characteristics and network characteristics. The methodological integration of founder-specific human capital variables and network attributes closely aligns with Hsu's (2007) analytical framework, which similarly examines the influence of founders' prior entrepreneurial experiences and social ties on venture outcomes, reinforcing the validity of our approach.

The independent variables related to human capital were derived from existing theories in related fields, which provided a suitable foundation for hypothesis development (e.g., a qualitative study by Bocken (2015)). Founder characteristics comprise (i) cumulative years of prior founding experience in sustainability ventures (FOUNDER_EXP) measured in five ordered brackets from *0 years* to *more than 10 years,* (ii) prior professional experience in sustainability-related positions (PROF_EXP) captured in six brackets from *0 years* to *more than 15 years* and (iii) prior formal education in sustainability (EDU_SUST) recorded as a binary variable (*Yes = 1; No = 0*). The founder's current executive role (CURR_ROLE) within the startup is classified into *CEO, COO, CTO, CFO, CMO, CPO, CSO,* or *Other*. These dimensions align with Unger et al.'s (2011) meta-analytic finding that human capital attributes, including education, experience, and task-specific skills, have significant, albeit modest, positive effects on entrepreneurial success. However, research notably lacks insights into human capital attributes specifically related to sustainability. Moreover, the inclusion

of professional experience and executive role reflects calls in the human capital literature to move beyond static indicators of education alone and to emphasise dynamic, task-related expertise (Tzabbar & Margolis, 2017; Unger et al., 2011).

Network characteristics are assessed through three dimensions. Following a similar approach as Semrau & Werner (2014), the number of relevant professional contacts (NET_CONT) is categorised into six groups ranging from *fewer than five contacts* to *more than fifty contacts* to measure network size. The network strength of these contacts for accessing finance, knowledge, and business partnerships (NET_STR) is derived based on the approach from Raz & Gloor (2007). However, instead of asking whether there is a 'weak, casual, or strong tie', network strength is rated on a five-point Likert scale from *Not at all important* to *Extremely important* for all network actors individually (CVCs, business angels, ESOs (accelerators and incubators), banks, government and regulatory agencies, academic institutions and research labs, business support services (lawyers, consultants, etc.), customers, suppliers, competitors, and other companies). This question conceptualises networking as a goal-directed activity (Engel et al., 2017; Porter & Woo, 2015) and is designed to reveal the startup's network strength to different stakeholders. The geographic embeddedness of network ties (NET_LOC) is also derived from Raz & Gloor (2007), but instead of measuring the distance from a centre, it is ranked ordinally from *local (within the same city or town)* through *regional (within the same state)* and *national (within Germany)* to *international (outside Germany)*. In addition, we include a binary indicator capturing whether the CEO serves as the primary mobiliser of the network connections (*Yes = 1; No = 0*) (CEO_NET).

3.6.3 Control Variables

To account for alternative explanations and reduce omitted-variable bias, demographic control variables were included. The control variable *gender (male, female, diverse)* was introduced because prior research indicates potential gender-specific barriers to entrepreneurial success, differences in the entrepreneurial process, and variations in the types of businesses initiated by male and female entrepreneurs (Langowitz & Minniti, 2007; Menzies et al., 2006; Murphy et al., 2007). *Age* (seven brackets from *under 20* to *70 and above*) was included due to two principal effects: first, older individuals generally have more extensive networks (Renzulli et al., 2000), and second, they tend to possess higher levels of human and financial capital. Consequently, older nascent entrepreneurs might rely less on external resources compared to their younger counterparts (Parker, 2004). The *highest*

educational attainment (*doctorate, master's degree, bachelor's degree, apprenticeship, higher education entrance qualification,* or *other*) was also included, as prior research highlights its significant impact on nascent entrepreneurs' overall success (Samuelsson & Davidsson, 2009; Van Gelderen et al., 2006). Additionally, education influences the volume of knowledge and information entrepreneurs require and can access through their network contacts (Diochon et al., 2008; Mosey & Wright, 2007; Yoo, 2000).

3.7 Data Analysis

3.7.1 Analytical Approach

Treating funding amount as a set of ranked categories necessitates an analytical technique that respects its ordinal nature while avoiding the unjustified assumption of equal monetary spacing between tiers. The cumulative-logit proportional-odds (PO) ordinal logistic regression (OLR) model fulfils this requirement by estimating the log-odds that an observation attains a category *j* or higher as a function of the predictors, thereby retaining the full ordering information and yielding consistent, efficient estimates for non-interval outcomes (Agresti, 2010; Harrell, 2015). OLR assumes (i) an ordered dependent variable, (ii) predictors that are either ordinal, binary, or interval-like, (iii) no multicollinearity, and (iv) proportional log-odds across response thresholds. In contrast, linear models would violate the measurement level and inflate Type I error rates whenever the intervals between categories are heterogeneous. Formally, the cumulative-logit specification is written as

$$\log\left[\frac{P(Y \geq j)}{P(Y < j)}\right] = \alpha_j + x\beta, \quad j = 1, \ldots, J-1$$

where a single slope vector β applies across all $J - 1$ cut-points. This PO constraint implies that each covariate exerts a constant multiplicative effect on the odds of occupying a higher funding tier irrespective of the threshold considered.

To minimise multicollinearity and ensure conceptual clarity, each theoretical proposition is evaluated in an independent OLR model that contains the focal predictor and a set of controls. As Harrell (2015) emphasises, tailoring the model design to a single scientific question prevents unnecessary variance inflation and enhances coefficient interpretability.

3.7.2 Data Preparation

All questionnaire responses were recoded into ascending integer categories to preserve their ordinal nature and to meet the coding requirements of OLR. The variable coding shown in Table 1 therefore enables consistent estimation of cumulative odds without imposing interval spacing.

Table 1: Variables Coding Scheme

Variables	Abbreviation	Response Option (Original Wording)	Variable Coding
Funding Variables – Dependent			
Funding Amount	*FUND*	*< €100k / €100k–€500k / €0.5–1 m / €1–5 m / €5–10 m / €10–50 m / >\€50 m*	1–7
Funding Rounds	*FUND_ROUNDS*	*0 – 11 rounds*	0–11
Funding Objective	*RUND_OBJ*	*Never / Rarely / Sometimes / Often / Always*	1–5
Founder Variables – Independent			
Founder Experience in Sustainability	*FOUND_EXP*	*0 / 1-2 / 3-5 / 6-10 / >\10*	*1–5*
Professional Experience in Sustainability	*PROF_EXP*	*0 / 1-2 / 3-5 / 6-10 / 11-15 / >\15*	*1–6*
Education in Sustainability	*EDU_SUST*	*No / Yes*	*0–1*
Current Role in Startup	*CEO_NONCEO*	*Non-CEO / CEO*	*0–1*
Network Variables – Independent			
Network Contacts	*NET_CONT*	*<5 / 5-10 / 11-20 / 21-30 / 31-40 / 41-50 / >\50*	*1–7*
Network Strength[1]	*NET_STR*[1]	*Not at all – Extremely*	*1–5*
Network Location	*NET_LOC*	*Local – International*	*1–4*
CEO Mobilised Network	*CEO_NET*	*No / Yes*	*0–1*
Control Variables			
Gender	*GENDER*	*Male / Female*	*0–1*[2]
Age	*AGE*	*<20 / 20-29 / 30-39 / 40-49 / 50-59 / 60-69 / ≥70*	*1–7*
Highest Level of Education	*EDU_LEVEL*	*General Higher Education Entrance Qualification – Doctorate*	*1–5*

To satisfy the requirements of the OLR model while preserving the conceptual hierarchy of each construct, all survey measures were systematically recoded onto ordered numeric scales. Specifically, every ordinal item (funding amount, funding objective, founder experience, professional experience, network contacts, network importance, network location, age and

[1] The network strength is considered with respect to each network stakeholder, from corporate venture capitalists (NET_STR_CVC), business angels (NET_STR_BA), entrepreneurial support organisations (NET_STR_ESO), banks (NET_STR_BNK), government and public agencies (NET_STR_GOV), academic institutions and research laps (NET_STR_AC), business support systems (NET_STR_BSS), customers (NET_STR_CUST), suppliers (NET_STR_SUP), competitors (NET_STR_COMP), to other companies (NET_STR_OTH). The overall network strength is the mean of the individual network strengths to the different stakeholders (NET_STR_AVG).

[2] Responses *Diverse* and *Prefer not to say* were treated as missing and handled with pair-wise deletion in models that included gender.

education level) was mapped to an ascending integer series whose values monotonically increase with the underlying attribute.

Binary indicators, such as CEO network mobilisation, education in sustainability, current role, and gender, were dummy-coded (0 = reference/1 = focal). Responses lacking an inherent rank order (*Diverse*, *Prefer not to say*, *Other* in education) were treated as missing rather than forced into the ordinal continuum to avoid violating the PO assumption (Agresti, 2010).

To test H2, three interaction terms were computed: the product of the CEO binary indicator with founding experience in sustainability (FOUND_EXP x CEO_NONCEO), with professional experience in sustainability (PROF_EXP x CEO_NONCEO), and with sustainability education (EDU_SUST x CEO_NONCEO).

To test H4b, we constructed two composite predictor variables that summarise the strength of a venture's stakeholder ties. NET_STR_FIN is defined as the average tie strength to CVCs, business angels, and commercial banks. NET_STR_NONFIN is operationalised as the average tie strength to all remaining stakeholder categories: ESOs, governmental and regulatory bodies, academic institutions, business support services, customers, suppliers, competitors, and other companies. Comparing the effects of these indices enables a direct test of whether financial ties exert a stronger influence on funding success than non-financial stakeholder ties.

To evaluate H5, three mutually exclusive binaries NET_LOC_LOC (Most contacts are located in the founder's city/town = 1, otherwise = 0), NET_LOC_REG (Most contacts are within the founder's federal state = 1, otherwise = 0), and NET_LOC_INT (Most contacts are outside Germany = 1, otherwise = 0).

Due to incomplete responses on some survey items, we utilised pairwise deletion to retain the maximum available data for each analytical model. We are confident that missing data was not systematically biased in relation to outcome variables, as most participants provided complete responses. Specifically, only five participants did not answer the question on funding objective, three did not report the number of funding rounds, one did not mention the funding amount, and two did not state the network strength to other companies (see Table 2).

4 Findings

This chapter presents the key findings of our empirical research. Section 4.1 outlines the key demographic, founder, and startup characteristics, summarising the distribution and central tendencies of the dependent, independent and control variables as well as significant correlations between variables. Section 4.2 reports the ordinal-logit regression analyses used to test hypotheses, detailing the predictive power and statistical significance of variables related to founders' experience and startups' network characteristics on funding success.

4.1 Descriptive Statistics

To illustrate the demographic characteristics presented in section 4.1.1 as well as the data related to the funding variables presented in section 4.1.2, the frequency distributions are highlighted in Appendix B and Appendix C respectively. The findings of the descriptive statistics are based on information in Table 2.

4.1.1 Control Variables

The sample consists mainly of male participants, who account for 89.7% of the total 165 respondents, with females representing 9.1%. A small fraction (0.6%) preferred not to disclose their gender, and there were no missing responses. The majority of respondents are aged between *30-39 years* (44.2%), followed by those in the *40-49* age range (25.5%). Those aged *20-29* and *50-59* each represent 12.1% of the sample, while only 5.5% are in the *60-69* group. A small percentage (0.6%) are aged *70 or above*.

The respondents are highly educated with 57.6% holding a *Master's degree or a Second State Examination*, and 23.6% having a *Doctorate*. Additionally, 11.5% have a *Bachelor's degree or First State Examination*, while 3.0% hold an *Apprenticeship* or *General Higher Education Entrance Qualification*.

The most common current role is *CEO*, representing 58.2% of the sample. Other roles include *CTO* (13.3%), *COO, CPO* (5.5% each), and *CFO, CMO, CSO* (ranging from 1.2% to 3.6%). A notable portion of participants (9.7%) reported holding *Other* roles (see Appendix B).

4.1.2 Dependent Variables

With respect to funding amounts, 10.30% of participants raised between *€10 million and €50 million*, while only 1.8% secured *more than €50 million*. Additionally, 7.88% raised *between €5 million and €10 million*, and the largest proportion of 30.91% in the sample raised *between €1 million and €5 million*. A further 12.73% raised between *€500,000 and €1 million*, 13.94% raised *between €100,000 and €500,000*, and 21.82% raised *less than €100,000*, making this the second largest group. Only one participant, 0.61%, chose not to disclose the amount of funding raised. The funding amount variable has a mean of 3.27, suggesting that the mean funding range lies between *1* and *5 million* Euro. The associated standard deviation of 1.67 indicates a moderate spread of funding amounts across the sample.

Startups in the sample have completed approximately 1.48 funding rounds on average, with values ranging from zero to five rounds. More precisely, 37 startups (22.4%) did not go through any funding round at all. Nevertheless, they were able to secure initial capital to launch their ventures. Specifically, 27 (72.97%) of these startups raised *less than €100,000*, six secured *between €100,000 and €500,000*, and the remainder obtained funding *exceeding €500,000*. Follow-up responses by some founders indicated that their funding sources included public grants, personal bootstrapping, financial support from friends and family, as well as bank loans.

Furthermore, the variable representing the attainment of funding objective shows a mean value of 3.63, suggesting that founders typically reported meeting their original funding goals between *Sometimes* and *Often* (see Appendix C).

4.1.3 Independent Variables

Examining the founder's human capital, founders report on average around one year of prior founding experience specifically within sustainability startups. Prior professional experience in sustainability is notably higher, averaging approximately three years. Educational background in sustainability, however, appears limited, only around 39% of the founders have education related to sustainability, while the majority have no education in this domain.

The sample provides a solid empirical foundation to investigate whether the CEO's professional, founding, and educational experience in sustainability exerts a stronger positive

influence on funding success compared to similar experience held by other founders since the variable considering the current role in the startups indicates that 58% (∅ 0.58) of founders in the sample currently serve as CEO of their startup.

The social capital of the sample demonstrates a high degree of engagement with diverse stakeholder groups. On average, startups report around 30 active network contacts (∅ 4.16), reflecting an active approach to relationship-building and external engagement.

The variable capturing the geographical scope of the startup's network indicates that most startups maintain networks that extend beyond the *Local* and *Regional* levels and lean toward *National* embeddedness.

Founders rated the strength of their startups networks to VCs and business angels as at least *Moderately important*. ESOs, Government and regulatory agencies, academic institutions and research labs, and business support services were also close to *Moderately important*. However, banks received a somewhat lower rating of at least *Slightly important*. Among all stakeholder groups, customers were rated as the most important, with a mean score of 4.55, pointing towards *Extremely important*, highlighting the centrality of demand-side relationships for startup success. The network strength to competitors and other companies were evaluated somewhat lower, falling between *Slightly* and *Moderately important*. However, suppliers were evaluated between *Moderately* to *Very important*. Overall, founders perceived their startups networks across all stakeholder groups as being, on average *Moderately important* in providing access to critical resources such as finance, knowledge, and business partnerships.

The variable reflecting whether the CEO is perceived as the primary founder responsible for mobilising the majority of the startup's network contacts over its lifecycle has a mean of 0.74. This indicates that 74% of the respondents agreed that the CEO played a leading role in developing and maintaining the startup's network, neutralising those where it is not applicable since they are a solo founder or the CEO itself is not a founder.

Importantly, the results of the Shapiro-Wilk tests reveal that most variables – with the exception of average network strength – significantly deviate from normality ($p < 0.001$ for most measures), indicating non-normal distributions across the sample (see Table 2).

Table 2: Descriptive Statistics

	n	Missing	M	SD	Skewness	Std. Error of Skewness	Kurtosis	Std. Error of Kurtosis	Shapiro-Wilk	p-value of Shapiro-Wilk	Min	Max
FUND	164	1	4.73	1.677	-0.150	0.190	-0.910	0.377	0.912	< .001	1.000	7.000
FUND_ROUNDS	162	3	1.48	1.202	0.718	0.191	0.285	0.379	0.890	< .001	0.000	5.000
FUND_OBJ	160	5	3.63	1.311	-0.596	0.192	-0.805	0.381	0.857	< .001	1.000	5.000
FOUNDER_EXP	165	0	1.84	1.316	1.352	0.189	0.482	0.376	0.672	< .001	1.000	5.000
PROF_EXP	165	0	2.91	1.807	0.420	0.189	-1.179	0.376	0.853	< .001	1.000	6.000
EDU_SUST	165	0	0.39	0.489	0.464	0.189	-1.806	0.376	0.618	< .001	0.000	1.000
CEO_NONCEO	165	0	0.58	0.495	-0.335	0.189	-1.911	0.376	0.627	< .001	0.000	1.000
NET_CONT	165	0	4.16	2.024	0.287	0.189	-1.325	0.376	0.867	< .001	1.000	7.000
NET_STR_CVC	165	0	3.07	1.375	-0.121	0.189	-1.224	0.376	0.893	< .001	1.000	5.000
NET_STR_BA	165	0	3.08	1.311	-0.131	0.189	-1.131	0.376	0.902	< .001	1.000	5.000
NET_STR_ESO	165	0	2.92	1.177	0.120	0.189	-0.833	0.376	0.915	< .001	1.000	5.000
NET_STR_BNK	165	0	2.21	1.193	0.606	0.189	-0.810	0.376	0.846	< .001	1.000	5.000
NET_STR_GOV	165	0	2.82	1.199	0.022	0.189	-0.936	0.376	0.911	< .001	1.000	5.000
NET_STR_AC	165	0	2.74	1.209	0.179	0.189	-0.884	0.376	0.910	< .001	1.000	5.000
NET_STR_BSS	165	0	2.99	1.163	-0.023	0.189	-0.799	0.376	0.917	< .001	1.000	5.000
NET_STR_CUST	165	0	4.55	0.822	-2.112	0.189	4.281	0.376	0.601	< .001	1.000	5.000
NET_STR_SUP	165	0	3.41	1.302	-0.434	0.189	-0.868	0.376	0.886	< .001	1.000	5.000
NET_STR_COMP	165	0	2.67	1.066	0.228	0.189	-0.660	0.376	0.907	< .001	1.000	5.000
NET_STR_OTH	163	2	2.49	1.108	0.219	0.190	-0.707	0.378	0.894	< .001	1.000	5.000
NET_STR_AVG	165	0	2.99	0.553	-0.359	0.189	-0.088	0.376	0.985	0.066	1.270	4.180
NET_LOC	165	0	3.13	0.729	-0.690	0.189	0.618	0.376	0.799	< .001	1.000	4.000
CEO_NET	165	0	0.74	0.439	-1.117	0.195	-0.763	0.387	0.545	< .001	0.000	1.000
GENDER	163	2	0.09	0.290	2.849	0.190	6.193	0.378	0.326	< .001	0.000	1.000
AGE	165	0	3.56	1.067	0.732	0.189	0.219	0.376	0.879	< .001	2.000	7.000
EDU_LEVEL	163	2	3.97	0.871	-1.360	0.190	2.788	0.378	0.769	< .001	1.000	5.000

4.1.4 Correlations

To ensure the validity of the regression analysis results, it is necessary to verify that strong correlations between independent variables and multicollinearity are absent, as they may affect the accuracy of the estimations (Heumann & Shalabh, 2016; Uyanık & Güler, 2013). This will be picked up on in this and the next subsection.

As the data is ordinal, it violates the assumptions required for parametric testing (see Table 2). To analyse non-parametric variables, the Spearman's ρ correlation coefficient is used (Saunders et al., 2015). The following paragraphs highlight insights of Table 3.

As expected, there is a strong positive correlation between the dependent variables funding amount and funding rounds ($r = 0.648$, $p < .001$). However, the correlation between funding amount and funding objective is positive but weaker ($r = 0.270$, $p < .001$), and there is no significant positive relationship between funding rounds and funding objective ($r = 0.130$, $p = .104$). Due to the strong positive correlation of funding amount and funding rounds and similar relationships with independent and control variables and the fact that 37 startups (22.4%) had zero funding rounds, the following analysis will focus solely on the dependent variables funding amount and funding objective.

Further, the human capital variables – prior professional experience, prior founding experience, and education in sustainability – show either weakly positive or weakly negative correlations with the three dependent variables, none of which are statistically significant. Notably, prior professional experience in sustainability and prior founding experience in sustainability are strongly and significantly correlated ($r = 0.501$, $p < .001$), with a weaker but still significant correlation between prior professional experience and education in sustainability ($r = 0.185$, $p < .05$).

Additionally, there is a positive and significant correlation between a participant being a CEO and both prior professional experience in sustainability ($r = 0.191$, $p < .05$) and prior founding experience in sustainability ($r = 0.224$, $p < .01$). However, funding amount are negatively and significantly related to a participant being a CEO ($r = -0.168$, $p < .05$). In contrast, funding objective is weakly positive and not significantly correlated with a participant being a CEO ($r = 0.048$, $p = .549$).

Table 3: Correlation Matrix

Variable	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.	17.	18.	19.	20.
1. FUND	—																			
2. FUND_OBJ	**0.270*****	—																		
3. FUND_ ROUNDS	**0.648*****	0.130	—																	
4. FOUND_ EXP	-0.022	-0.119	-0.045	—																
5. PROF_EXP	0.037	-0.016	-0.001	**0.501*****	—															
6. EDU_SUST	0.029	0.071	-0.025	-0.066	**0.185***	—														
7. CEO_ NONCEO	**-0.168***	0.048	**-0.234****	**0.224****	**0.191***	-0.006	—													
8. NET_CONT	**0.259*****	**0.276*****	0.130	-0.095	0.015	0.063	0.064	—												
9. NET_STR_ AVG	**0.188***	-0.006	**0.176***	-0.016	**0.168***	0.118	0.030	**0.244****	—											
10. NET_STR_ FIN	**0.325*****	-0.028	**0.278*****	-0.016	0.053	-0.023	-0.076	**0.214****	**0.592*****	—										
11. NET_STR_ NONFIN	0.096	0.014	0.079	-0.025	0.150	0.130	0.076	**0.224****	**0.896*****	**0.207****	—									
12. NET_LOC	**0.292*****	-0.010	-0.116	-0.100	-0.131	0.016	-0.069	-0.084	-0.051	-0.152	-0.002	—								
13. NET_LOC_ LOC	-0.064	-0.029	0.030	0.009	0.004	0.004	-0.137	-0.118	**-0.171***	-0.092	**-0.176***	**0.331*****	—							
14. NET_LOC_ REG	**-0.258*****	-0.008	**-0.223****	0.046	-0.059	-0.053	0.036	-0.106	-0.043	**-0.164***	0.027	**0.573*****	-0.064	—						
15. NET_LOC_ NAT	-0.020	0.015	0.088	**-0.180***	-0.095	0.077	-0.034	0.097	0.100	0.062	0.086	**0.346*****	**-0.194***	**-0.395*****	—					
16. NET_LOC_ INT	**0.224****	-3.004×10^{-4}	0.046	**0.158***	0.142	-0.048	0.062	0.013	-0.015	0.080	-0.045	**-0.891*****	-0.118	**-0.241****	**-0.733*****	—				
17. CEO_NET	**-0.161***	-0.058	-0.087	0.049	0.084	-0.076	**0.391*****	0.008	-0.043	-0.064	-0.037	0.039	-0.059	0.103	-0.024	-0.020	—			
18. GENDER	0.025	-0.125	0.152	0.044	0.142	0.005	0.011	0.029	**0.169***	0.062	0.142	-0.012	0.066	-0.116	0.073	-0.024	-0.037	—		
19. AGE	0.066	-0.099	0.068	**0.419*****	**0.485*****	-0.147	**0.250*****	0.065	0.075	0.025	0.071	**-0.161***	-0.057	-0.044	-0.109	**0.168***	0.045	0.121	—	
20. EDU_ LEVEL	0.084	0.075	-0.067	0.040	**0.233****	**0.431*****	-0.077	0.082	0.096	-0.044	0.082	**-0.154***	0.036	-0.095	-0.102	**0.164***	-0.134	0.032	0.121	—

* p < .05, ** p < .01, *** p < .001

The matrix for the social capital variables also reveals a significant positive correlation for size of network contacts with funding amount ($r = 0.259$, $p < .001$) and funding objective ($r = 0.276$, $p < .001$). The network strength of startups' network contacts shows a positive and significant correlation with funding amount ($r = 0.188$, $p < .05$) but a very weak, negative, and non-significant correlation with funding objective ($r = –0.006$, $p = .939$). The size of network contacts shows a positive and significant correlation with the network strength of startups' network contacts ($r = 0.244$, $p < .01$).

It is important to point out that there is a positive and significant correlation between funding amount and the network strength to financial stakeholders ($r = 0.325$, $p < .001$), like CVCs, business angels, ESOs, banks, and a weaker positive. For funding objective, the correlation network strength to financial stakeholders is slightly negative and non-significant ($r = -0.028$, $p = .725$). More precisely, there is a positive correlation between funding amount and the network strength to venture capitalists ($r = 0.436$, $p < .001$). However, for funding objective, the correlation with network strength to venture capitalists is positive but not significant ($r = 0.046$, $p = .564$) (see Appendix D).

Additionally, the correlations of network strength to all non-financial stakeholders with the dependent variable objective is very weakly positive and non-significant ($r = 0.014$, $p = .858$). Further, the correlation of funding amount and network strength to all non-financial stakeholders is weakly positive and non-significant ($r = 0.096$, $p = .223$). Furthermore, the correlation of the network strength to financial stakeholders and the network strength to non-financial stakeholders is positive and significant ($r = 0.207$, $p < .01$).

It is important to highlight that there is a significant and positive correlation between the network strength among venture capitalists and business angels ($r = 0.333$, $p < .001$), as well as between business angels and entrepreneurial support organisations (such as incubators and accelerators) ($r = 0.354$, $p < .001$). Entrepreneurial support organisations also show positive correlations with research labs or academic institutions ($r = 0.308$, $p < .001$) and government or regulatory agencies ($r = 0.263$, $p < .001$) (see Appendix D).

Furthermore, funding amount is positively and significantly correlated with the geographical scope of the network ($r = 0.292$, $p < .001$). However, the correlations for funding objective with the geographical scope of the network is weakly positive and non-significant ($r = 0.010$,

p= .896). However, the correlation matrix reveals that there is a positive and significant positive correlation of regional and international network embeddedness and funding amount ($r = 0.258$, $p < .001$) and ($r = 0.224$, $p < .01$). Funding objective does not support any significant positive nor negative correlations with geographic embeddedness.

Notably, the variable indicating that the CEO has mobilised the most network contacts shows a negative correlation with funding amount ($r = -0.161$, $p < .05$) and funding objective ($r = -0.058$, $p = .481$), although it is only significant for funding amount. However, there is a moderate and significant positive correlation between a participant being a CEO and the statement that the CEO has mobilised the most network contacts for the startup ($r = 0.391$, $p < .001$).

Finally, the control variable age is positively and significantly correlated with prior professional ($r = 0.485$, $p < .001$) and founding experience ($r = 0.419$, $p < .001$) in sustainability but shows a negative and non-significant correlation with education in sustainability ($r = -0.147$, $p = .060$). Notably, the education level is positively and significantly correlated with education in sustainability ($r = 0.431$, $p < .001$) and shows a weaker but still significantly positive correlation with prior professional experience in sustainability ($r = 0.233$, $p < .001$). However, its correlation with prior founding experience is weak and non-significant ($r = 0.040$, $p = .616$).

4.1.5 Collinearity

Collinearity arises when two or more independent variables exhibit strong correlations, such that the values of one variable can largely predict the values of another. In these instances, changes in one variable may systematically induce changes in another, potentially resulting in unstable or biased parameter estimates within the regression model (Harrell, 2015; Johnston et al., 2018). The presence of substantial collinearity raises concerns regarding the validity of the conclusions drawn from the regression analysis, as it diminishes the precision of the estimates (Salmerón et al., 2018). To evaluate the extent of collinearity, the Variance Inflation Factor (VIF) is employed, following the recommendation of Uyanık & Güler (2013). For studies with smaller samples, a conservative VIF threshold of 2.5 is applied (Braun & Yuan, 2007; Johnston et al., 2018).

In this study, the highest observed VIF across all variables, except for the interaction terms, was 1.749, indicating that multicollinearity was not a concern and the lowest observed tolerance value of 0.572, which means that 57.2% of its variance was unique and not shared with other predictors. The overall pattern of even lower VIFs and higher tolerances suggest that no variables, except for the interaction terms, needed to be excluded from the regression models due to multicollinearity concerns. However, the interaction terms, CEO x prior founding experience in sustainability and CEO x prior professional experience in sustainability, raised some concerns, with VIFs of 2.632 and 3.473 and tolerances of 0.288 and 0.380, respectively. Even though a conservative VIF was taken as a threshold, the subsequent regression analyses will examine these interaction terms individually to address potential collinearity issues.

4.2 Regression Analyses

This chapter evaluates the research hypotheses through a series of ordinal-logit models. The two complementary dependent variables are analysed: funding amount and funding objective. Table 4 and Table 5 summarise the ordinal-logit results for realised funding amount (FUND) for the human and social capital hypotheses, respectively. Appendix E and Appendix F present the robustness specification based on the funding objective (FUND_OBJ).

The regression analyses proceed by reporting (i) the likelihood-ratio (LR) χ^2 test to show the change in deviance of the model against the null model (ΔDeviance), (ii) the p-value of the χ^2 test, (iii) the variable coefficient β-value including its p-value and, (iv) the odds ratios ($OR = e^{\beta}$) if relevant to facilitate substantive interpretation. Unless noted otherwise, significance at $p < .05$ is required for confirming an effect.

In the control model (Model 0, Table 4), none of the demographic covariates exhibit a statistically reliable association with the probability of moving to a higher funding tier. Gender ($\beta = 0.17$, $p = .717$), founder age ($\beta = 0.086$, $p = .522$) and the education level ($\beta = 0.19$, $p = .238$) all fail to reach conventional significance levels, and the LR test against a null model that contains only cut points is negligible ($\chi^2 = 1.84$, $p = 0.606$). Taking funding objective as a robustness check leads to similar results with gender ($\beta = 0.62$, $p = .216$), founder age ($\beta = 0.215$, $p = .114$) and the education level ($\beta = –0.125$, $p = .466$) all being non-

significant. Hence, before introducing the predictors, there is no empirical indication that these control variables explain variation in funding amount and objective.

4.2.1 Hypothesis 1: Founders' Experience

When the three experience dimensions hypothesised in H1a–c are entered individually as well as simultaneously (Models 1-4, Table 4), the overall fit does not improve, and none of the new coefficients is distinguishable from zero. Professional experience in sustainability (Model 1, Table 4) shows nearly no effect ($\beta = -0.02$, $p = .827$); prior founding experience (Model 2, Table 4) carries a small negative but non-significant coefficient ($\beta = -0.08$, $p = .506$); and formal sustainability education (Model 3, Table 4) is positive but trivial ($\beta = 0.04$, $p = .914$). Consequently, there is no statistical evidence to support H1a, H1b or H1c for funding amount, and the joint inclusion of the three variables (Model 4, Table 4) likewise adds no explanatory power ($\chi^2 = 0.46$, $p = .928$). The robustness analysis with funding objective paints the same substantive picture (see Appendix E).

To probe whether *any* form of sustainability-related human capital increases funding success, we estimated a supplementary ordinal-logit model that replaces the three separate indicators with a single binary predictor (Professional and/or founding and/or educational sustainability experience = 1, none = 0). The LR test shows that adding the dummy does not improve model fit ($\chi^2 = 1.27$, $p = .259$). The coefficient is positive ($\beta = 0.38$) but statistically non-significant ($p = .246$) (Model 1, Appendix G). Similarly, accounting some sustainability-related human capital (More than 2 years of professional and/or founding and/or education experience in sustainability = 1; less than or equal to 2 years of professional and/or founding experience and/or no education in sustainability = 0) led to positive but statistically non-significant results ($\chi^2 = 0.25$, $\beta = 0.16$, $p = .615$) (Model 2, Appendix G). The test on funding objective leads to the same conclusion: introducing first binary variable yields a trivial slope ($\beta = -0.03$) and no incremental fit ($\chi^2 = 0.01$, $p = .924$) (Model 1, Appendix H), while the second specification is likewise negligible ($\beta = 0.04$; $\chi^2 = 0.01$, $p = .911$) (Model 2, Appendix H). Hence, across both dependent variables, sustainability-related human capital fails to reach statistical significance.

Table 4: Regression Models Human Capital (Funding Amount)

	Model 0		Model 1		Model 2		Model 3		Model 4		Model 5		Model 6		Model 7	
Coefficients	**β**	**SE[3]**	**β**	**SE**	**β**	**SE**	**β**	**SE**	**β**	**SE**	**β**	**SE**	**β**	**SE**	**β**	**SE**
Intercept 1 (< 100 k)	**-5.066*****	0.999	**-5.097*****	1.006	**-5.079*****	1.000	**-5.050*****	1.003	**-5.057*****	1.008	**-4.532*****	1.033	**-4.865*****	1.031	**-4.793*****	1.032
Intercept 2 (≤ 500 k)	**-3.115*****	0.844	**-3.148*****	0.853	**-3.131*****	0.846	**-3.100*****	0.849	**-3.110*****	0.855	**-2.569****	0.884	**-2.908*****	0.882	**-2.834*****	0.883
Intercept 3 (≤ 1 M)	**-2.621****	0.832	**-2.653****	0.841	**-2.639****	0.834	**-2.606****	0.837	**-2.617****	0.843	**-2.065***	0.873	**-2.408****	0.870	**-2.331****	0.871
Intercept 4 (≤ 5 M)	-1.103	0.810	-1.134	0.819	-1.119	0.811	-1.087	0.815	-1.098	0.821	-0.489	0.858	-0.845	0.851	-0.764	0.853
Intercept 5 (≤ 50 M)	-0.556	0.806	-0.587	0.815	-0.569	0.808	-0.539	0.811	-0.547	0.818	0.089	0.857	-0.278	0.849	-0.198	0.851
Intercept 6 (> 50 M)	0.154	0.807	0.124	0.815	0.143	0.808	0.171	0.812	0.166	0.818	0.828	0.860	0.448	0.850	0.526	0.853
Control Variables																
GENDER	0.176	0.485	0.186	0.488	0.171	0.485	0.172	0.485	0.166	0.488	0.167	0.489	0.174	0.486	0.197	0.487
AGE	0.086	0.134	0.103	0.157	0.132	0.152	0.089	0.136	0.134	0.168	0.140	0.159	0.173	0.154	0.149	0.141
EDU_LEVEL	0.193	0.163	0.199	0.165	0.192	0.163	0.183	0.179	0.180	0.180	0.196	0.166	0.184	0.164	0.164	0.181
Human Capital Variables																
PROF_EXP			-0.020	0.093					0.003	0.104	-0.179	0.144				
FOUND_EXP					-0.082	0.125			-0.084	0.135			-0.088	0.251		
EDU_SUST							0.035	0.319	0.040	0.332					-0.098	0.471
CEO_NONCEO											**-1.502****	0.553	-0.787	0.530	**-0.783***	0.376
PROF_EXP x CEO_NONCEO											**-0.303**†	0.170				
FOUND_EXP x CEO_NONCEO													0.072	0.273		
EDU_SUST x CEO_NONCEO															0.241	0.592
Model Statistics																
χ^2	1.843		0.048		0.442		0.012		0.459		8.506		5.552		5.618	
p	0.606		0.827		0.506		0.914		0.928		**0.037***		0.136		0.132	

† p < 0.10, * p < .05, ** p < .01, *** p < .001

[3] SE = Standard Error

The data offer no empirical support for the contention that sustainability-related human capital, whether professional, entrepreneurial or educational, boosts the chances of funding success. Thus, Hypotheses H1a, H1b, and H1c are not supported.

4.2.2 Hypothesis 2: CEO x Founders' Experience

Introducing the *CEO × professional experience* interaction term (Model 5, Table 4) results in a now statistically significant LR test ($\chi^2 = 8.51$, $p = .037$). The interaction coefficient is positive yet only marginally significant ($\beta = +0.30$, $p = .074$). This implies that a one-unit rise in professional experience lifts the CEO's odds of larger rounds by 35 % (OR ≈ 1.35). However, being a CEO compared to non-CEOs is negative and significant with respect to funding amount ($\beta = –1.50$, $p = .007$). This implies that being a CEO reduces the odds of receiving higher funding by 78% compared to non-CEOs when experience is zero. When the *CEO × founding experience* interaction item is added (Model 6, Table 4), overall fit improves only marginally ($\chi^2 = 2.57$, $p = .109$) and the coefficient is negative and non-significant ($\beta = –0.17$, $p = .110$). Taking the *CEO × sustainability education* term (Model 7, Table 4) improves the LR in a minor way ($\chi^2 = 5.62$, $p = .132$) and the interaction is positive and clearly non-significant ($\beta = +0.24$, $p = .684$). Finally, a model that contains all three interactions simultaneously was not run because of potential collinearity issues.

The robustness analysis based on funding objective provides a slightly different picture. Adding *CEO x professional experience* to the baseline model (Model 5, Appendix E), results in no meaningful fit gain ($\chi^2 = 1.28$, $p = .733$) and an effectively zero interaction ($\beta = +0.01$, $p = .970$). Entering the *CEO × founding experience* interaction item (Model 6, Appendix E) improves the fit to a marginal degree ($\chi^2 = 6.94$, $p = .074$) and the interaction is positive and just misses the 5 % threshold ($\beta = +0.54$, $p = .055$). This near-significance implies that a one-unit rise in founding experience lifts the CEO's odds by 71 % to achieve their funding targets. However, being a CEO compared to a non-CEO is negative and significant with respect to funding objective ($\beta = –1.26$, $p = .021$). This implies that being a CEO reduces the odds of achieving funding targets by 72% compared to non-CEOs when experience is zero. Meanwhile for *CEO × sustainability education* (Model 7, Appendix E), the LR statistic remains non-significant ($\chi^2 = 4.73$, $p = .193$) and the interaction is negative and marginal (β

= –1.13, p = .067), suggesting that concentrating sustainability education in CEOs may, if anything, correlate with less frequent goal attainment.

Hence, H2 overall receives no support. CEO-centred sustainability expertise as opposed to non-CEO experience can have a substantial impact on funding success – but only under specific conditions (professional experience for funding amount, founding experience for funding objective). However, the statistical significance is below the required 5% threshold.

4.2.3 Hypothesis 3: Network Size

Adding network size as a single linear predictor (Model 8, Table 5) first markedly improves model fit for both dependent variables. For funding amount the deviance drops by 12.19 points ($\chi^2 = 12.19$, $p < .001$) and the coefficient for network contacts is positive and significant ($\beta = 0.263$, $p < .001$), translating into a 30% increase in the odds of reaching a higher funding category for every one-rank increase in network size (OR ≈ 1.30). For funding objective, the pattern is almost identical ($\chi^2 = 13.08$, $p < .001$, $\beta = 0.271$ ($p < .001$)), including an OR of 1.31 for achieving higher funding for every one-rank increase in network size (Model 8, Appendix F). Hence, under a strictly linear assumption, network size exerts a positive and statistically robust influence on both realised funding and objective attainment.

Model 9 in Table 5 augments the linear specification with a squared network contacts term to test the concavity posited in H3. Including the quadratic term yields an additional deviance reduction ($\chi^2 = 14.87$, $p < .001$) for funding amount. The linear effect remains positive and significant ($\beta_1 = 0.971$, $p = .024$; OR ≈ 2.64 per rank), while the squared term turns negative as predicted ($\beta_2 = –0.079$) but attains only marginal significance ($p = .097$). Taken together, the signs are consistent with an inverted-U: the marginal benefit of enlarging the network diminishes and eventually turns negative, although the curvature is weak (95% CI for β_2 includes zero). The implied turning point lies at about 6.1 network size ranks ($\frac{-0.971}{2*-0.079}$), therefore falling just below the 41-50 network contacts bracket. This suggests that the sample is located on the rising but flattening portion of the curve, as the marginal gain is shrinking. Only founders who push their networks well beyond 50 contacts would start to see the estimated benefit plateau and eventually decrease. The dataset contains few such cases, so the declining limb of the curve is effectively extrapolated rather than observed.

Table 5: Regression Models Social Capital (Funding Amount)

	Model 8		Model 9		Model 10		Model 11		Model 12		Model 13		Model 14		Model 15		Model 16	
Coefficients	**β**	**SE**	**β**	**SE**	**β**	**SE**	**β**	**SE**	**β**	**SE**	**β**	**SE**	**β**	**SE**	**β**	**SE**	**β**	**SE**
Intercept 1 (< 100 k)	**-5.943*** **	1.045	**-7.098*** **	1.258	**-6.853*** **	1.250	**-6.455***	3.129	**-7.259*** **	1.152	**-7.768*** **	1.309	**-4.786*** **	1.011	**-3.459** **	1.106	**-4.901*** **	1.060
Intercept 2 (≤ 500 k)	**-3.967*** **	0.896	**-5.134*** **	1.138	**-4.897*** **	1.125	-4.499	3.085	**-5.290*** **	1.014	**-5.854*** **	1.190	**-2.806** **	0.859	-1.470	0.972	**-2.938** **	0.914
Intercept 3 (≤ 1 M)	**-3.464*** **	0.882	**-4.634*** **	1.128	**-4.403*** **	1.113	-4.005	3.082	**-4.785*** **	0.999	**-5.327*** **	1.175	**-2.298** **	0.846	-0.960	0.964	**-2.431** **	0.902
Intercept 4 (≤ 5 M)	**-1.879***	0.851	**-3.046** **	1.102	**-2.866** **	1.083	-2.468	3.077	**-3.180*** **	0.958	**-3.683** **	1.135	-0.711	0.827	0.619	0.959	-0.834	0.883
Intercept 5 (≤ 50 M)	-1.291	0.844	**-2.450***	1.092	**-2.306***	1.074	-1.907	3.074	**-2.595** **	0.948	**-2.851** **	1.125	-0.120	0.826	1.198	0.962	-0.246	0.881
Intercept 6 (> 50 M)	-0.534	0.841	-1.672	1.082	-1.571	1.068	-1.172	3.070	-1.816	0.940	**-2.298***	1.116	0.636	0.829	1.941	0.970	0.502	0.883
Control Variables																		
GENDER	0.186	0.486	0.236	0.491	-0.024	0.491	-0.025	0.491	0.045	0.486	0.064	0.493	0.098	0.491	0.219	0.487	0.308	0.521
AGE	0.036	0.136	0.051	0.136	0.083	0.135	0.081	0.135	0.079	0.135	0.070	0.136	0.045	0.138	0.020	0.136	0.188	0.144
EDU_LEVEL	0.154	0.164	0.107	0.168	0.155	0.165	0.155	0.165	0.204	0.166	0.299†	0.176	0.141	0.167	0.148	0.165	0.175	0.166
Social Capital Variables																		
NET_CONT	**0.263*** **	0.074	**0.971***	0.431														
NET_CONT^2			**-0.079**†	0.047														
NET_STR					**0.638***	0.265	0.358	2.065										
NET_STR^2							0.048	0.354										
NET_STR_FIN									**0.968*** **	0.232	**1.010*** **	0.239						
NET_STR_NONFIN											0.014	0.208						
NET_LOC_LOC													-0.757	0.828				
NET_LOC_REG													**-1.271** **	0.476				
NET_LOC_INT													0.502	0.331				
NET_LOC															**-0.687*** **	0.206		
CEO_NET																	**-0.607**†	0.343
Model Statistics																		
χ^2	12.188		14.870		5.821		5.840		18.171		19.639		13.191		10.781		3.187	
p	**< .001*** **		**< .001*** **		**0.016***		**0.054**†		**< .001*** **		**< .001*** **		**0.004** **		**0.001** **		**0.074**†	

† p < 0.10, * p < .05, ** p < .01, *** p < .001

For the robustness outcome with funding objective the quadratic extension again improves fit overall ($\chi^2 = 13.15$, $p = .001$), yet the pattern of coefficients does not support concavity (Model 9, Appendix F). The linear term becomes negative and non-significant ($\beta_1 = –0.388$, $p = .360$) and the squared term is positive and far from significant ($\beta_2 = 0.013$, $p = .778$). The joint evidence therefore contradicts the hypothesised inverted-U for the funding objective measure, showing instead a U-shape function.

Overall, H3 is supported for funding amount but not for funding objective attainment. In practical terms, expanding founder networks appears beneficial up to a point for securing larger funding, after which returns taper off. However, having an extensive network does not show the same nonlinear pattern with respect to routinely hitting funding goals.

4.2.4 Hypothesis 4: Network Strength

In the first step, overall network strength, captured by the founders' mean importance rating across the eleven stakeholder groups, was introduced as a single linear predictor (Model 10, Table 5). For realised funding, this addition produced a modest yet statistically significant improvement over the baseline ($\chi^2 = 5.82$, $p = .016$). The coefficient was positive ($\beta = 0.638$, $p = .016$), implying an 89% increase in the odds of moving to a higher funding bracket for every one-point rise in average stakeholder importance (OR ≈ 1.89). By contrast, the funding-objective model did not benefit from the same predictor (Model 10, Appendix F). The deviance reduction was negligible ($\chi^2 = 0.091$, $p = .763$) and the slope turned non-significant and slightly negative ($\beta = –0.079$, $p = .762$), corresponding to a trivial 8% decrease in the odds of targeting a lower funding tier. Under a purely linear assumption, network strength therefore appears to be connected only for funding amount.

A second specification (Model 11, Table 5) augmented the equation with a quadratic term to test the concavity anticipated in H4a. For funding amount the two-term block produced only a marginal improvement ($\chi^2 = 5.84$, $p = .054$). Crucially, the linear effect remained trivial ($\beta_1 = 0.36$, $p = .862$) and the squared term was both non-significant and positive ($\beta_2 = +0.05$, $p = .891$), directly contradicting the predicted inverted-U. The robustness check with funding-objective attainment fared still worse (Model 11, Appendix F). Adding the quadratic yielded no fit gain ($\chi^2 = 0.74$, $p = .690$) and neither coefficient approached significance ($|z| < 0.90$).

Taken together, the evidence offers no support for H4a. Perceived network strength neither boosts funding performance in a linear fashion nor follows the envisioned concave trajectory; if anything, the weak and inconsistently signed coefficients suggest that founders' subjective valuations of their ties bear little relation to the hard outcomes of how much capital they raise or how reliably they hit their funding targets.

Entering network strength to financial network contacts alone (Model 12, Table 5) improves the fit for funding amount ($\chi^2 = 18.17$, $p < .001$) and the coefficient is positive and highly significant ($\beta = 0.968$, $p < .001$). This implies that every one-point increase in network strength to CVCs, business angels, banks, raises the odds of entering a higher funding tier by 163%, more than doubling (OR ≈ 2.63). For funding objective, however, the same addition is immaterial ($\chi^2 = 0.034$, $p = .854$) and the slope is essentially zero ($\beta = 0.042$, $p = .850$) (Model 12, Appendix F)

Adding network strength to non-financial network contacts to the model (Model 13, Table 5) augments this specification. Although the joint block still beats the control model ($\chi^2 = 19.08$, $p < .001$), the incremental reduction in deviance is modest and non-significant ($\Delta\chi^2 = 7.42$, $p = .38$). Consistent with this test, the coefficient for network strength to non-financial network contacts is essentially zero ($\beta = 0.014$, $p = .947$; OR ≈ 1.01), while the effect of network strength to financial network contacts remains robust and even slightly larger ($\beta = 1.010$, $p < .001$; OR ≈ 2.75). For funding objective attainment neither composite improves the model and both slopes are far from significant (Model 13, Appendix F).

In sum, the empirical results provide robust support for H4b in the context of funding amount, but not with respect to funding objective attainment. The network strength with financial support stakeholders is associated with a substantively large and statistically distinctive increase in the likelihood of securing larger investment rounds, whereas ties to other stakeholders fail to yield any additional explanatory power. By contrast, neither financial nor non-financial network strength meaningfully affects the probability of routinely meeting previously targeted funding levels.

4.2.5 Hypothesis 5: Network Location

To evaluate H5, the model omits national and includes three mutually exclusive binaries *Local, Regional,* and *International*. With *National (contacts mainly inside Germany but*

outside the founder's state) as the reference, each coefficient measures the log-odds gap between that tier and national embeddedness (Model 14, Table 5). The block of three dummies jointly improves model fit for funding amount ($\chi^2 = 13.19$, $p = .004$), indicating that the geographic focus of network contacts matters for the funding amount raised. Nationally embedded startups outperform regional ($\beta = -1.27$, $p = .008$, $OR = 0.28$) and local ones ($\beta = -0.76$, $p = .360$, $OR = 0.47$), even though the latter is not statistically significant. Regional (local) networks therefore secure 72% (53%) lower cumulative odds of reaching a higher funding bracket than national networks ($OR = 0.28$). Although not significantly, international embedded startups ($\beta = 0.50$, $p = .130$, $OR = 1.65$) outperform national ones with respect to funding amount, resulting in 65% higher odds of moving into a higher funding bracket.

The same dummy set fails to enhance model fit for funding objective ($\chi^2 = 0.12$, $p = .989$) (Model 14, Appendix F). Although not significantly, local networks tend to outperform national networks by securing their funding objective more often ($\beta = 0.296$, $p = .720$, $OR = 1.34$), resulting in 34% higher odds of achieving funding objective attainment. However, regional and international networks have coefficients close to zero and are not significant ($\beta = 0.024$, $p = .961$) and ($\beta = 0.032$, $p = .924$), respectively. Therefore, the frequency with which ventures hit their funding objective is not significantly related to whether their network contacts are local, regional, national, or international.

Overall, H5 is therefore only supported for funding amount in regional comparison whereas it is not significantly supported for local or international as well as generally not for funding objective.

Additionally, to test whether 'broader is better', the ordered location variable was entered in the model alongside the control variables (Model 15, Table 5). This specification assigns one linear slope to the entire four-level scale. Including the variable improves the overall model fit ($\chi^2 = 10.78$, $p = .001$) and the coefficient for network location is positive and significant ($\beta = 0.687$, $p < .001$). This means that each one-step move to a broader location tier almost doubles (+99%) the cumulative odds of reaching a higher funding bracket ($OR = 1.99$). Probing the same for funding objective leads to no significant change in the model fit nor to a significant effect (Model 15, Appendix F).

4.2.6 Hypothesis 6: CEO-led Network Mobilisation

This single binary predictor was added to the baseline control model to evaluate H6 (Model 16, Table 5). Adding the binary variable of whether the CEO mobilised the most network contacts yields only a marginal improvement in fit for funding amount ($\chi^2 = 3.19$, $p = .074$). The coefficient itself is negative and just shy of conventional significance ($\beta = –0.607$, $p = .077$), corresponding to an OR of 0.55. Substantively, ventures in which the CEO mobilised the most network contacts for the startup show 45% lower cumulative odds of landing in a higher funding bracket compared with startups where a non-CEO founder mobilised the majority. This direction is one opposite to that hypothesised, however, with only weak statistical support.

For the robustness outcome, introducing the binary predictor of whether the CEO mobilised the most network contacts does not improve model fit for funding objective ($\chi^2 = 1.05$, $p = .306$) (Model 16, Appendix F). The coefficient is small, positive and clearly non-significant ($\beta = +0.355$, $p = .309$), translating to an OR of 1.43. Thus, having the CEO as the primary networker offers no reliable advantage in how often prior funding rounds hit their targets.

Therefore, taken together, these findings fail to support H6. Concentrating the most extensive personal network in the CEO's hands does not translate into higher capitalisation, nor into a stronger track record of meeting funding targets in this sample.

5 Discussion

Given the inconsistent and often limited research on the relationship of human and social capital characteristics and the success of sustainability startups, this study aimed to provide further insight into the commonly proposed positive performance effects of founders' backgrounds and startups' network characteristics. Specifically, we investigated sustainability startups' network characteristics, like size, strength and embeddedness, and their founders' characteristics, like prior professional and founding experience and education within sustainability, with respect to the startups' funding success – an area that has received scant empirical attention to date.

We developed and tested hypotheses regarding human capital, proposing that increased prior professional and founding experience as well as educational attainment, and the presence of such human capital of the CEO within sustainability would positively influence funding success. In terms of social capital, we hypothesised that a larger network size, stronger network strength – especially the network strength to financial support organisations – national embeddedness, and the mobilisation of the most network contacts by the CEO would positively affect sustainability startups' funding success. Notably, for network size and strength, we also considered the possibility of diminishing returns. Our analysis confirmed some but not all hypotheses. Section 5.1 critically interprets the empirical findings, revealing that while social capital positively influences funding success in sustainability startups, sustainability-specific human capital exhibits limited predictive power. Section 5.2 particularly outlines level-of-analysis constraints.

5.1 Interpretation

Contrary to expectations grounded in human capital theory (Becker, 1993; Coleman, 1988) and prior entrepreneurship-related literature (Brattström, 2019; Franke et al., 2008; Gompers et al., 2020), none of the examined dimensions of human capital, including founders' professional, founding, or educational experience in sustainability, showed a statistically significant impact on funding success. However, Unger et al. (2011) emphasised that the strength of this relationship depends heavily on how human capital is conceptualised, noting that task-related, outcome-based forms (e.g., practical knowledge and skills) had stronger correlations with success than investment-based forms (e.g., years of education or training).

As also noted by Unger et al. (2011), the choice of success measurement moderates effect sizes: size-oriented outcomes (e.g., revenue, scale) exhibit stronger associations with human capital than growth- or profit-oriented indicators. However, since funding amount is a size-oriented outcome and sustainability-related professional and founding experience is outcome based, specific sustainability-related human capital should reveal a higher and positive relationship with funding success than it is reported in this study.

Generally, it can be stated that individual sustainability human capital is not perceived as highly valuable sector-specific credentials for sustainable startup success. Supporting this interpretation, Piva & Rossi-Lamastra (2018) also found that neither general nor industry-specific education and work experience significantly influenced equity crowdfunding success. However, our correlation matrix indicated a strong and significant relationship between prior professional and founding experience, suggesting that individuals with sustainability experience often leverage it across both professional and founding contexts.

Interestingly, we found no significant CEO-specific effects. Overall, CEO experience in sustainability did not yield any advantage over general founder experience, contradicting previous research emphasising the symbolic and strategic centrality of the CEO role (see Sections 2.4.4 & 2.5.5). While our data showed that CEOs had significantly more prior professional and founding experience in sustainability, they were also associated with significantly lower funding amounts. This may suggest that CEOs, despite their experience, lack other critical competencies necessary to secure investor support – perhaps in communication, networking, or strategic vision. These findings suggest that investors adopt a more holistic evaluation of leadership teams, focusing on team dynamics, market engagement, or institutional affiliations rather than individual credentials alone.

Overall, our results support Unger et al.'s (2011) conclusion that human capital, particularly when defined in general or investment-oriented terms, is not a sufficient condition for entrepreneurial success. Moreover, our findings resonate with Davidsson & Honig (2003) argument that the influence of human and social capital evolves over time. While general human capital may aid in opportunity recognition and early-stage venture formation, a more mature startup stage demands more targeted external resources through social capital.

In contrast to the limited support for human capital effects, the findings related to social capital offer partial alignment with prior theoretical expectations. The hypothesis that network size positively influences funding outcomes receives strong empirical support for funding amount and funding objectives – approximately a 30% increase per rank. Moreover, the analysis confirms a concave relationship with respect to funding amount: the marginal returns of expanding the network diminish beyond approximately 40 to 50 contacts. However, this nonlinear relationship does not hold for funding objective. The observed concave relationship between network size and funding success supports existing theories that advocate for the resource-access benefits of larger networks but also acknowledge diminishing returns due to redundancy (Semrau & Werner, 2014). Particularly in the context of sustainability startups the cost of maintaining extensive networks may divert attention and resources from core activities such as technology development and market alignment.

Unexpectedly, however, the hypotheses concerning tie strength were only partially supported. The proposition that stronger network ties would positively (albeit with diminishing returns) influence funding success was not empirically validated. Semrau & Werner (2014) provide a relevant interpretative lens, arguing that while strong ties foster trust and reciprocity, their incremental benefits diminish once a foundational threshold of trust is met. It is plausible that, within our sample, most founders had already cultivated relationships of adequate strength, making additional investments in tie deepening less impactful. Furthermore, this finding raises questions about the validity of using founder-reported relational strength as a proxy for resource mobilisation efficacy.

Semrau & Werner (2014) also emphasise that not all resources demand equal levels of network investment. Access to knowledge or information can often be achieved through weaker or fewer ties. In contrast, access to financial capital, where tangible risks and reputational considerations are involved, requires more robust and strategically cultivated relationships. These dynamics were evident in our findings: strong ties specifically to financial support stakeholders, including CVCs, business angels, and banks, were significantly associated with a 123% increase in the odds of higher funding amounts. Ties to non-financial stakeholders conferred no additional benefit once financial ties were considered. However, this effect did not extend to the founders' perceived attainment of funding objectives. It should be noted that the results are driven by the moderately strong correlation between CVC network strength and funding amount, reinforcing the critical role that VC

access plays in capital acquisition. However, the lack of correlation with perceived funding objective attainment suggests that VC involvement, while financially impactful, may not influence how founders assess strategic goal fulfilment. This may reflect a misalignment between investor expectations and founders' perceptions of adequacy or strategic fit.

Further analysis of stakeholder interrelationships revealed a tightly interlinked sub-ecosystem within the broader startup ecosystem landscape. Significant intercorrelations were found among key stakeholders, including CVCs, business angels, ESOs, government entities, and academic institutions (e.g., CVC – business angels; business angels – ESO; ESO – government entities; ESO – academic institutions). ESOs act as intermediaries connecting startups to business angels, which in turn are connected to CVCs, and government agencies as well as academic institutions. Such collaboration – common in innovation hubs and joint funding or mentoring schemes – create relational synergies that facilitate access to multiple resources through a single-entry point.

Interestingly, a positive association was also observed between network size and perceived relational strength. At first glance, this may appear counterintuitive, as one might expect a trade-off between quantity and quality. Semrau & Werner (2014) argue that building strong network strength requires substantial time and effort, which potentially ends at the expense of expanding the network. However, an alternative explanation suggests that startups capable of growing their networks may simultaneously develop relational skills that enhance tie strength. This interpretation implies a learning effect: as ventures engage with diverse stakeholders, they become more adept at trust-building and effective relationship management. Thus, network size and relational strength may co-evolve rather than compete.

The hypothesis that national-level embeddedness in networks leads to superior funding outcomes was not supported. However, national networks were more effective than regional and local ones in securing funding, even though the latter is not significant. Although not statistically significant, national did not outperform international embedded networks with respect to funding amount. A supplementary analysis using a linear scale of geographic breadth confirmed that broader network reach positively predicts the amount of capital raised. These findings are consistent with Davidsson & Honig's (2003) emphasis on bridging social capital and weak ties to external networks as critical during a mature phase of the startup

lifecycle. However, these geographic effects did not extend to funding objective, implying that spatial reach affects capital acquisition.

The finding that CEO-led network mobilisation negatively correlates with funding success challenges traditional narratives that position the CEO as the central broker in entrepreneurial ventures. This may reflect a pattern of over-centralisation, where CEOs invest disproportionately in strong ties at the expense of strategically valuable weak ties (Granovetter, 1973). Furthermore, this might result in a lower diversification of network contacts, limiting access to novel information or external validation critical for growth and legitimacy. These findings call for a reconsideration of how network activation is distributed across founding teams and suggest that collaborative or distributed networking strategies may be more effective. Notably, our data revealed a significant positive association between being a CEO and serving as the primary network mobiliser. CEOs often perceived themselves as having contributed the most to network development, while non-CEO team members generally disagreed. This perception gap suggests a potential misalignment or controversy regarding internal recognition of contributions to network mobilisation, which may have implications for team dynamics and internal legitimacy.

Additionally, as our study employed funding success as the primary outcome variable – reflecting on the funding barriers faced by sustainability startups (see Section 2.3) – the results are particularly relevant to cost-sensitive and trust-dependent resources. Notably, participants were asked about general resource access, like knowledge, business partners, and finance. This may explain why only specific network variables, such as network size and network strength to financial support stakeholder, had significant predictive power, while other dimensions, like network strength to non-financial support stakeholders and national embeddedness, had no or limited predictive power. These findings reinforce Semrau & Werner's (2014) argument that performance effects of networks are contingent on the type of resource being sought.

Furthermore, a persistent divergence emerged between the objective measure of funding success, funding amount, and the subjective assessment of funding success, funding objective. While variables such as network size, network strength to financial support stakeholders, and geographic reach are significantly associated with actual funding outcomes, they show consistently weaker or no correlation with founders' subjective perceptions. This discrepancy

may stem from cognitive biases, differing expectations, or a lack of alignment between external funding outcomes and internal strategic goals. It underscores the need for future research to adopt a dual-lens approach that differentiates between externally validated and internally perceived measures of success.

In summary, our analysis reveals that social capital, particularly in form of large, strategically structured networks with ties to key financial actors, plays a central role in sustainability startups success. Conversely, sustainability-specific human capital shows limited predictive value. This may result from the varying influences of human and social capital over time. The former is particularly beneficial during the startup formation phase, whereas the latter becomes increasingly advantageous as the startup matures. Our findings also highlight important tensions between leadership roles and network mobilisation and between the general performance effect of human and social capital and funding success, but also between objective financial performance and subjective founder evaluations.

5.2 Limitations

While this study provides novel insights into the relationship between human and social capital and funding success in sustainability startups, several limitations must be acknowledged in addition to methodological limitations (see Section 3.5).

First, the generalisability of the findings is limited by using purposive sampling and the exclusive focus on sustainability startups in Germany. Although this geographical and sectoral focus enhances internal validity and contextual relevance, it restricts the direct transferability of results to sustainability startups in different national contexts. The structure and dynamics specific to German sustainability startups – shaped by distinct national policies, cultural norms, and investor preferences – may differ significantly from those in other countries or sectors. Welter (2011) encourages to adopt a contextualised perspective on entrepreneurship, exploring how the mechanisms observed here operate under varying institutional and cultural conditions. Additionally, the representativeness of the sample may be questioned due to gender imbalance (89.7% male). Although the gender distribution mirrors that of sustainability startup founders in Crunchbase (89.1% male), the limited representation of female respondents restricts the ability to provide gender-specific insights.

Second, the research design may be affected by survivor bias, as the sample exclusively includes active sustainability startups in Germany. This selection approach is methodologically significant because firm survival itself could be influenced by human capital factors. The literature on this issue is mixed; one study suggests that founders with lower human capital are more likely to fail (Brüderl et al., 1992), whereas another indicates that founders with high human capital and high performance thresholds may discontinue operations prematurely (Gimeno et al., 1997). Such truncation could reduce variance in critical variables and potentially underestimate the actual relationship between human capital and success (Unger et al., 2011). Due to limited operationalisations of consistent survival metrics in our sample, this study does not address outcomes related to firm failure or survival, and thus its findings may not generalise to startups that have ceased operations.

Third, the level of analysis adopted in this study introduces interpretive complexities, as human capital is primarily conceptualised at the individual level while the analysis is conducted at the venture level. As Unger et al. (2011) and Gimeno et al. (1997) note, if human capital is an individual level construct, the entrepreneur would try to maximise individual level returns (such as founders pursuing multiple entrepreneurial ventures or supplemental employment) may not align directly with venture-level performance indicators, such as funding success. Consequently, future studies should carefully align their conceptual and analytical levels, potentially incorporating the human capital of employees and founding team to better reflect firm-level dynamics (Davidsson & Wiklund, 2001). Furthermore, it should be acknowledged that the conceptual scope of human capital in this research is constrained by its focus on experiential attributes, such as sustainability-specific education, prior founding experience, and professional background. While this enhances construct clarity, it potentially excludes less tangible yet influential factors like personality traits.

Fourth, the structural properties of entrepreneurial networks investigated represent another significant limitation. Following the critique by Semrau & Werner (2014), this study does not explicitly account for startups' structural positions within their networks, such as network density or structural holes (Burt, 2005; Coleman, 1990). Structural positioning could critically moderate the effectiveness of network size and quality in providing access to resources – entrepreneurs in densely connected networks may benefit from enhanced trust and cooperation (Coleman, 1988, 1990), while those bridging structural holes might access more diverse, non-redundant information (Burt, 1995, 2005). While this study infers embeddedness

based on geographic proximity of contacts, direct metrics of structural positioning would provide clearer insights into the role of network configuration in resource acquisition.

Fifth, the analysis is restricted to direct network ties and does not account for the potential influence of indirect contacts. As Semrau & Werner (2014) argue, indirect ties – although potentially useful as gateways to larger networks – are generally short-term and less effective in sustained resource provision. Although the study aligns with research indicating that direct ties are more stable and relevant for entrepreneurial performance (Kim & Aldrich, 2005; Reagans & Zuckerman, 2008; Steier & Greenwood, 2000), the exclusion of indirect networks limits the comprehensiveness of the social capital analysis.

Sixth, the operationalisation of network strength employed in this study might not fully encapsulate the complexity of related concepts like trust and reciprocity, which are context-dependent and dynamic. The study adopts an agentic and deterministic perspective, conceptualising networking as goal-directed behaviour (Engel et al., 2017; Porter & Woo, 2015). This perspective presupposes startup founders can anticipate and strategically target network contacts (Hallen & Eisenhardt, 2012), assuming advanced knowledge about who the target tie will be and what it could offer (Engel et al., 2017). This implies objectives for a respective action can be set in advance (Miller, 2007), and activities are coordinated around stable, known goals such as seeking resources or receiving investment (Hallen & Eisenhardt, 2012; Zott & Huy, 2007). Therefore, we assumed that startups are building stronger network ties to those network contacts that are important for the sustainability startup to access resources. However, it should be acknowledged that the literature presented in Semrau & Werner (2014) measured network strength through frequency of interaction or time spent with the network. Furthermore, it should be acknowledged that predicting which ties will be needed and what value they will create for the startup may be impossible in settings of uncertainty, where goals are emergent. Some of the business literature has assumed opportunities can be mapped out in advance (Brown, 2005), others have argued these opportunities are often emergent and serendipitous (Denrell et al., 2015; Mintzberg & Waters, 1985).

Finally, due to its cross-sectional design, this study cannot establish causal relationships. While associations between founders' backgrounds, startups' network characteristics, and funding success are identified, directional causality remains uncertain. For example, entrepreneurs experiencing resource deficits might strategically expand their networks as a

compensatory response, aligning with the "network compensation hypothesis" (Brüderl & Preisendörfer, 1998, p.224). This hypothesis has limited empirical support in the literature. However, testing the “network compensation hypothesis” in our sample would not have revealed enough significant explanatory power, since human capital is measured on an individual level and the network is measured on an organisational level. Overall, a longitudinal research design could provide greater clarity on causality and dynamic interactions over time.

6 Conclusion

This thesis began by identifying a critical financing gap that hampers the scaling of sustainability-oriented startups and by posing two research questions: whether founders' sustainability-specific human capital facilitates fund-raising (RQ1), and how startups' social capital configurations shape their capital acquisition (RQ2). Drawing on survey data of 165 German sustainability startups, the study provides an empirically grounded answer to both questions.

Contrary to expectations derived from human capital theory, neither sustainability-oriented professional, founding or educational experience exerted a statistically significant influence on funding amount or on meeting funding objectives. Similarly, CEO-specific human capital as well as CEO-led network mobilisation showed no significant results. By contrast, three properties of startups' networks emerged as decisive. First, network breadth exhibited an inverted-U relationship with funding: expanding the network up to roughly fifty contacts improved the probability of entering higher funding tiers, after which returns fell. Second, the depth of ties to financial stakeholders – driven in particular by the network strength to CVCs – more than doubled the odds of raising larger amounts, whereas equivalent ties to non-financial actors had no comparable effect. Third, spatial scope mattered: national networks were more effective than regional and local ones in securing funding, even though the latter is not significant. In contrast, national did not outperform international embedded networks with respect to funding amount, although not statistically significant. However, a separate analysis confirmed that broader reach positively predicts the absolute amount of capital raised, indicating that the diversity of resources accessed drives fund-raising capacity. Together, these results demonstrate that social capital, not sustainability-specific human capital, is the primary driver of funding success in this setting.

Hereafter, Section 6.1 outlines how our findings challenge traditional human capital centric frameworks and highlights the primacy of social capital structures in shaping fundraising outcomes for sustainability startups. Section 6.2 translates the core insights into actionable strategies for entrepreneurs, investors, and policymakers seeking to enhance capital access and ecosystem functionality in the sustainability venture domain. Section 6.3 identifies emergent questions, proposing avenues for future research that could deepen theoretical understanding and improve empirical precision.

6.1 Theoretical Implications

This study demonstrates that sustainability-specific education, as well as professional and founding experience – often treated as universal productivity signals (Becker, 1993; Unger et al., 2011) – bear no significant relation to the funding amount or to the frequency with which funding targets are met for sustainability startups. This finding points to contingency views suggesting that, once ventures move from opportunity recognition to resource mobilisation, other signals eclipse individual credentials (Davidsson & Honig, 2003). The study refines debates on human versus social capital by showing that, in capital-intensive sustainability contexts, structural access to capital providers outweighs individual sustainability credentials (Becker, 1993; Davidsson & Honig, 2003).

The data reveal that social capital characteristics, specifically network size, network strength to financial stakeholders and geographic reach, are indeed beneficial for funding attainment. Consistent with resource-dependency logic (Aldrich & Zimmer, 1986), each incremental tier in network breadth increases the likelihood of entering a higher funding bracket. However, the concave shape of the relationship identifies a point at which resource redundancy erodes marginal benefits. More important than sheer breadth is the strength of ties to financial stakeholders. This result extends the resource-specific performance argument (Semrau & Werner, 2014) by showing that startup funding, unlike knowledge sharing, requires high-trust bonding with actors who control capital flows. Overall, the findings challenge popular advice in entrepreneurship literature advocating unlimited networking and instead reinforce the notion of building a "network of essential ties" (Grandi & Grimaldi, 2003, p. 330).

Geographic embeddedness further conditions fundraising outcomes. Whereas cluster theory has often contrasted the virtues of local density with those of global pipelines (Bathelt et al., 2004), the present study discovered that networks anchored at the national level can outperform regional and local ones but not international ones. An additional analysis underlined the importance of geographic breadth rather than that of any single spatial tier. These findings show a somewhat different picture than the previous study by Uzzi (1996) who found out that apparel contractors with a balanced mix of strong and 'arm's-length' ties exhibited better economic performance than those operating exclusively through either close or distant relationships.

The finding that ventures perform better when external relations are distributed across the founding team, rather than concentrated solely in the CEO, challenges the prevailing assumption in the literature that the CEO's social capital is the primary engine for securing external resources. While prior theory emphasises the CEO's unique capacity for symbolic leadership and network bridging as a catalyst for venture legitimacy and funding (Baron & Markman, 2003; Nahapiet & Ghoshal, 1998), the empirical evidence suggests a leadership contingency: the over-centralisation of external engagement in the CEO may in fact hinder performance.

Finally, this study employed funding success as the primary outcome variable. This may explain why only specific network variables had significant predictive power, while other dimensions had no or limited predictive power. The results contribute to the discussion on potential moderators of the effects of network size and strength on startups' success – a key insight for interpreting the inconsistencies found in earlier studies (Elfring & Hulsink, 2003; Hoang & Antoncic, 2003). Furthermore, the variables that predict the amount of capital raised explain little of the variance in founders' subjective goal attainment, highlighting the risk of conflating external and internal benchmarks of entrepreneurial success.

Taken together, these results reorient the theoretical conversation from founder-centric capability frameworks to ecosystem-centric explanations. They show that fundraising success in sustainability entrepreneurship is best understood as a function of network scale, composition and spatial reach rather than of individual sustainability credentials. In doing so, the study clarifies a set of structural factors – sizeable networks, dense ties to financial actors and distributed brokerage – that future research must accommodate.

6.2 Practical Implications

The practical implications follow directly from the structural levers mentioned above. Entrepreneurs seeking to improve their fundraising prospects should invest early in network extension and systematic broader geographic outreach, stopping only when marginal network additions no longer introduce novel resources. They should concentrate scarce resources for relationship strength on high-trust interactions with capital providers rather than diffuse stakeholder engagements and ensure brokerage responsibilities are shared among co-founders to avoid CEO over-centralisation.

Our results also indicate that network size and tie strength are, at least to some extent, substitutable in their effects on resource access. This suggests that startups have two strategic options for improving their chances of obtaining a specific resource can either expand their network or deepen existing relationships. Importantly, they should opt for the approach that allows them to access the desired resource most efficiently. Furthermore, our findings suggest the presence of a learning effect. Startups who are effective at expanding their networks also tend to excel at cultivating strong, high-quality relationships, indicating that network-building and relationship-deepening capabilities may reinforce one another over time.

Capital providers, in turn, can refine their screening heuristics by weighting the scale of a venture's network above sector-specific schooling or prior sustainability experiences. Since high-potential startups typically exhibit such network architecture, due diligence should map not only who is in a founder's network but also where those contacts are situated geographically and how intensively they engage with financial support stakeholders. Investors and policy makers can further accelerate the network-funding flywheel, e.g., with the help of ESOs, by orchestrating curated introductions and structuring syndication events that connect early-stage firms with later-stage capital (Casson & Giusta, 2007). Additionally, assessing whether networking is decentralised across the founding team provides a proxy for adaptive capacity and resilience.

The study equips funders, ESOs and policymakers with a clearer view of the relational bottlenecks that inhibit capital flows. Interventions such as national green tech connect platforms, mobility grants that subsidise attendance at investment forums, and mentorship programmes that train non-CEO founders in brokerage skills can be designed with greater precision. In this way, the research contributes to more informed, evidence-based decision-making across the sustainability-entrepreneurship ecosystem and advances scholarly understanding of how structural network properties translate into financial performance.

6.3 Future Research Directions

Several avenues remain open for further research. Future research could adopt an in-depth qualitative design, such as a multiple-case study that follows founding teams and their capital providers through successive financing rounds to uncover the fine-grained interactions, persuasive narratives, and trust-building that quantitative surveys necessarily abstract away.

First, human capital tends to influence opportunity exploitation, strategic planning, and venture strategy (Baum et al., 2001; Frese et al., 2007), which may be critical to the formation of a sustainability startup rather than to its performance. Furthermore, opportunity discovery is often influenced by serendipity rather than deliberate planning (Denrell et al., 2015; Liu & De Rond, 2016). Despite its importance, the literature has remained relatively silent on how to manage this uncertainty or create conditions that facilitate serendipitous discoveries. Therefore, future research could investigate whether human capital plays a more central role in enabling entrepreneurs to recognise and act on unforeseen opportunities.

Second, the findings suggests that future research should shift away from static or stock-based conceptualisations of human capital and instead adopt a process-oriented perspective that emphasises learning behaviours, adaptive expertise, and the application of knowledge over time. A contingency-based view may help explain why human capital does not consistently lead to immediate or uniform performance gains for sustainability startups. For instance, if entrepreneurs lack growth aspirations (Wiklund & Shepherd, 2003), or if the learning environment does not effectively convert experience into actionable skills (Reuber & Fischer, 1994), human capital may fail to translate into successful outcomes such as funding or scaling.

Third, the cross-sectional design precludes causal inference. Longitudinal panel studies that track the co-evolution of founders' networks and capital inflows could test whether social ties anticipate new rounds (a *network-pull* mechanism) or whether well-funded ventures simply attract additional contacts *ex post* (a *success-breeds-ties* mechanism). Linking event-history models with dynamic network analysis would thus help adjudicate between competing accumulation logics (Shane & Stuart, 2002).

Fourth, the study relied on founder-reported assessments of network characteristics, introducing possible common-method bias and perceptual inflation. Future research can link survey data with behavioural traces such as e-mail metadata, investment-syndication records or digital platform interactions to provide more objective proxies of relational intensity (Gulati & Gargiulo, 1999). Combining such multi-source measures with egocentric network surveys would also illuminate the micro-processes – trust formation, signalling efficacy and knowledge transfer – through which specific connections translate into resource flows.

Fifth, the German institutional setting may condition several of the findings. Comparative studies across coordinated, liberal and emerging market economies could test whether the

optimal spatial scope of networks varies with the strength of local investor ecosystems, the centralisation of regulatory agencies or the maturity of climate-finance instruments. Cross-country analyses would also clarify whether the discounting of sustainability-specific credentials is a special feature of a capital-intensive European context or a more general phenomenon.

A sixth line of research could integrate gender and diversity lenses, testing whether the benefits of network scale and financial-stakeholder focus accrue equally to women-led and minority-led ventures, or whether structural biases in access to influential ties dampen these effects (Brush et al., 2018).

Finally, outcome scopes could be broadened beyond capital raised. Investigating how the same founders' backgrounds and network dimensions influence subsequent growth, survival, or environmental impact would point to the performance heterogeneity that persists after the funding hurdle is cleared.

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Declaration

We, Hannah Bauer and Jakob Benöhr, hereby declare that we are the sole authors of this thesis. To the best of our knowledge this thesis contains no material previously published by any other person except where due acknowledgement has been made. We are aware that we are responsible for all content of this master's thesis, including the parts where AI tools are used. Open AI’s ChatGPT (2025) was used for language refinement. We are responsible for ensuring that the thesis complies with ethical rules for privacy and publica on.

Appendices

Appendix A – Survey

Networks of Startups: Access to Finance, Knowledge and Additional Business Partners

Dear participant,

As part of our master's thesis at the University of Mannheim and the Norwegian School of Economics, we are researching **how founder characteristics and networks impact sustainability startup success in Germany.**

This study examines how a startup's network and founder's expertise impact its access to finance, knowledge, and additional business partners. By analysing key factors such as network size, relationship strength, location and sustainability expertise, we aim to identify the critical drivers of success. Your responses will contribute to a better understanding of how founders like you leverage networks to secure investment and accelerate business growth.

The survey takes **5 minutes** and is **voluntary and anonymous**. Your responses will be **stored securely** and used solely for research purposes. No identifiable information will be collected unless explicitly provided. Data will be **deleted after the project ends** (01.06.2025).

By proceeding, you consent to data processing as described. You may request access, correction, or deletion of your data.

If you have any questions about the study, feel free to contact us at: hannah.bauer@students.uni-mannheim.de and jakob.benohr@student.nhh.no

We greatly appreciate your valuable insights and time!

Hannah Bauer and Jakob Benöhr

Startup's Network Contacts

Q1 How important are the following network contacts currently for your startup to access finance, knowledge and additional business partners?

	Not at all important	Slightly important	Moderately important	Very important	Extremely important
(Corporate) Venture Capitalists	○	○	○	○	○
Business Angels	○	○	○	○	○

Entrepreneurial Support Organisations (Accelerators & Incubators)	○	○	○	○	○
Banks	○	○	○	○	○
Government and Regulatory Agencies	○	○	○	○	○
Academic Institutions and Research Labs	○	○	○	○	○
Business Support Services (Lawyers, Consultants, etc.)	○	○	○	○	○
Customers	○	○	○	○	○
Suppliers	○	○	○	○	○
Competitors	○	○	○	○	○
Other Companies	○	○	○	○	○

Q2 How many network contacts does your startup currently interact with that you consider relevant to access finance, knowledge and additional business partners?

- ○ Less than 5
- ○ 5-10
- ○ 11-20
- ○ 21-30
- ○ 31-40
- ○ 41-50

- ○ More than 50

Q3 Where are most of these network contacts located that you consider relevant to access finance, knowledge and additional business partners?

- ○ Local (within your city/town)
- ○ Regional (within your state)
- ○ National (within Germany)
- ○ International (outside Germany)

Q4 Indicate whether you agree with the following statement: "Among the co-founders, the CEO is the one who has mobilised the most contacts for the startup's network throughout the venture's lifecycle."

- ○ Yes
- ○ No
- ○ Not applicable, the CEO is not a co-founder
- ○ Not applicable, I am a solo founder

Startup's Funding

Q5 What is your startup's total funding amount in all previous funding rounds combined? [in EUR]

- ○ Below 100.000
- ○ 100.000 to 500.000
- ○ 500.000 to 1 million
- ○ 1 million to 5 million
- ○ 5 million to 10 million
- ○ 10 million to 50 million
- ○ More than 50 million

Q6 To what extent have you reached your funding objectives during your previous funding rounds?

- ○ Always
- ○ Often
- ○ Sometimes
- ○ Rarely
- ○ Never

Founder's Characteristics

For this survey, **sustainability-related startups, positions, and education** refer to work and study in fields that contribute to preserve natural resources by focusing on climate-friendly technologies and innovations that reduce carbon emissions and mitigate the severity of global warming.

Q7 Before founding your current startup, how many cumulative years of experience did you have as a founder in sustainability-related startups? [in years]

- ○ 0
- ○ 1-2
- ○ 3-5
- ○ 6-10
- ○ More than 10

Q8 Before founding your current startup, how many years of professional experience did you have in sustainability-related positions? [in years]

- ○ 0
- ○ 1-2
- ○ 3-5
- ○ 6-10

- ○ 11-15
- ○ More than 15

Q9 Was any of the education you obtained with a focus on a sustainability-related field?

- ○ Yes
- ○ No

Q10 What is your current role in your startup?

- ○ CEO (Chief Executive Officer)
- ○ COO (Chief Operating Officer)
- ○ CTO (Chief Technology Officer)
- ○ CFO (Chief Financial Officer)
- ○ CMO (Chief Marketing Officer)
- ○ CPO (Chief Product Officer)
- ○ CSO (Chief Sales Officer)
- ○ Other

Demographic Data

Q11 What is your gender?

- ○ Male
- ○ Female
- ○ Diverse
- ○ I prefer not to say

Q12 How old are you? [in years]

- ○ under 20

- ○ 20-29
- ○ 30-39
- ○ 40-49
- ○ 50-59
- ○ 60-69
- ○ 70 and above

Q13 What is the highest level of education you obtained?

- ○ Doctorate
- ○ Master’s Degree / Second State Examination
- ○ Bachelor’s Degree / First State Examination
- ○ Apprenticeship
- ○ General Higher Education Entrance Qualification
- ○ Other

Appendix B – Frequency Tables Control Variables

Frequencies for Gender

Gender	Frequency	Percent	Valid Percent	Cumulative Percent
Male	148	89.697	89.697	89.697
Female	15	9.091	9.091	98.788
Diverse	1	0.606	0.606	99.394
I prefer not to say	1	0.606	0.606	100.000
Total	165	100.000		

Frequencies for Age

Age	Frequency	Percent	Valid Percent	Cumulative Percent
20-29	20	12.121	12.121	12.121
30-39	73	44.242	44.242	56.364
40-49	42	25.455	25.455	81.818
50-59	20	12.121	12.121	93.939
60-69	9	5.455	5.455	99.394
70 and above	1	0.606	0.606	100.000
Total	165	100.000		

Frequencies for Education Level

Education Level	Frequency	Percent	Valid Percent	Cumulative Percent
General Higher Education Entrance Qualification	5	3.030	3.030	3.030
Apprenticeship	5	3.030	3.030	6.061
Bachelor's Degree / First State Examination	19	11.515	11.515	17.576
Master's Degree / Second State Examination	95	57.576	57.576	75.152
Doctorate	39	23.636	23.636	98.788
Other	2	1.212	1.212	100.000
Total	165	100.000		

Frequencies for Current Role

Current Role	Frequency	Percent	Valid Percent	Cumulative Percent
CEO (Chief Executive Officer)	96	58.182	58.182	58.182
CFO (Chief Financial Officer)	6	3.636	3.636	61.818
CMO (Chief Marketing Officer)	2	1.212	1.212	63.030
COO (Chief Operating Officer)	9	5.455	5.455	68.485
CPO (Chief Product Officer)	9	5.455	5.455	73.939
CSO (Chief Sales Officer)	5	3.030	3.030	76.970
CTO (Chief Technology Officer)	22	13.333	13.333	90.303
Other	16	9.697	9.697	100.000
Total	165	100.000		

Appendix C – Frequency Tables Dependent Variables

Frequencies for Funding Amount

Funding Amount	Frequency	Percent	Valid Percent	Cumulative Percent
More than 50 million	3	1.818	1.829	1.829
10 million to 50 million	17	10.303	10.366	12.195
5 million to 10 million	13	7.879	7.927	20.122
1 million to 5 million	51	30.909	31.098	51.220
500.000 to 1 million	21	12.727	12.805	64.024
100.000 to 500.000	23	13.939	14.024	78.049
Below 100.000	36	21.818	21.951	100.000
Missing	1	0.606		
Total	165	100.000		

Frequencies for Funding Objective

Funding Objective	Frequency	Percent	Valid Percent	Cumulative Percent
Never	14	8.485	8.750	8.750
Rarely	21	12.727	13.125	21.875
Sometimes	30	18.182	18.750	40.625
Often	40	24.242	25.000	65.625
Always	55	33.333	34.375	100.000
Missing	5	3.030		
Total	165	100.000		

Frequencies for Funding Rounds

Funding Rounds	Frequency	Percent	Valid Percent	Cumulative Percent
0	37	22.424	22.840	22.840
1	53	32.121	32.716	55.556
2	41	24.848	25.309	80.864
3	23	13.939	14.198	95.062
4	4	2.424	2.469	97.531
5	4	2.424	2.469	100.000
Missing	3	1.818		
Total	165	100.000		

Appendix D – Correlation Matrix Network Strength Variables

Variable	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.	17.
1. FUND	—																
2. FUND_OBJ	**0.270*****	—															
3. FUND_ROUNDS	**0.648*****	0.130	—														
4. NET_STR_CVC	**0.436*****	0.046	**0.269*****	—													
5. NET_STR_BA	0.104	-0.013	0.139	**0.333*****	—												
6. NET_STR_ESO	-0.072	-0.041	-0.035	0.048	**0.354*****	—											
7. NET_STR_BNK	0.072	-0.102	**0.166***	0.062	0.037	-0.023	—										
8. NET_STR_GOV	0.136	0.038	0.053	0.099	0.137	**0.263*****	**0.257*****	—									
9. NET_STR_AC	0.011	-0.014	-0.117	-0.048	-0.002	**0.308*****	0.058	**0.421*****	—								
10. NET_STR_BSS	0.042	0.100	**0.165***	-0.003	0.029	0.061	**0.284*****	**0.207****	0.142	—							
11. NET_STR_CUST	0.033	0.086	0.037	-0.028	0.141	-0.135	0.031	**0.190***	-0.045	**0.286*****	—						
12. NET_STR_SUP	**0.195***	0.128	**0.171***	**0.162***	0.049	0.005	0.146	**0.221****	**0.193***	**0.362*****	**0.341*****	—					
13. NET_STR_COMP	0.025	-0.086	0.014	0.008	-0.016	-0.085	**0.157***	**0.219****	0.150	**0.229****	**0.333*****	**0.265*****	—				
14. NET_STR_OTH	-0.097	-0.042	-0.046	**-0.174***	-0.142	-0.002	**0.260*****	**0.238****	**0.234****	**0.214****	0.127	**0.322*****	**0.297*****	—			
15. GENDER	0.025	-0.125	0.152	-0.042	0.015	0.083	**0.163***	0.131	0.070	**0.196***	0.001	0.021	0.040	0.085	—		
16. AGE_RANK	0.066	-0.099	0.068	0.040	-0.041	-0.051	0.093	0.019	-0.003	0.067	0.013	0.045	0.077	0.086	0.121	—	
17. EDU_LEVEL	0.084	0.075	-0.067	0.061	-0.037	-0.099	-0.092	0.050	**0.237****	0.037	0.133	0.045	0.124	0.064	0.032	0.121	—

* p < .05, ** p < .01, *** p < .001

Appendix E – Regression Models Human Capital (Funding Objective)

Coefficients	Model 0		Model 1		Model 2		Model 3		Model 4		Model 5		Model 6		Model 7	
	β	SE	β	SE	β	SE	β	SE	β	SE	β	SE	β	SE	β	SE
Intercept 1 (Never – Rarely)	**-2.694****	0.883	**-2.777****	0.895	**-2.600****	0.887	**-2.736****	0.890	**-2.741****	0.899	**-2.656****	0.937	**-2.076***	0.929	**-3.161*****	0.941
Intercept 2 (Rarely – Sometimes)	**-1.648**†	0.858	**-1.730***	0.870	**-1.547**†	0.862	**-1.689**†	0.865	**-1.684**†	0.874	**-1.606**†	0.913	-1.001	0.906	**-2.102***	0.915
Intercept 3 (Sometimes – Often)	-0.740	0.850	-0.821	0.860	-0.630	0.853	-0.782	0.856	-0.765	0.864	-0.695	0.905	-0.070	0.901	-1.180	0.904
Intercept 4 (Often – Always)	0.347	0.848	0.268	0.858	0.462	0.852	0.305	0.853	0.333	0.863	0.399	0.904	1.047	0.906	-0.065	0.899
Control Variables																
GENDER	0.620	0.501	0.658	0.505	0.589	0.501	0.610	0.501	0.643	0.505	0.648	0.505	0.561	0.502	0.563	0.503
AGE	0.215	0.136	0.257	0.159	0.130	0.156	0.202	0.138	0.175	0.171	0.279	0.161	0.196	0.158	0.277	0.143
EDU_LEVEL	-0.125	0.172	-0.107	0.174	-0.142	0.172	-0.085	0.187	-0.092	0.188	-0.123	0.175	-0.149	0.174	-0.070	0.189
Human Capital Variables																
PROF_EXP			-0.051	0.095					0.198	0.106	-0.041	0.144				
FOUND_EXP					0.152	0.130			-0.096	0.140			-0.233	0.256		
EDU_SUST							-0.180	0.326	-0.100	0.340					0.464	0.476
CEO_NONCEO											-0.319	0.551	**-1.260***	0.546	0.103	0.376
PROF_EXP x CEO_NONCEO											0.006	0.170				
FOUND_EXP x CEO_NONCEO													**0.539**†	0.281		
EDU_SUST x CEO_NONCEO															**-1.128**†	0.616
Model Statistics																
χ^2	5.323		0.286		1.346		0.301		2.464		1.284		6.940		4.725	
p	0.150		0.593		0.246		0.583		0.482		0.733		**0.074**†		0.193	

† p < 0.10, * p < .05, ** p < .01, *** p < .001

Appendix F – Regression Models Social Capital (Funding Objective)

	Model 8		Model 9		Model 10		Model 11		Model 12		Model 13		Model 14		Model 15		Model 16	
Coefficients	**β**	**SE**	**β**	**SE**	**β**	**SE**	**β**	**SE**	**β**	**SE**	**β**	**SE**	**β**	**SE**	**β**	**SE**	**β**	**SE**
Intercept 1 (Never – Rarely)	**-1.675†**	0.917	-1.502	1.114	**-2.483****	1.122	-0.290	3.032	**-2.786****	1.000	-2.208	1.145	**-2.698****	0.888	**-2.760****	1.012	**-2.969****	0.968
Intercept 2 (Rarely – Sometimes)	-0.604	0.896	-0.430	1.101	-1.435	1.104	0.764	3.029	**-1.741†**	0.978	-1.157	1.128	**-1.650†**	0.863	**-1.714†**	0.990	**-1.798†**	0.937
Intercept 3 (Sometimes – Often)	0.360	0.893	0.536	1.101	-0.525	1.098	1.679	3.031	-0.834	0.970	-0.242	1.124	-0.740	0.855	-0.805	0.982	-0.828	0.927
Intercept 4 (Often – Always)	1.533	0.902	1.709	1.109	0.561	1.098	2.767	3.036	0.255	0.968	0.860	1.126	0.347	0.853	0.282	0.980	0.320	0.925
Control Variables																		
GENDER	0.663	0.504	0.652	0.505	0.638	0.505	0.648	0.506	0.617	0.502	0.623	0.506	0.601	0.505	0.616	0.501	**1.040†**	0.543
AGE	0.235	0.138	**0.233†**	0.138	0.216	0.136	0.211	0.137	0.215	0.136	0.224	0.136	0.216	0.139	0.217	0.137	0.155	0.145
EDU_LEVEL	-0.150	0.174	-0.140	0.176	-0.120	0.172	-0.103	0.173	-0.124	0.172	-0.185	0.181	-0.130	0.173	-0.123	0.172	-0.128	0.175
Social Capital Variables																		
NET_CONT	**0.271*****	0.076	-0.388	0.424														
NET_CONT^2			0.013	0.047														
NET_STR					-0.079	0.263	-1.710	2.059										
NET_STR^2							0.283	0.354										
NET_STR_FIN									0.042	0.223	0.040	0.231						
NET_STR_NONFIN											-0.104	0.213						
NET_LOC_LOC													0.296	0.825				
NET_LOC_REG													0.024	0.493				
NET_LOC_INT													0.032	0.333				
NET_LOC															0.028	0.203		
CEO_NET																	0.355	0.348
Model Statistics																		
χ^2	13.076		13.150		0.091		0.742		0.034		0.252		0.119		0.018		1.049	
p	**< .001*****		**0.001*****		0.763		0.690		0.854		0.882		0.989		0.894		0.306	

† p < 0.10, * p < .05, ** p < .01, *** p < .001

Appendix G – Additional Tests Human Capital (Funding Amount)

Coefficients	Model 1		Model 2	
	β	SE	β	SE
Intercept 1 (< 100 k)	**-5.445*** **	1.057	**-5.023*** **	0.999
Intercept 2 (≤ 500 k)	**-3.486*** **	0.910	**-3.069*** **	0.845
Intercept 3 (≤ 1 M)	**-3.030*** **	0.898	**-2.574** **	0.833
Intercept 4 (≤ 5 M)	**-1.494**†	0.872	-1.054	0.811
Intercept 5 (≤ 50 M)	-0.992	0.868	-0.507	0.808
Intercept 6 (> 50 M)	-0.267	0.866	0.203	0.808
Control Variables				
GENDER	0.208	0.487	0.144	0.488
AGE	0.112	0.136	0.073	0.137
EDU_LEVEL	0.205	0.166	0.167	0.169
Human Capital Variables				
HUMAN CAPITAL_VS_NONE[4]	0.378	0.325		
HUMAN CAPITAL_SOME[5]			0.160	0.321
Model Statistics				
χ^2	1.272		0.254	
p	0.259		0.615	

† p < 0.10, * p < .05, ** p < .01, *** p < .001

Appendix H – Additional Tests Human Capital (Funding Objective)

Coefficients	Model 1		Model 2	
	β	SE	β	SE
Intercept 1 (Never – Rarely)	**-2.561*** **	0.946	**-2.685** **	0.885
Intercept 2 (Rarely – Sometimes)	**-1.539**†	0.922	**-1.638**†	0.861
Intercept 3 (Sometimes – Often)	-0.623	0.914	-0.730	0.852
Intercept 4 (Often – Always)	0.454	0.913	0.357	0.850
Control Variables				
GENDER	0.666	0.503	0.614	0.504
AGE	0.208	0.139	0.212	0.139
EDU_LEVEL	-0.154	0.175	-0.131	0.177
Human Capital Variables				
HUMAN CAPITAL_VS_NONE[3]	-0.032	0.332		
HUMAN CAPITAL_SOME[4]			0.037	0.327
Model Statistics				
χ^2	0.009		0.013	
p	0.924		0.911	

† p < 0.10, * p < .05, ** p < .01, *** p < .001

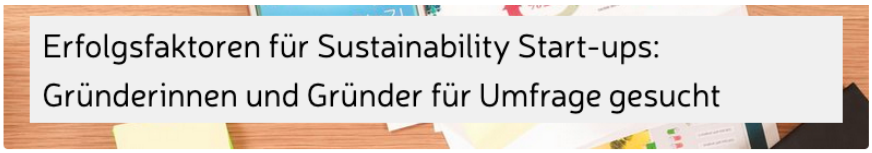
[4] Professional and/or founding and/or educational sustainability experience = 1, no experience (all three variables =0) = 0

[5] More than 2 years of professional and/or founding and/or education experience in sustainability = 1; less than or equal to 2 years of professional and/or founding experience and/or no education in sustainability = 0

Appendix I – Third Party Survey Posts

1. Website post by Start Green (part of the Borderstep Institute for Innovation and Sustainability)

Access the post through the link.



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Nachhaltige Start-ups leisten einen entscheidenden Beitrag zum Klima- und Ressourcenschutz, indem sie innovative Technologien und Geschäftsmodelle entwickeln, die den CO_2-Ausstoß verringern und eine nachhaltige Wirtschaft vorantreiben. Doch welche Faktoren machen diese Start-ups besonders erfolgreich? Die Erkenntnisse dieser Studie könnten wertvolle Impulse für Gründer*innen, Investor*innen und politische Entscheidungstragende liefern.

Jetzt teilnehmen: Kurze, anonyme Umfrage für Start-ups

Um fundierte Ergebnisse zu gewinnen, suchen die Forschenden **Gründer*innen von Sustainability Startups in Deutschland, die nach 2018 gegründet wurden**. Die Teilnahme an der Umfrage ist anonym und dauert maximal 5 Minuten.

👉 **Hier geht's zur Umfrage:**

https://qualtricsxmfs4d2d5vh.qualtrics.com/jfe/form/SV_cTvDfUnOuGhVSgS

Je mehr Gründer*innen teilnehmen, desto aussagekräftiger werden die Ergebnisse – und desto größer der Mehrwert für die gesamte Start-up-Community.

📩 Kontakt:

Hannah Bauer – hannah.bauer@students.uni-mannheim.de

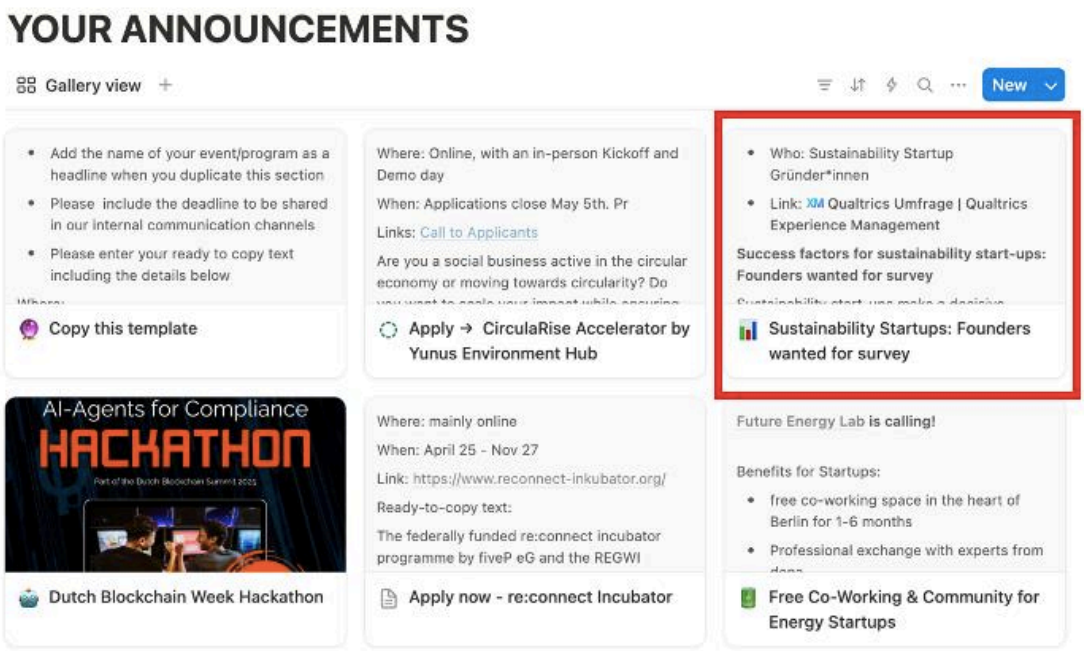
Jakob Benöhr – jakob.benohr@student.nhh.no

2. LinkedIn post by Smart Green Accelerator

Access the post through the link.

3. Internal post by Impact Factory

Access the post through the link.



4. LinkedIn post by SET Hub (part of dena (German Energy Agency))

Access the post through the link.