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Information signals and bias in investment decisions: A meta-analytic comparison of prediction and actual performance of new ventures

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ABSTRACT

This study investigates the presence, direction, and scale of bias in investors' consideration of qualitative information signals while appraising new venture proposals through a meta-analysis of 75 empirical studies published between 2000 and 2020. Our results suggest that investors evaluate different information signals differently owing to their varying abilities and motivations. High levels of ability and motivation stimulate elaboration, resulting in positive bias, whereas low levels of both ability and motivation reduce the likelihood of elaboration, resulting in negative bias. However, for lower levels of either ability or motivation, we found a mix of both positive and negative biases determined by the dominance of information cues. While considering the prospects of investment decisions, our results show that signals suggesting growth potential are preferred over those suggesting financial risk coverage. This study has substantial implications for investors to optimize their decision-making processes and enable entrepreneurs to understand investors' appraisal processes.

1. Introduction

Investments in "new ventures" have surged in recent years. This reaction is considered a response to their high financial returns compared to the capital and commodities markets. The proportion of investments in new ventures, in reference to all stages of a startup, quadrupled in the last 20 years, with an average investment exceeding $4 million (Teare, 2021). However, new ventures carry high risks due to their untested products and teams (Colombo, 2021). They are in the early stages of business venturing and are yet to stabilize. Hence, predicting the performance of new ventures is challenging. Often referred to as the "death valley," most new ventures collapse between the beginning of their operations and revenue generation stages. This is reflected in the skewed financial returns as a large number of "new venture" investments end up in losses, and only a few earn very high returns to justify the performance of the overall portfolio (Drover et al., 2017; Mason & Harrison, 2002). Furthermore, most new ventures have failed (Linder et al., 2020; Nanda & Rhodes-Kropf, 2013). The error is not limited to overvaluing undeserving new ventures; even deserving entrepreneurs are rejected by investors. In addition to causing capital losses, such outcomes damage the economy's innovation trajectory by depriving entrepreneurs of funding. This indicates that investors' inaccurate assessments of new ventures require a more thorough investigation.

To avoid negative consequences, decision-makers assess the prospects for a decision based on available information signals (Lynn et al., 2015). Researchers exploring the decision to invest in new ventures have found a list of qualitative information signals investors consider while investing. A simultaneous development in the domain of new-venture performance has revealed the significance of these qualitative aspects in determining the performance of such new ventures. However, the perceived value of an information signal is not consistent across both the product (Audretsch et al., 2012) and team-related aspects of the new venture (Hsu, 2007; Thies et al., 2019), as the results are contradictory in terms of both the significance and direction of the effect of an

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information signal on investment decisions (Colombo, 2021). Even a small variation in the presentation of information signals is found to influence investment decisions (Lagazio and Querci, 2018; Tajvarpour and Pujari, 2022). In such a case, meta-analysis helps understand the consistency and significance of the perceived value by calculating the combined effect size from various studies for each information signal and assessing its significance. meta-analysis is a statistical procedure that combines data from multiple studies. In this study, we used meta-analysis techniques to consolidate the studies on investors' decisions and new-venture performance separately and compared the significance of the factors. We analyzed the findings of 75 research papers published between 2000 and 2020, as venture financing has shifted significantly in favor of new ventures since the beginning of this century (Teare, 2021). This process has comprehensively and quantitatively concluded the presence, direction, and scale of bias in consideration of qualitative information signals in investors' predictions of a new venture's performance.

While appraising proposals, investors look for information signals that can reflect the future prospects of the alternatives (Edelman et al., 2021). Unlike the capital market, the novelty of the product and target industry in new ventures means that information related to them is not easily available, and even the sparsely available information signals are qualitative in nature (Amit et al., 1990; Colombo, 2021; Nagy et al., 2012). The founding team presents their ideas, market potential, and probable revenues to investors and receives funding if they succeed in persuading investors about the growth potential of their venture. The interaction is short, with less information on untested products, without market wisdom, and often a young and untested team (Jeffrey et al., 2016). This influences investors' decisions, as information availability not only propagates the decision-making process (Ribeiro-Navarrete et al., 2021) but also brings the element of rationality into the decisions (Citroen, 2011). The already present difficulty due to less information is propagated by the subjectivity involved with qualitative information (Lynn et al., 2015). This difficulty in processing information significantly introduces bias in decisions and affects the outcome of persuasion (Petty & Cacioppo, 1986).

The elaboration likelihood model (ELM) suggests a dual route of information processing, namely the central and peripheral routes, and its respective consequences on the attitude toward an object in the context of decision-making (Petty & Cacioppo, 1986). An entrepreneur's objective in interacting with investors is to persuade them to invest; hence, information is presented by entrepreneurs to investors (receivers) with the intention of reflecting the benefits of investing in their venture. Investors process this information to arrive at their investment decision. However, the investors' motivation and ability to process the presented information significantly affect their decisions (Petty & Cacioppo, 1986). Motivation is measured as the importance of information in the context, whereas ability refers to the extent to which one possesses the expertise to understand and assess information (Allison et al., 2017). This study examines the cause of bias in investors' decisions based on ELM arguments. An investor's motivation and ability determine the dominance of the central or peripheral routes. Here, the central route is a result of careful and thoughtful processing of issue-relevant information, while peripheral routes consider the associative linkage between cues. The change in attitude resulting from processing issue-relevant information (central route) is more persistent and resistant to counter-argument than the results from the peripheral cues (peripheral route). However, an investor's motivation and ability moderate the perceived usefulness of information in their decision process (Petty & Cacioppo, 1986; Sussman & Siegal, 2003).

This study aims to explore the presence, direction, and scale of bias in investors' consideration of qualitative information signals through the ELM lens. We used meta-analysis to examine the significance of the information signals across previous literature focusing on new-venture financing and performance and compared the results to analyze the variation in the significance of information signals.

Our analysis revealed the presence of bias when considering information signals. We argue that, because of the varying effects of ability and motivation, instead of issue-relevant information through the central route, new venture investment decisions are dominated by associative cues through peripheral routes. When both ability and motivation are low, lower elaboration results in a negative bias toward an information signal, while a higher likelihood of elaboration, due to high motivation and ability of the investor, results in a positive bias. However, for lower levels of either ability or motivation, we found a mix of both positive and negative biases determined by the dominance of information cues. On the venture's team-related factors, investors are found to be negatively biased toward subjective and difficult information such as social capital, entrepreneurship skills, and intellectual property rights (IPR) and positively biased toward information that is easy to understand, such as team experience. This is consistent with the difficulty involved in processing such information. Investors are found to be positively biased toward factors that are directly associated with performance, such as a product's technology and market potential, and negatively biased toward factors that are not directly associated with performance, such as sustainability and macroeconomic factors.

Based on the quantitative results, our study argues that the cause of inaccurate appraisals is the presence of bias in investors' consideration of information signals. These biases bring inefficiency to an investor's appraisal decisions; hence, investors either invest in bad proposals or reject good proposals. This pattern of bias is associated with an investor's ability and motivation to consider specific information signals. The results of our study will help investors introspect and calibrate their investment decisions, and entrepreneurs understand the minute aspects of investors' appraisal decisions. Lastly, the results provide a new perspective on investor bias for scholars working in this niche area of entrepreneurship and entrepreneurial finance.

The remainder of the paper is organized as follows. Section 2 reviews the literature on the significance of information signals in investor decisions and new-venture performance. Section 3 explains the methodology used and our approach to data collection, coding procedure, and statistical analysis. The results presented in Section 4 cover the comparison of effect sizes, followed by a discussion and implications in Section 5. Finally, Section 6 concludes the study.

2. Literature review and hypotheses development

The use of information signals in decision-making is important for assessing and comparing alternatives (Lynn et al., 2015). For new venture investment decisions, investors look for multiple information signals that can help predict performance and choose to invest in new ventures that will perform well in the future (Edelman et al., 2021; Xu et al., 2022). Although quantitative information is suitable for comparing alternatives, investment decisions in new ventures are limited to qualitative information signals due to the early stage of venturing (Colombo, 2021). A new venture's performance depends on the product, its founding team, and macroeconomic factors (Kaplan et al., 2009; Thornton & Marche, 2003); hence, investors consider information about the team, product, and macroeconomic aspects during appraisal (Félix et al., 2013; Gompers et al., 2020; Vazirani & Bhattacharjee, 2021). Investors consider education, skills, social capital, gender, and experience-related information to judge a team's ability (Claes & Vissa, 2020; Franke et al., 2006; Gompers et al., 2020; Hambrick & Mason, 1984; Kanze et al., 2018; Murnieks et al., 2011), whereas investors consider technology, legal protection (IPR), market potential, and sustainability-related information to judge the product (Félix et al., 2013; Kim et al., 2016; Meoli et al., 2019; Payne et al., 2009; Zhou et al., 2016). Although teams and products are the predominant factors (Gompers et al., 2020), investors seek a stable and progressive macroeconomic environment (Table 1) to ensure a smooth journey for the new venture (Bonini & Alkan, 2012; Burchardt et al., 2016; Li & Zahra, 2012), thus suggesting three themes (Fig. 1) of information signals

Table 1
Themes and respective factors.

Themes	Qualitative information signals
Product	Technology, Legal protection/IPR (Intellectual Property Right), Market potential, Market competition, Sustainability
Team	Education, Team size, Industry experience, Gender, Entrepreneurship skills, and Social capital
Macroeconomic external factors	Negative external (unemployment, inflation, interest rate, and legal rigidity), Positive external (GDP, political, and capital market stability)

influencing investors' decisions: team, product, and macroeconomic environment (Vazirani & Bhattacharjee, 2021). The comprehensiveness of the information scale does not ensure decision accuracy if the value of the information signal is not considered rationally. Investors fail to predict a new venture's performance as most invested ventures collapse (Drover et al., 2017). The cause of inaccuracy is associated with the significance of the information signals received in an investor's decision-making.

ELM discusses the effect of an information receiver's varying motivation and ability on their decision-making process (Petty & Cacioppo, 1986). Though the seminal work of ELM discusses the outcome of persuasion as a "change in attitude," due to the contextual aspect of this work, we have considered it an "investment decision." ELM states that an individual's ability to process information and motivation to consider a specific information signal determine the likelihood of elaboration. Here, elaboration suggests that people add something of their own to the specific information provided in the communication beyond mere verbatim encoding of the information provided (Petty & Wegener, 1999). High elaboration follows the central route, which considers detailed processing of issue-relevant information; however, in the case of a low likelihood of elaboration, the peripheral route dominates, which looks for associative links between credibility cues (Petty & Cacioppo, 1986). The ability and motivation also affect the perceived usefulness of the information signal, as experts or highly involved receivers consider issue-relevant argument quality to be more useful, whereas those with lower levels of expertise or involvement consider the credibility of the source to be more useful (Sussman & Siegal, 2003). Thus, we argue that the perceived usefulness of team-related credibility cues and product-relevant arguments differ due to investors' varying abilities and motivations. However, limiting the scope of team-related credibility cues and product-relevant arguments specifically to peripheral and central routes, respectively, is difficult (Sussman & Siegal, 2003). With low levels of ability or motivation, instead of cognitively intensive analysis of issue-relevant information, investors prefer signals that are easier to understand without determining their relevance to the actual performance of a new venture (Petty & Cacioppo, 1986; Sussman & Siegal, 2003). This preference results in a positive or negative bias when considering information signals. Hence, this study aims to determine the presence, direction, and scale of bias while considering information signals by investors by utilizing the theoretical alignment of ELM.

Many researchers, while reviewing this niche literature using qualitative methods, suggested an inconsistency in the effect of information signals on such investment decisions and asked to explore the source of bias for future studies (Colombo, 2021; Vazirani & Bhattacharjee, 2021). Only a few literature reviews have used the quantitative approach of meta-analysis to explore the significance of information signals in such investment decisions, but the scale was limited to a single signal (Geiger, 2020). Furthermore, no work has explored the presence of bias in investors' consideration of information signals using quantitative methods. Appendix A provides a summary of the studies used for each construct. We discuss different information signals in the subsequent subsections.

2.1. Education

Information about the team's education suggests the quality of the team members. Such information positively affects investors' decisions (Ko & McKelvie, 2018) and the actual performance of new ventures (Adomako et al., 2018; Dvir et al., 2010; Parker & Van Praag, 2006). The

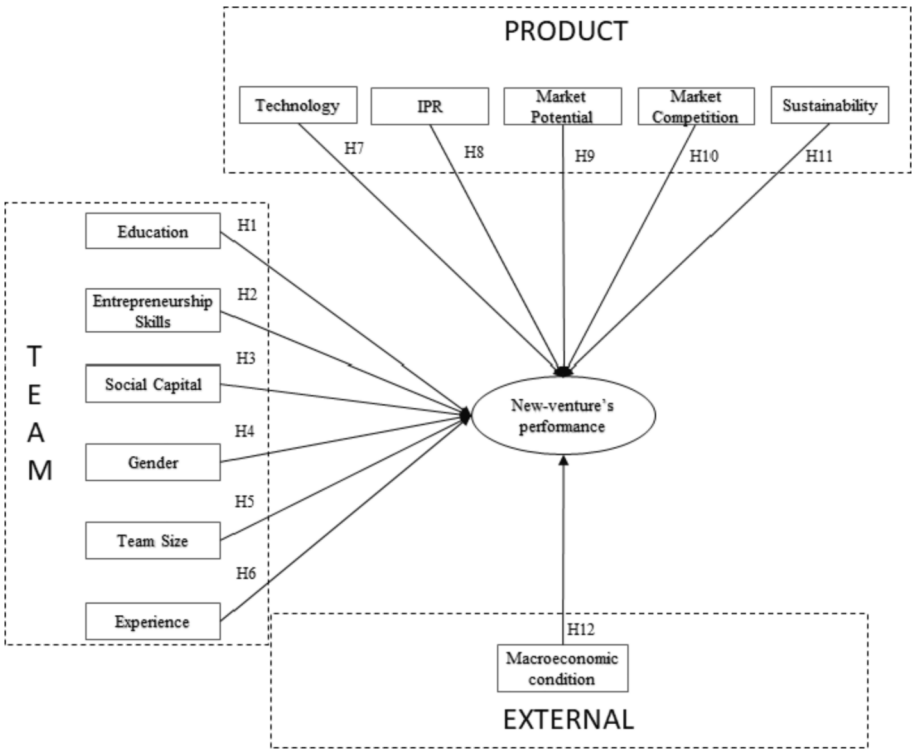

Fig. 1. Hypothesized relationships.

relatedness of a team's quality with a new venture's performance motivates investors to consider education-related signals; however, the status of accrediting authority and the relatability of the knowledge gained with the specific industry of the new venture brings variation in its perceived value (Behrens et al., 2012). This is also reflected in the performance of new ventures (Tryba et al., 2022). While the information about education looks binary, the effect is not linear, as in some cases, higher education has a negative effect on investment decisions (Hsu, 2007). Although education reflects the presence of human capital, higher levels of education impede flexibility, which is detrimental to new ventures' performance (Matusik et al., 2008). This variation reflects subjectivity in the perceived value of an educated team. Although the value of skills associated with education is a highly relevant aspect in determining new-venture performance, the difficulty in assessing subjective information (Lynn et al., 2015) may cause negative bias in investors' decisions. This tradeoff between motivation due to the relevance of information and difficulty due to subjectivity can deviate the bias in either direction. Thus, we hypothesize as follows:

H1: *Investors are biased in considering the team's education-related information signals in the process of appraising new venture proposals for investment.*

2.2. Entrepreneurship skills

New ventures need the skills of the team to stand and deliver in line with market expectations. Gompers et al. (2020) found that, within a team, skills are the most important factor for investors. The relatedness of a "skillful team" with performance motivates investors to signal this in their decisions (Parhankangas & Ehrlich, 2014; Payne et al., 2009). Entrepreneurship skills are found to have positive effects even in the case of new-venture performance (Cheng et al., 2022; Donbesuur et al., 2020), especially in a highly competitive market (Chaston and Sadler-Smith, 2012) where market dynamism creates both barriers and opportunities. Hence, teams with entrepreneurship skills can better address and utilize them (Martin et al., 2020). However, skill-related information is qualitative, unstandardized, unverifiable, and thus difficult to validate. These characteristics are expected to reflect in investors' consideration of this information signal in their decisions. However, similar to education, the trade-off between motivation due to its relevance and the difficulty due to subjectivity can deviate bias in either direction. Thus, we hypothesize as follows:

H2: *Investors are biased in considering a team's entrepreneurship skills-related information signals in the process of appraising new venture proposals for investment.*

2.3. Social capital

Social connections and presence in professional networks help reduce information asymmetry and connect with the market, thus positively affecting investors' decisions (Baum & Silverman, 2004; Shane & Cable, 2002; Troise et al., 2020, Nitani et al., 2019). This also reflects the performance of new ventures (Albors et al., 2008; Donbesuur et al., 2020), as entrepreneurs use such networks to reach potential customers and penetrate the market (Olanrewaju et al., 2020; Pakura & Rudeloff, 2020; Sigmund et al., 2015; Tumasjan et al., 2021). However, this effect is not absolute (Thies et al., 2019). We argue that this variation in perceived value is due to the qualitative and unstandardized characteristics of this information signal. Understanding social capital information is complex because of its unstandardized format, which brings subjectivity to perceiving its value. Although social capital is relevant to performance, processing unstandardized and subjective information is difficult. This suggests a tradeoff between the motivation to include and hesitance owing to its complex nature, which can deviate bias in either direction. Hence, we hypothesize as follows:

H3: *Investors are biased in considering a team's social capital-related information in the process of appraising new venture proposals for investment.*

2.4. Gender of the founding team

Social science researchers have always argued about gender-based stereotyping and bias in favor of men. The preference for male entrepreneurs over female entrepreneurs was found in investors' decisions (Alsos et al., 2006; Kanze et al., 2018) as well as in determining a new venture's performance (Zhao & Yang, 2021). Unlike the other information signals discussed thus far, gender is binary in perspective. However, industry features, team structure, and other skills may cause variation in the perceived value of male entrepreneurs. Although male entrepreneurs can be considered relevant to performance and motivate investors to include it in their decision-making, there are possible variations that make this information signal complex. This suggests a tradeoff between the motivation to include and hesitance owing to its complex nature, which can deviate bias in either direction. Hence, we hypothesize as follows:

H4: *Investors are biased in considering a team's gender-related information in the process of appraising new venture investment proposals.*

2.5. Team size

A larger team is helpful in bringing about diverse skill sets and work distribution, but such teams are also difficult to manage. Investors prefer diversified and larger teams (Brush et al., 2012); however, the effect is not consistent, as larger teams have a negative effect on investors' decisions (Ko & McKelvie, 2018). Similarly, in the case of actual performance, the results are not consistent, as a few researchers found that larger teams help in the new venture's performance (Boso et al., 2019), but in some cases, it had a negative effect (Dai et al., 2019). The inconsistent results for both investors' decisions and actual performance suggest the complex characteristics of this information signal. Furthermore, it is difficult to relate the size of the team to performance. Given the lower motivation due to its less relevance to performance and its complex nature, we hypothesize the following:

H5: *Investors are negatively biased when considering a team's size-related information in the process of appraising new venture investment proposals.*

2.6. Experience

Given the dynamism involved in entrepreneurial journeys, an experienced team is preferred. Specifically, a team that has experience in handling operations, team management, and problem-solving can improve execution and bring efficiency to deliver performance (Kaplan & Strömberg, 2004; Zhang, 2019). This is also reflected in the positive impact of experience on new-venture performance (Patzelt et al., 2008). The binary characteristics of the presence or absence of work experience make it easy to process such information signals. This makes it a generic piece of information to process. Furthermore, the association of an experienced team with performance motivates the consideration of such information signals in the decision process. This suggests a combination of the motivation to include and the ability to process, which can result in a positive bias. Hence, we hypothesize the following:

H6: *Investors are positively biased when considering a team's industrial experience-related information in the process of appraising new venture proposals for investment.*

2.7. Product's technology

While information on the venture's team reflects its execution skills, the product is the engine that competes in the market; hence, investors look for better technology while investing in a new venture (Baum & Silverman, 2004; Le Pendeven & Schwienbacher, 2021; Payne et al., 2009). This is reflected in its positive role in determining the

performance of a new venture (Guo et al., 2019). However, technology-related information is not generic in nature and requires expertise for a justified analysis to perceive its value. It would be difficult for investors to perceive such information unless they had the required expertise. However, technology-related product information is highly associated with a new venture's performance. Thus, it motivates investors to include this in their decisions. This suggests a tradeoff between the motivation to include and hesitance owing to its required expertise to understand, which can deviate bias in either direction. Hence, we hypothesize the following:

H7: *Investors are biased in considering a product's technology-related information in the process of appraising new venture proposals for investment.*

2.8. Technology's legal protection/IPR

Protecting the technological innovation of a product helps control market competition. Investors prefer both trademarks and patents when appraising new-venture proposals (Brush et al., 2012; Meoli et al., 2019; Zhou et al., 2016), especially new ventures that follow innovator strategies and not imitator strategies (Audretsch et al., 2012). Even in actual market situations, technology protection helps in market penetration, controlling competition, and hence improving a new venture's performance (Willoughby, 2013; Zhao et al., 2013). However, similar to technology-related information, a justified analysis of IPR requires expertise, making it difficult for investors to comprehend such information. However, technology protection can motivate investors as IPR reduces competition and significantly affects performance. This suggests a tradeoff between the motivation to include and hesitance owing to its required expertise to understand, which can deviate bias in either direction. Hence, we hypothesize the following:

H8: *Investors are biased in considering a product's IPR-related information in the process of appraising new venture proposals for investment.*

2.9. Product's market potential

Even with innovative technology, if the product does not have a market to capture, generating financial returns will be difficult. Investors look for market potential as a significant factor when appraising proposals (Eckhardt et al., 2006; Félix et al., 2013; Mason & Stark, 2004), and researchers have found it to be a significant factor in determining the actual performance of the new venture (Zhao et al., 2013). The presence of market potential for the product suggests a path for the realization of financial returns. This is expected to create motivation that is specific to market potential-related information signals. Furthermore, the perceived market potential is derived from the available quantitative information; hence, it is comparatively easy to process. This suggests a combination of both a high motivation to include and a high ability to process this information, which can result in a positive bias in decisions. Hence, we hypothesize the following:

H9: *Investors are positively biased when considering the product's market potential-related information in the process of appraising new venture proposals for investment.*

2.10. Market competition

Market competition signals the available business potential of the industry; however, severe competition makes it difficult for new ventures to enter such market segments. Investors prefer industry competition as it boosts the performance of new ventures (Claes & Vissa, 2020), while it also puts pressure on resources and hence has a negative effect on future prospects (Zacharakis & Shepherd, 2005). This makes concluding the niche range of competition difficult, which can have a positive effect on new venture performance. However, unlike the positive relevance of market potential, market competition, which signals risk exposure, may receive more attention. This suggests a tradeoff between the motivation to include and hesitance owing to its complex nature, which can deviate bias in either direction. Hence, we hypothesize the following:

H10: *Investors are biased in considering the market's competition-related information when appraising new venture proposals for investment.*

2.11. Sustainability

Given multiple mental accounts, an individual considers a variety of utilities while making a choice. Researchers have found that investors consider non-financial utility in terms of the social cost of a product while appraising investment proposals for investment (Nitani et al., 2019; Truong & Nagy, 2021). The preference for non-financial utility is also reflected in the market, as new ventures that consider environmental impact and social imbalance are successful (Danso et al., 2020; Zhao & Yang, 2021). Although the sustainability aspect can address a specific mental account of non-financial utility, it is difficult to associate sustainability with the financial utility expected from new venture performance. This reduces investors' motivation to include the sustainability aspects of products in their investment decisions. Furthermore, unlike financial information, sustainability-related information is not standardized, thus creating difficulty in processing such information. Given the lower level of perceived relevance of sustainability to new-venture performance and the difficulty in processing subjective information, we hypothesize the following:

H11: Investors are negatively biased when considering the product's sustainability-related information when appraising new venture proposals for investment.

2.12. Macroeconomic factors

In an already dynamic journey of entrepreneurship, socio-political stability and favorable economic conditions are fundamental to the performance of the new venture. Investors seek countries with the least legal and financial compliance (Bock & Watzinger, 2019; Bonini & Alkan, 2012; Félix et al., 2013) and favorable economic growth (Félix et al., 2013; Ning et al., 2015). A similar pattern has been found in determining the actual performance of new ventures (Batjargal et al., 2013; Zhao & Yang, 2021). However, the presence of a positive ecosystem may not mirror the presence of a negative ecosystem. Hence, we categorize positive and negative macroeconomic factors separately. Unlike products or teams, macroeconomic factors are distantly related to venture performance, and these indirect characteristics may reduce investors' motivation to include this in their decisions. Furthermore, macroeconomic information is complex and requires expert knowledge for justified understanding. This combination of reduced motivation and difficulty in processing information can result in negative bias. Hence, we hypothesize the following:

H12a: Investors are negatively biased when considering the economy's negative information in the process of appraising new venture investment proposals.

H12b: *Investors are negatively biased when considering the economy's positive information in the process of appraising new venture investment proposals.*

3. Method of meta-analysis

3.1. Literature search

We used several leading electronic databases such as Scopus, EBSCO, Google Scholar, ScienceDirect, Emerald, Taylor & Francis, and SAGE (Jeyaraj & Dwivedi, 2020; Tamilmani et al., 2019) to comprehensively search the primary studies relevant to our study context. We conducted a search and extraction of relevant studies on investors' decisions, using multiple keywords and their combinations. The keywords included "crowdfunding," "venture capitalist," "angels," "investment decisions,"

"new venture investment," "new venture investment factor," "early-stage investment factors," and "early-stage venture investment factors." We also extracted studies focused on the actual performance of a venture using the keywords "new venture performance," "factors for new venture performance," "NVP," and "critical factors for new venture performance." Furthermore, we conducted a manual search of relevant journals to search for articles that might not have appeared in the database search. We scrutinized the references of the identified articles to search for additional relevant works. Of the identified studies, only those published between 2000 and 2020 were considered for further analysis. The initial database search yielded a total of 727 articles.

The search for primary studies for meta-analysis included several steps highlighted in previously published literature reviews and meta-analyses (Jeyaraj & Dwivedi, 2020; Dwivedi et al., 2019; Hooda et al., 2022; Mishra et al., 2023; Sarkar et al., 2020). First, we excluded the irrelevant studies by reading the titles, abstracts, and keywords of the identified articles. Second, we read the abstracts independently to identify the articles that were relevant to the present study. Third, we filtered out the review articles, commentary, news, prefaces, editorials, non-English, and duplicate articles. A total of 321 studies were considered at the end of the first filtration stage.

Finally, we read the full text of the shortlisted articles and extracted relevant information needed for the meta-analysis. We filtered articles based on a fixed set of criteria, and only those papers that met all the criteria were included in this study. First, the studies should focus on examining the qualitative factors responsible for evaluating the performance of a new venture or its actual performance. Second, the papers must focus on an empirical investigation of the above-mentioned topic and provide quantitative data, such as correlation coefficients (r) and sample size. Third, the papers should be published in peer-reviewed journals in English. Most papers were filtered out because of the absence of correlation coefficient (r) data. The final shortlist of primary studies included 75 research articles. Appendix B provides the profile of the studies used in the meta-analysis.

3.2. Data coding

Our coding of the data began with the collection of basic information for each study. This included the title of the paper, author details, journal name, year of publication, geographical origin of the sample, and qualitative factors examined in the study. Subsequently, we extracted and noted the quantitative data, such as sample size and correlation coefficients, for each of the observed relationships between the independent and dependent variables. We merged some of the qualitative factors with different labels but with similar conceptualizations into the same factor, following a discussion between the authors of this study. We also coded additional information regarding the context of the study, such as the prediction of performance and actual performance, to compare the two scenarios. We considered the context of the variable "performance of the venture" within the acceptable norms of financial and non-financial parameters that such new ventures delivered after the beginning of their operations.

3.3. Meta-analytic approach

We use the approach by Borenstein et al. (2007) to summarize the individual effect sizes of different studies and calculate the summary or combined effect size for each of the path relationships. Pearson's correlation coefficient (r) was used as the effect size metric in this study (Dwivedi et al., 2019). This methodology has been well established and recognized by scholars to quantitatively provide a summary of the research findings. This method has also been extremely effective in determining the causes of heterogeneity in the relationships studied in the existing literature with the help of moderator analysis. Overall, we found that this method enables an in-depth quantitative examination of the phenomenon under study. We use the random-effect model, assuming the existence of varying effects across the varying study contexts and sample sizes in the primary studies (Rana et al., 2015).

We conducted the following steps in the analysis (Hedges & Vevea, 1998; Lipsey & Wilson, 2001; Borenstein et al., 2007):

Step 1: We calculated the Fisher transformation of correlation coefficients as follows:

Fisher transformation $(T_i) = .0.5 * log \frac{1+r_i}{1-r_i}$

Step 2: We tested homogeneity among the studies using the Q-statistic, which was calculated as the weighted variance of the effect size metric. The Q-statistic indicates variability in the effect size estimate due to sample heterogeneity rather than sampling error. The formulas used for the analysis are as follows:

$$Q = \sum_{i=1}^{n} W_i * (T_i - \overline{T})^2$$

where,

Q = Heterogeneity statistic,

W_i = Sample size for the i^{th} study.

T_i = Effect size for the i^{th} study

$$\overline{T} = \sum (W_i * T_i) / \sum W_i$$

Step 3: We calculated the overall effect size as follows:

$$T\,(\text{consolidated}) = \sum_{i=1}^{n} W_i' * T_i$$

where,

$1/ = 1/W_i + \tau^2$.

τ^2 = Max [0, (Q-df)/C]

$$C = \sum W_i - \frac{\sum W_i^2}{\sum W_i}$$

df = Degrees of Freedom.

Overall effect size (r) $= \frac{e^{2T(consolidated)} - 1}{e^{2T(consolidated)} + 1}$

Step 4: We assessed the significance level of the overall effect size; the p-value linked to the overall effect size specifies the statistical significance.

4. Results

Table 2 summarizes the combined effect sizes, estimated significance levels, and confidence intervals for the hypothesized relationships. We found that the team's education-related information did not have a significant positive effect on investment decisions; however, the effect was significant on actual performance. For H1, our results suggest a negative bias toward this signal. We found that entrepreneurship skills-related information had a significant effect on investment decisions as well as on actual performance; the effect was stronger in the latter study context, suggesting a negative bias (H2). We found that the effect of social capital on investment decisions and actual performance was significant, with a stronger effect on actual performance, thus suggesting a negative bias (H3). The results suggested that gender did not play a significant role in investors' decisions; however, the effect on actual performance was significant, thus suggesting a negative bias (H4). The effect of information related to team size on investment decisions and actual performance was significant, with a stronger effect on actual performance, thus suggesting a negative bias (H5). Experience had a stronger significant effect on investment decisions than it had on actual performance, thus suggesting a positive bias for this signal (H6). We found that all product-related information, such as product technology, IPR, and market potential, have a significant effect on investment decisions and actual performance. The effect of IPR-related information on actual performance was stronger, thus suggesting a negative bias (H8). However, the effect of product technology and market potential-related information was stronger on investment decisions, suggesting a positive bias toward these signals (H7 and H9). We failed to find support for

Table 2
Comparison of effect sizes.

Path	Subgroup	N	TSS	Meta Cor	p-value	SD	Q Stats	z-value	LLCI	ULCI
Edu → Perf	Prediction	11	2324	0.04	0.294	0.099	0.2783 ^{ns}	1.04	−0.03	0.11
	Actual	16	18,048	0.06	0.003	0.064		3	0.02	0.1
ESkil → Perf	Prediction	5	1066	0.19	0.004	0.115	0.8136 ^{ns}	2.92	0.06	0.3
	Actual	13	2790	0.30	0.001	0.317		3.46	0.13	0.45
SCap → Perf	Prediction	10	27,980	0.11	0.000	0.07	1.2733 ^{ns}	3.96	0.06	0.17
	Actual	18	4331	0.23	0.000	0.219		4.34	0.13	0.33
Genr → Perf	Prediction	5	4540	−0.03	0.299	0.053	10.3025**	−1.04	−0.1	0.03
	Actual	11	13,174	0.08	0.000	0.041		3.98	0.04	0.11
TSize → Perf	Prediction	8	28,852	0.08	0.006	0.074	0.2592 ^{ns}	2.76	0.02	0.14
	Actual	5	2985	0.12	0.088	0.143		1.71	−0.018	0.25
IExp → Perf	Prediction	7	3116	0.17	0.004	0.133	1.0402 ^{ns}	2.89	0.06	0.28
	Actual	12	7147	0.10	0.008	0.117		2.65	0.026	0.173
Tech → Perf	Prediction	5	682	0.30	0.077	0.372	0.3691 ^{ns}	1.77	−0.033	0.571
	Actual	14	9398	0.22	0.000	0.119		6.25	0.15	0.29
IPR → Perf	Prediction	10	6047	0.12	0.020	0.164	3.9880**	2.33	0.02	0.23
	Actual	8	1531	0.31	0.000	0.199		4.22	0.17	0.44
MPot → Perf	Prediction	8	1359	0.27	0.003	0.243	1.7237 ^{ns}	2.96	0.09	0.43
	Actual	9	11,783	0.12	0.038	0.16		2.08	0.01	0.23
MCom → Perf	Prediction	3	704	−0.08	0.370	0.116	2.797*	−0.9	−0.26	0.1
	Actual	8	1632	0.22	0.089	0.359		1.7	−0.03	0.44
Sust → Perf	Prediction	3	31,079	0.04	0.000	0	2.5833 ^{ns}	6.18	0.03	0.05
	Actual	3	8101	0.21	0.010	0.134		2.57	0.051	0.36
NExt → Perf	Prediction	4	15,364	−0.04	0.134	0.036	0.8359 ^{ns}	−1.5	−0.09	0.01
	Actual	4	1011	−0.18	0.138	0.234		−1.48	−0.402	0.059
PExt → Perf	Prediction	8	45,704	0.05	0.001	0.03	16.9459***	3.41	0.02	0.07
	Actual	3	9537	0.3	0.002	0.194		3.15	0.116	0.464

Notes: According to Kirca et al. (2005), a meta-analysis was conducted on factors that had at least three significant studies.
ns: non-significant relationship; $p > 0.10$.
*: $p < 0.10$.
**: $p < 0.050$.
***: $p < 0.010$.

market competition as a significant predictor of investment decisions; however, the effect on actual performance was significant, thus suggesting a negative bias (H10). Product sustainability-related information had a significant effect on investment decisions and actual performance, and the effect was stronger on actual performance, thus suggesting a negative bias. Negative macroeconomic information did not have a significant effect on investment decisions and actual performance, thus providing no support for our hypothesis (H12a). However, the effect of positive macroeconomic information is significantly stronger on actual performance than on investment decisions, thus suggesting a negative effect on this signal (H12b).

5. Discussion and implications

This study explored the presence, direction, and scale of decision bias in new venture investors' investment decisions through the ELM lens (Petty & Cacioppo, 1986). Researchers have considered ELM to explore new venture investment decisions, but their focus was limited to the significance of the factors. Few studies investigate the scope of bias resulting from investors' abilities and motivations (Allison et al., 2017). The existing literature suggests inconsistency in investors' consideration of information signals and the presence of bias in investors' consideration of information signals while predicting the performance of new ventures (Colombo, 2021; Vazirani & Bhattacharjee, 2021). Investors are influenced by the narrative description of the information signal, irrespective of the value (Tajvarpour & Pujari, 2022). However, there is a paucity of studies that quantitatively explore the presence of such biases in investors' decisions. We reviewed the existing literature on investors' prediction of new venture performance and compared the results with the actual relevant factors that significantly determine new venture performance to explore the decision bias in new venture investments. When both ability and motivation are low, investors are negatively biased toward information signals, whereas they are positively biased when both ability and motivation are high (Table 3). However, for lower levels of either ability or motivation, we found a mix of both positive and negative biases determined by the dominance of information cues (Chaiken & Maheswaran, 1994).

H1-H6 deal with team-related factors. In the case of H1, unlike the positive significance of an educated team in determining the actual performance, investors do not significantly consider education-related information. This finding is consistent with the results of previous studies. Although education is a generic piece of information and should have been positively associated with investment decisions, the variety of domains and levels of education causes subjectivity (Behrens et al., 2012; Huang et al., 2009). This subjectivity makes it difficult to understand a signal's value and inhibits the consideration of information signals (Sussman & Siegal, 2003). Although the relevance of an educated team with performance may motivate investors to include this factor in their decision-making, the negative aspect of subjectivity dominates (Petty & Cacioppo, 1986), and investors hesitate to consider this in their decisions.

Considering H2 and H3, entrepreneurial skills and social capital are found to be significant in both investors' decisions and in determining the actual performance of the new venture. However, the comparison indicates that investors are negatively biased against these information signals and give less preference than required in determining the performance of the new venture. Although little effort is required to realize the importance of highly associative factors such as entrepreneurship skills and social capital for the performance of a new venture, these signals are preferred less as they are not easily measurable or verifiable. These characteristics of immeasurableness and non-verifiability reduce the value of credibility cues and inhibit elaboration possibilities (Chaiken & Maheswaran, 1994; Lynn et al., 2015; Petty & Cacioppo, 1986). This is reflected in the lower perceived usefulness of this signal (Sussman & Siegal, 2003). Hence, investors are negatively biased because of the dominance of the difficulty in information processing.

H4 hypothesizes investor bias in considering the role of the gender of a team member in a new venture's performance. Unlike investors'

Table 3
Relationship between ability, motivation, and bias.

Hypotheses	Relationship	Ability	Motivation	Meta Outcome	Direction of Bias	Elaboration Status	Source
H1	Edu → Perf	No	Yes	Insignificant			
H2	ESkil → Perf	No	Yes	Significant	Negative Bias	Bias	Difficulty dominance
H3	SCap → Perf	No	Yes	Significant	Negative Bias	Bias	Difficulty dominance
H4	Genr → Perf	No	Yes	Insignificant			
H5	TSize → Perf	No	No	Significant	Negative Bias	Low Elaboration	Peripheral
H6	IExp → Perf	Yes	Yes	Significant	Positive Bias	High Elaboration	Central
H7	Tech → Perf	No	Yes	Significant	Positive Bias	Bias	Positive cue dominance
H8	IPR → Perf	No	Yes	Significant	Negative Bias	Bias	Difficulty dominance
H9	MPot → Perf	Yes	Yes	Significant	Positive Bias	High Elaboration	Central
H10	MCom → Perf	No	Yes	Insignificant			
H11	Sust → Perf	No	No	Significant	Negative Bias	Low Elaboration	Peripheral
H12a	Next → Perf	No	No	Insignificant			
H12b	PExt → Perf	No	No	Significant	Negative Bias	Low Elaboration	Peripheral

insignificant preferences for a specific gender, male entrepreneurs were positively significant in determining the actual performance of the new venture. This is consistent with studies showing that men have always had better access to resources, be it for education, business ventures, food within the family, or even at the societal level for political postings, sports, and so on (Hultin & Szulkin, 1999). These preferences improve social capital and learning. Hence, instead of a biological parameter delivering successful ventures, it is the preference that male members have already received in related domains that places them in a better position to deliver a performing venture. We argue that the stated subjectivity about the role of gender that is specific to the niche industry, skills, and team structure has inhibited its significant consideration. Even with high motivation in the perceived relevance with performance, the difficulty in considering the subjectivity in the perceived value of having male entrepreneurs inhibits investors' consideration of this information signal.

H5 discusses the significance of team size in investors' decisions. Investors are found to be negatively biased toward team size-related information signals, while they play a greater role in a new venture's performance. First, it is difficult to conclude the specific size of the team to be effective. Second, it lacks the required relevance to associate it with new-venture performance. Owing to the lack of investors' ability and motivation, the perceived usefulness of this signal reduces in the investors' decisions (Petty & Cacioppo, 1986; Sussman & Siegal, 2003). Hence, this has a low likelihood of elaboration, resulting in a peripheral route to information processing.

H6 explores investor bias in considering the role of industry experience in determining the performance of a new venture. In both cases, predictions by investors, actual performance, and industry experience have a positive effect. However, the effect on an investor's decision was more than the significance it had in determining performance. Hence, investors are positively biased toward information on industry experience. This positive bias, while considering experience-related signals, reiterates the previous argument that investors display a greater preference for generic information signals (Petty & Cacioppo, 1986; Sussman & Siegal, 2003). Furthermore, industry experience is highly relevant in determining performance, as experienced teams are more stable and less likely to fail (Bosma et al., 2004). This motivates investors to consider such information signals (Petty & Cacioppo, 1986). Given the high likelihood of elaboration, information related to industry experience is processed through the central route.

Although team-related factors help ascertain the journey of a venture in the market, it is the product that directly faces market competition. For H7, the product technology being the fundamental source of creating value for the customers is found to be a significant driver of both the investor's decision and in determining the actual performance of a new venture. However, we found investors to be positively biased in favor of technology-related information compared to the role it plays in determining a new venture's performance. Though technology-related information signals are complex to understand and require expertise for a justified evaluation, the positive cue due to its relevance to today's technology-powered economic models dominates the negative effect of lack of ability (Chaiken & Maheswaran, 1994).

H8 explores investor bias in considering the role of legal protection for a new venture's product, such as IPR, in determining a new venture's performance. Product technology provides leverage for acquiring new customers. However, a consistent and sustainable market share requires protecting the newly developed technology from replication. Hence, IPR is found to be a significant factor in both the investors' decisions and in determining the actual performance of a new venture. However, we found investors to be negatively biased toward IPR compared to its role in the actual scenario. We argue that the expertise required to analyze IPR-related information signals to understand their value has inhibited the significance of these information signals in investors' decision-making (Sussman & Siegal, 2003). Unlike technology, motivation is not significant in overcoming the negative aspects of the difficulty in understanding IPR-related information (Chaiken & Maheswaran, 1994).

H9 explores investor bias in considering the role of the market potential of a new venture's product in its performance. Market potential reflects the probable financial value of the product's idea and hints at the revenue generation ability of a new venture. The results suggest that market potential is a significant factor affecting investors' decisions and determines a new venture's actual performance. However, investors are positively biased toward this signal compared to the role it plays in determining the actual performance of the new venture. The ease of processing market potential-related information and the high motivation for its relevance with the actual financial returns creates a high likelihood of elaboration (Petty & Cacioppo, 1986). Hence, investors use the central route of information processing and are positively biased toward market potential-related information signals (Petty & Cacioppo, 1986; Sussman & Siegal, 2003).

H10 explores investor bias in considering the effect of competition level in determining the performance of a new venture. The results for H10 suggest that market competition does not have a significant impact on new-venture investor decisions, but it is a significant factor in determining a new venture's performance. This could be the result of a risk-averse approach, as competition-related information suggests a possible struggle for a new venture's initial journey. However, a higher level of competition also suggests higher market potential (Vasile et al., 2012). Such extremely diverse opinions lead to inconsistencies in concluding the direction of this information signal. As new venture investment is a high-risk segment, investors need to refrain from the risk-aversion approach and consider this signal while making investment decisions. Alternatively, higher competition requires diverting critical resources and time for promotional activities; hence, it may not be helpful for the initial journey of the venture. Hence, there is a need to explore the specific characteristics of competition, such as perfect, oligopolistic, monopolistic, and so on, to comment on the role of market competition on the performance of new ventures.

H11 considers the sustainability of new ventures. Incorporating

sustainability principles into a venture's business process is considered a responsible business approach and is expected to attract more premiums from stakeholders. Investors are found to be negatively biased toward sustainability-related information signals compared to their role in a new venture's performance (Jayaraman et al., 2012; Nilssen et al., 2019; O'Rourke & Ringer, 2016). This is consistent with prior empirical research that indicates financial returns as an investor's primary goal. Furthermore, given the higher risk of exposure to the capital invested, investors may prefer to focus on factors that can increase profit margins. This lack of a perceived direct association between sustainability and performance reduces investors' motivation to consider it in their decisions (Petty & Cacioppo, 1986). Furthermore, sustainability-related information is yet to be standardized and subjective (Lopez-de-Silanes et al., 2020); hence, it is difficult to process. The lack of motivation and ability results in a low likelihood of elaboration; hence, investors are negatively biased (Sussman & Siegal, 2003) and prefer peripheral routes for processing sustainability-related information.

In addition to the internal factors of the new venture, external factors provide the ecosystem for its development. H12 investigates the negative and positive aspects of the macroeconomic environment to evaluate their specific effects on investment decisions. Macroeconomic factors do not directly affect a specific venture, but a supportive macroeconomic ecosystem is essential for the development of a new venture (Soto-Simeone et al., 2020). However, for H12a, we found that negative macroeconomic factors do not have a significant effect on investors' decisions or on determining the actual success of new ventures. Therefore, there is a need for in-depth analysis to identify industry-specific negative macroeconomic factors to clarify the results. Regarding H12b, our results show that positive external factors have a significant positive effect on investors' decisions, as well as on the performance of the new venture. However, investors are negatively biased toward such information rather than the actual role they play in determining a new venture's performance. Given the difficulty of processing technical information in the macroeconomic context and the lower motivation for its indirect relevance in determining new venture performance, the likelihood of elaboration is low (Petty & Cacioppo, 1986). Hence, investors are negatively biased (Sussman & Siegal, 2003), and this information is processed through the peripheral route.

5.1. Theoretical implications

Our study contributes to the existing literature by suggesting a meta-analytic approach to identifying the presence of bias in investment decisions. meta-analysis enabled us to combine the effect size metrics from various studies and assess their significance across two different contexts: prediction of performance and actual performance of new ventures. We found this methodology to be effective in assessing the direction of bias across investment decisions for the various information signals considered in this study. Our work found the presence of bias in investors' decisions across all themes, as well as for specific information signals, through the theoretical lens of the ELM. Investors are negatively biased toward information signals that are difficult to assess, such as IPR and social capital or are not directly associated with the new venture, such as sustainability and macroeconomic factors. Highly subjective factors, such as entrepreneurship skills and social capital, are difficult to measure (Kollmann & Kuckertz, 2010); hence, they are not preferred to compare alternative choices of business proposals (Lynn et al., 2015; Petty & Cacioppo, 1986). Furthermore, information signals such as macroeconomic factors, team size, and a product's sustainability, which are not directly associated with a new venture's performance, carry less motivation to be considered in an investor's decision. Hence, investors are negatively biased toward such signals (Petty & Cacioppo, 1986; Sussman & Siegal, 2003). Researchers working on investors' decisions should consider the perspective of information characteristics while designing methodologies to obtain results on investors' decisions. The source of the significance of an information signal in the decision process can be associated with the information type, framing effect, or contextual aspects (Colombo, 2021; Petty & Cacioppo, 1986; Sussman & Siegal, 2003) and not just by the value it actually carries.

Information signals that make the growth projection easier increase the motivation level and hence receive the highest consideration from investors (Petty & Cacioppo, 1986). Product technology, being the source of value for customers, was preferred as the most significant factor, followed by market potential. The familiarity of market potential with probable market returns drives investors' decisions in favor of investment (Kornell et al., 2011; Petty & Cacioppo, 1986). The significantly higher scale of the effect size further suggests that investors use a combination of technology and market potential to confirm financial returns from investment. Information that leads to the team's historical performance, such as industry experience, is also preferred over its role in determining actual performance. A team with no failure at the personal level in the past is expected not to fail in their business venturing journey in the future, suggesting a risk-averse approach (Bosma et al., 2004). Hence, investors seek such signals to ensure the security of capital while appraising the proposal. Comparing the scale of effect sizes between signals indicating "financial returns," such as technology and market potential, with "risk coverage" signals, such as experience, suggests that investors give more importance to financial returns than risk coverage while making new-venture investment decisions. This is an exception to loss aversion (Kahneman & Tversky, 2013), as in this high-risk investment, the return potential is more critical than the expected loss. Furthermore, the low probability of gains in such investment decisions may increase risk exposure, making risk coverage an insignificant aspect of investor decisions.

Our results show that investors are biased toward information signals that are easier to process to reach investment conclusions. Among these information signals, those that suggest growth potential are preferred to those that suggest financial risk coverage. This contradicts the theoretical work on the economic prospects of a decision that states that individuals prefer loss coverage above return potential and value things that they have more than the things they do not have (Kahneman & Tversky, 2013; Levy, 1992). Lastly, signals that are either difficult to process or are not directly related to the venture's performance are given the least importance by investors. Hence, investors are biased in their decisions to predict a new venture's performance, and as a result, most investments fail to provide the expected financial returns. The researchers should consider the contextual aspects and characteristics of information before concluding the significance of a specific information signal in a decision.

5.2. Managerial implications

Our results contribute to the literature on different stakeholders at three levels. Investors should give less importance to the team's experience, product technology, and market potential and focus more on the team's skill, social capital, IPR, and macroeconomic factors, as these factors are more significant in determining the performance of new ventures. First, it will help investors understand their decision-making processes and the presence of bias in their decisions; this understanding will help them escape the loss of capital and maximize their returns by avoiding inaccurate appraisals. Hence, the results will help investors at the fund and firm levels. The changes in investors' decision to invest will result in the selection of better proposals, thus helping deserving entrepreneurs receive the required funds to establish their ventures. Second, our results will help entrepreneurs understand investors' appraisal decisions and their preferences for information. Such awareness will help entrepreneurs optimize their persuasion strategies and increase the probability of receiving funds. With the application of nudging, entrepreneurs can use specific information signals to attract investor attention and raise the funds required for venture development. Entrepreneurs should avoid information signals for which investors are negatively biased to escape rejection and communicate the information

signals for which investors are positively biased to increase the possibility of receiving funds. Third, investing in better proposals and reducing capital loss will preserve the capital resources of the economy, especially for emerging countries that have limited capital resources for such investments and thus rely on international institutions to finance new local ventures. Such optimization of funds at the macroeconomic level will improve the innovation index of the economy, as better ventures will receive financial support. The significance of external macroeconomic factors also suggests that policymakers should ensure a suitable macroeconomic ecosystem for the growth of new ventures. Such an ecosystem not only reduces losses for such investors but also propagates innovation and leads to a systemic improvement of the economy.

5.3. Limitations and future scope

Although an extensive review of the literature was performed using a quantitative methodology, this study has some limitations. First, only the popular databases were referred to for the extant literature, and hence, there is some probability of missing some of the relevant research articles that were not present in these databases. Hence, future meta-analyses may consider a wider range of databases for source research. Second, since studies reporting significant results have a greater chance of being published, the results of our study might be influenced by publication bias. Third, the meta-analysis considered only quantitative studies that could lead to a potential sampling bias. Future research should explore the scope for the reduction of bias in the decision due to the framing of specific information signals and explore the variation in the bias due to investors' profiles. The appraisal decision is binary in nature, as it involves either a rejection or acceptance of investing. Extending the results of this study, researchers can explore the effect of bias on appraisal conclusions. Empirical methodologies can be used to explore the effect of bias for a specific signal on investment appraisal conclusions. There is a possibility of categorizing the factor-specific bias to result in the acceptance or rejection of a proposal.

6. Conclusion

We explored the presence of bias in new venture investors' decisions through the lens of the ELM. We found quantitative evidence that the significance investors attach to information signals of an investment proposal varies from the significance of these factors in determining actual performance. Our results show the presence of bias in the significance that investors attach to the information signals. The direction of bias is determined by investor motivation and their ability to process information signals. When both ability and motivation are low, investors are negatively biased toward information signals, whereas they are positively biased when both ability and motivation are high. However, for lower levels of either ability or motivation, we found a mix of both positive and negative biases determined by the dominance of information cues. Thus, we conclude that investors' preference for information signals is determined not by the merit of the information signals in determining the actual performance of the new venture but by investors' motivation and ability to process the information signal.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data availability

Data will be made available on request.

Appendix A. Summary of studies used for each construct

Theme	Information Signal	Effect Sizes	Reference
Team	Education	27	Adomako et al., 2018; Adomako et al., 2018; Alcantara & Kshetri, 2013; Batjargal et al., 2013; Boso et al., 2019; Chen et al., 2017; Danso et al., 2020; Eesley et al., 2014; Hmieleski et al., 2013; Hsu, 2007; Ko & McKelvie, 2018; Kolympiris et al., 2018; Lin et al., 2015; Liu et al., 2019; Ma et al., 2017; Nitani et al., 2019; Wei et al., 2021; Zhang et al., 2013; Zhao & Yang, 2021.
	Entrepreneurship skills	18	Adomako et al., 2018; Adomako et al., 2018; Banerji & Reimer, 2019; Boso et al., 2019; Bruton et al., 2018; Chen et al., 2009; Cheng et al., 2020; Guo et al., 2014; Lin et al., 2015; Lin et al., 2006; Ma et al., 2017; Malmström et al., 2020; Parhankangas & Ehrlich, 2014; Park et al., 2019; Payne et al., 2009; Wu et al., 2020; Xie & Lv, 2016; Zhang et al., 2013
	Social capital	28	Adomako et al., 2018; Anwar et al., 2018; Banerji & Reimer, 2019; Batjargal & Liu, 2004; Batjargal et al., 2013; Bauke et al., 2016; Boso et al., 2019; Chen et al., 2017; Cumming et al., 2020; Duan et al., 2020; Hormiga et al., 2011; Lin et al., 2015; Lin et al., 2006; Lukkarinen et al., 2016; Meoli et al., 2019; Nitani et al., 2019; Pakura & Rudeloff, 2020; Shane & Cable, 2002; Short & Anglin, 2019; Sigmund et al., 2015; Sullivan et al., 2021; Wei et al., 2021; Wu et al., 2020; Xie & Lv, 2016; Xue et al., 2019; Zahra & Bogner, 2000; Zhu, 2020.
	Gender	16	Alcantara & Kshetri, 2013; Batjargal et al., 2013; Bauke et al., 2016; Boso et al., 2019; Cheng et al., 2020; Duan et al., 2020; Grilli, 2019; Lin et al., 2015; Liu et al., 2019; Ma et al., 2017; Malmström et al., 2020; Nitani et al., 2019; Shane & Cable, 2002; Wei et al., 2021; Zhang et al., 2013; Zhao & Yang, 2021.
	Team size	13	Behrens et al., 2012; Boso et al., 2019; Brush et al., 2012; Cumming et al., 2020; Dai et al., 2019; Eesley et al., 2014; Grilli, 2019; Hsu, 2007; Ko & McKelvie, 2018; Ralcheva & Roosenboom, 2020; Schlichte et al., 2019; Sullivan et al., 2021; Zhu, 2020.
	Industry experience	19	Alcantara & Kshetri, 2013; Banerji & Reimer, 2019; Batjargal, 2007; Batjargal & Liu, 2004; Batjargal et al., 2013; Bauke et al., 2016; Brush et al., 2012; Chen et al., 2017; Cheng et al., 2020; Eesley et al., 2014; Grilli, 2019; Hmieleski et al., 2013; Ko & McKelvie, 2018; Lin et al., 2015; Sullivan et al., 2021; Zacharakis & Shepherd, 2005; Zhang et al., 2013; Zhao et al., 2013; Zheng, 2012.
	Technology	19	Alcantara & Kshetri, 2013; Batjargal, 2007; Batjargal & Liu, 2004; Eesley et al., 2014; Guo et al., 2019; Hu & Zhang, 2012; Jayawarna et al., 2014; Lin et al., 2006; Liu et al., 2019; Ma et al., 2017; Messersmith & Guthrie, 2010; Payne et al., 2009; Shane & Cable, 2002; Wei et al., 2021; Willoughby, 2013; Xie & Lv, 2016; Zahra & Bogner, 2000; Zhou et al., 2016; Zhu, 2020.
Product	Legal protection	19	Brush et al., 2012; Hsu, 2007; Hsu & Ziedonis, 2013; Juma McGee, 2006; Kolympiris, Hoenen et al., 2018; Ling, 2013; Malmström et al., 2020; Meoli et al., 2019; Parhankangas & Ehrlich, 2014; Ralcheva & Roosenboom, 2020; Willoughby, 2013; Zacharakis & Shepherd, 2005; Zahra & Bogner, 2000; Zhao et al., 2013; Zhou et al., 2016.

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Theme	Information Signal	Effect Sizes	Reference
	Market potential	17	Alcantara & Kshetri, 2013; Batjargal, 2007; Batjargal & Liu, 2004; Brush et al., 2012; Guo et al., 2019; Hsu & Ziedonis, 2013; Jayawarna et al., 2014; Ko & McKelvie, 2018; Lin et al., 2006; Lukkarinen et al., 2016; Shane & Cable, 2002; Zacharakis & Shepherd, 2005; Zahra & Bogner, 2000; Zhang et al., 2013; Zhao et al., 2013; Zhao & Yang, 2021.
	Market competition	11	Anwar et al., 2018; Bruton et al., 2018; Claes & Vissa, 2020; Danso et al., 2020; Guo et al., 2019; Guo et al., 2014; Jayawarna et al., 2014; Wu et al., 2020; Zacharakis & Shepherd, 2005; Zahra & Bogner, 2000
	Sustainability	6	Amankwah-Amoah et al., 2019; Danso et al., 2020; Kim et al., 2016; Nitani et al., 2019; Truong & Nagy, 2021; Zhao & Yang, 2021
	Negative external	8	Batjargal et al., 2013; Bruton et al., 2018; Crum & Nelson, 2015; Hu & Zhang, 2012; Félix et al., 2013
Macroeconomic external environment	Positive external	12	Batjargal et al., 2013; Cumming et al., 2005; Duan et al., 2020; Félix et al., 2013; Grilli et al., 2019; Li et al., 2016; Moore et al., 2015; Zhao & Yang, 2021

Appendix B. Studies used for meta-analysis

Study	Cite	Sample Size	Location	Context	Reference
Entrepreneurial alertness and new venture performance: Facilitating roles of networking capability	Adomako et al., 2018	203	Ghana	Actual	Adomako, S., Danso, A., Boso, N., & Narteh, B. (2018). Entrepreneurial alertness and new venture performance: Facilitating roles of networking capability. *International Small Business Journal*, *36*, 453–472.
Entrepreneurs' improvisational behavior and new venture performance: Firm-level and institutional contingencies	Adomako et al., 2018	395	Ghana	Actual	Adomako, S., Opoku, R. A. & Frimpong, K. (2018). 'Entrepreneurs' improvisational behavior and new venture performance: Firm-level and institutional contingencies. *Journal of Business Research*, *83*, 10–18.
The link between societal motivation and new venture performance: Evidence from entrepreneurs in Japan	Alcantara & Kshetri, 2013	2328	Japan	Actual	Alcantara, L. L., & Kshetri, N. (2013). The link between societal motivation and new venture performance: Evidence from entrepreneurs in Japan. *Journal of Small Business & Entrepreneurship*, *26*, 623–641.
Entrepreneurial orientation, environmental sustainability and new venture performance: Does stakeholder integration matter?	Amankwah-Amoah et al., 2019	242	Ghana	Actual	Amankwah-Amoah, J., Danso, A., & Adomako, S. (2019). Entrepreneurial orientation, environmental sustainability and new venture performance: Does stakeholder integration matter? *Business Strategy and the Environment*, *28*(1), 79–87.
Networking and new venture's performance: Mediating role of competitive advantage	Anwar et al., 2018	319	Pakistan	Actual	Anwar, M., Rehman, A. U., & Shah, S. Z. A. (2018). Networking and new venture's performance: Mediating role of competitive advantage. *International Journal of Emerging Markets*.
Startup founders and their LinkedIn connections: Are well-connected entrepreneurs more successful?	Banerji & Reimer, 2019	129	USA	Prediction	Banerji, D., & Reimer, T. (2019). Startup founders and their LinkedIn connections: Are well-connected entrepreneurs more successful? *Computers in Human Behavior*, *90*, 46–52.
Institutional polycentrism, entrepreneurs' social networks, and new venture growth	Batjarga et al., 2013	637	Global	Actual	Batjargal, B., Hitt, M. A., Tsui, A. S., Arregle, J. L., Webb, J. W., & Miller, T. L. (2013). Institutional polycentrism, entrepreneurs' social networks, and new venture growth. *Academy of Management Journal*, *56*, 1024–1049.
Entrepreneurs' access to private equity in China: The role of social capital	Batjargal & Liu, 2004	158	China	Prediction	Batjargal, B., & Liu, M. (2004). 'Entrepreneurs' access to private equity in China: The role of social capital. *Organization Science*, *15*(2), 159–172.
Network triads: Transitivity, referral and venture capital decisions in China and Russia	Batjargal, 2007	37	China and Russia	Prediction	Batjargal, B. (2007). Network triads: Transitivity, referral and venture capital decisions in China and Russia. *Journal of International Business Studies*, *38*, 998–1012.
Relational trust and new ventures' performance: The moderating impact of national-level institutional weakness	Bauke et al., 2016	203	Germany and China	Actual	Bauke, B., Semrau, T., & Han, Z. (2016). 'Relational trust and new ventures' performance: The moderating impact of national-level institutional weakness. *International Entrepreneurship and Management Journal*, *12*, 1007–1024.
Specific managerial human capital, firm age, and venture capital financing of biopharmaceutical ventures: A contingency approach	Behrens et al., 2012	204	USA and Europe	Prediction	Behrens, J., Patzelt, H., Schweizer, L., & Bürger, R. (2012). Specific managerial human capital, firm age, and venture capital financing of biopharmaceutical ventures: A contingency approach. *The Journal of High Technology Management Research*, *23*, 112–121.
Do entrepreneurs always benefit from business failure experience?	Boso et al., 2019	240	Nigeria	Actual	Boso, N., Adeleye, I., Donbesuur, F., & Gyensare, M. (2019). Do entrepreneurs always benefit from business failure experience? *Journal of Business Research*, *98*, 370–379.
Ready for funding? Entrepreneurial ventures and the pursuit of angel financing	Brush et al., 2012	332	USA	Prediction	Brush, C. G., Edelman, L. F., & Manolova, T. S. (2012). Ready for funding? Entrepreneurial ventures and the pursuit of angel financing. *Venture Capital*, *14*(2–3), 111–129.

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Study	Cite	Sample Size	Location	Context	Reference
New venture performance in transition economies from different institutional perspectives	Bruton et al., 2018	112	China	Actual	Bruton, G. D., Su, Z., & Filatotchev, I. (2018). New venture performance in transition economies from different institutional perspectives. *Journal of Small Business Management*, *56*, 374–391.
Social networks as mediator in entrepreneurial optimism and new venture performance	Chen et al., 2017	142	China	Actual	Chen, Y., Zhou, X., Yang, G., Bao, J., & Wang, G. (2017). Social networks as mediator in entrepreneurial optimism and new venture performance. *Social Behavior and Personality: An International Journal*, *45*(4), 551–562.
Entrepreneur passion and preparedness in business plan presentations: A persuasion analysis of venture capitalists' funding decisions	Chen et al., 2009	159	USA	Prediction	Chen, X. P., Yao, X., & Kotha, S. (2009). Entrepreneur passion and preparedness in business plan presentations: A persuasion analysis of venture capitalists' funding decisions. *Academy of Management Journal*, *52*, 199–214.
Entrepreneurial traits, entrepreneurial environment perception, and new venture performance: Empirical evidence from Chinese firms	Cheng et al., 2020	231	China	Actual	Cheng, C., Zhang, W., Zhang, W., & Jiang, Y. (2022). Entrepreneurial traits, entrepreneurial environment perception, and new venture performance: Empirical evidence from Chinese firms. *Entrepreneurship Research Journal*, *12*.
Does social similarity pay off? Homophily and venture capitalists' deal valuation, downside risk protection, and financial returns in India	Claes and Vissa, 2020	622	India	Prediction	Claes, K., & Vissa, B. (2020). Does social similarity pay off? Homophily and venture capitalists' deal valuation, downside risk protection, and financial returns in India. *Organization Science*, *31*(3), 576–603.
Stabilizing institutions for new venture investment decisions	Crum & Nelson, 2015	7551	Global	Prediction	Crum, M., & Nelson, T.E. (2015). Stabilizing institutions for new venture investment decisions. *Journal of Enterprising Communities: People and Places in the Global Economy*.
Liquidity risk and venture capital finance	Cumming et al., 2005	18,774	USA	Prediction	Cumming, D., Fleming, G., & Schwienbacher, A. (2005). Liquidity risk and venture capital finance. *Financial Management*, *34*, 77–105.
Crowdfunding models: Keep-it-all vs all-or-nothing	Cumming et al., 2020	22,850	Global	Prediction	Cumming, D. J., Leboeuf, G., & Schwienbacher, A. (2020). Crowdfunding models: Keep-it-all vs all-or-nothing. *Financial Management*, *49*, 331–360.
Personality traits of entrepreneurial top management team members and new venture performance	Dai et al., 2019	156	China	Actual	Dai, S., Li, Y., & Zhang, W. (2019). Personality traits of entrepreneurial top management team members and new venture performance. *Social Behavior and Personality: an international journal*, *47*(7), 1–15.
Stakeholder integration, environmental sustainability orientation and financial performance	Danso et al., 2020	233	Ghana	Actual	Danso, A., Adomako, S., Lartey, T., Amankwah-Amoah, J., & Owusu-Yirenkyi, D. (2020). Stakeholder integration, environmental sustainability orientation and financial performance. *Journal of Business Research*, *119*, 652–662.
Entrepreneurs' facial trustworthiness, gender, and crowdfunding success	Duan et al., 2020	1770	Global	Prediction	Duan, Y., Hsieh, T. S., Wang, R. R., & Wang, Z. (2020). Entrepreneurs' facial trustworthiness, gender, and crowdfunding success. *Journal of Corporate Finance*, *64*, p.101693.
The contingent effects of top management teams on venture performance: Aligning founding team composition with innovation strategy and commercialization environment	Eesley et al., 2014	2067	USA	Actual	Eesley, C. E., Hsu, D. H., & Roberts, E. B. (2014). The contingent effects of top management teams on venture performance: Aligning founding team composition with innovation strategy and commercialization environment. *Strategic Management Journal*, *35*, 1798–1817.
The determinants of venture capital in Europe —Evidence across countries	Félix et al., 2013	131	Europe	Prediction	Félix, E. G. S., Pires, C. P., & Gulamhussen, M. A. (2013). The determinants of venture capital in Europe—Evidence across countries. *Journal of Financial Services Research*, *44*, 259–279.
There must be an angel? Local financial markets, business angels and the financing of innovative start-ups	Grilli, 2019	2184	Italy	Prediction	Grilli, L. (2019). There must be an angel? Local financial markets, business angels and the financing of innovative start-ups. *Regional Studies*, *53*(5), 620–629.
Knowledge integration methods, product innovation and high-tech new venture performance in China	Guo et al., 2019	295	China	Actual	Guo, R., Cai, L. and Fei, Y. (2019). Knowledge integration methods, product innovation and high-tech new venture performance in China. *Technology Analysis and Strategic Management*, *31*, 306–318.
To be different, or to be the same? The interactive effect of organizational regulatory legitimacy and entrepreneurial orientation on new venture performance	Guo et al., 2014	116	China	Actual	Guo, H., Tang, J., & Su, Z. (2014). To be different, or to be the same? The interactive effect of organizational regulatory legitimacy and entrepreneurial orientation on new venture performance. *Asia Pacific Journal of Management*, *31*, 665–685.
Entrepreneurs' improvisational behavior and firm performance: A study of dispositional and environmental moderators	Hmieleski et al., 2013	201	USA	Actual	Hmieleski, K. M., Corbett, A. C., & Baron, R. A. (2013). 'Entrepreneurs' improvisational behavior and firm performance: A study of dispositional and environmental moderators *Strategic Entrepreneurship Journal*, *7*, 138–150.
The impact of relational capital on the success of new business start-ups	Hormiga et al., 2011	130	Spain and Portugal	Actual	Hormiga, E., Batista-Canino, R. M., & Sánchez-Medina, A. (2011). The impact of relational capital on the success

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Study	Cite	Sample Size	Location	Context	Reference
					of new business start-ups. *Journal of Small Business Management*, *49*, 617–638.
Resources as dual sources of advantage: Implications for valuing entrepreneurial-firm patents	Hsu & Ziedonis, 2013	360	USA	Prediction	Hsu, D. H., & Ziedonis, R. H. (2013). Resources as dual sources of advantage: Implications for valuing entrepreneurial-firm patents. *Strategic Management Journal*, *34*, 761–781.
Experienced entrepreneurial founders, organizational capital, and venture capital funding	Hsu, 2007	149	USA	Prediction	Hsu, D. H. (2007). Experienced entrepreneurial founders, organizational capital, and venture capital funding. *Research Policy*, *36*(5), 722–741.
New venture capability of the transformation from entrepreneurial orientation to new venture's performance	Hu & Zhang, 2012	150	China	Actual	Hu, W., & Zhang, Y. (2012). New venture capability of the transformation from entrepreneurial orientation to new venture's performance: Theory model and empirical study in China. *Nankai Business Review International*.
The performance of entrepreneurial ventures: Examining the role of marketing practices	Jayawarna et al., 2014	236	United Kingdom	Actual	Jayawarna, D., Jones, O., Lam, W., & Phua, S. (2014). The performance of entrepreneurial ventures: Examining the role of marketing practices. *Journal of Small Business and Enterprise Development*.
The relationship between intellectual capital and new venture performance: An empirical investigation of the moderating role of the environment	Juma & McGee, 2006	161	USA	Actual	Juma, N., & McGee, J. (2006). The relationship between intellectual capital and new venture performance: An empirical investigation of the moderating role of the environment. *International Journal of Innovation and Technology Management*, *3*, 379–405.
TMI: Signaling credible claims in crowdfunding campaign narratives	Kim et al., 2016	30,606	Global	Prediction	Kim, P. H., Buffart, M., & Croidieu, G. (2016). TMI: Signaling credible claims in crowdfunding campaign narratives. *Group and Organization Management*, *41*, 717–750.
Signaling for more money: The roles of founders' human capital and investor prominence in resource acquisition across different stages of firm development	Ko & McKelvie, 2018	235	USA	Prediction	Ko, E. J., & McKelvie, A. (2018). Signaling for more money: The roles of founders' human capital and investor prominence in resource acquisition across different stages of firm development. *Journal of Business Venturing*, *33,* 438–454.
Geographic distance between venture capitalists and target firms and the value of quality signals	Kolympiris et al., 2018	248	USA	Prediction	Kolympiris, C., Hoenen, S., & Kalaitzandonakes, N. (2018). Geographic distance between venture capitalists and target firms and the value of quality signals. *Industrial and Corporate Change*, *27*, 189–220.
Policies of promoting entrepreneurship and angel investment: Evidence from China	Li et al., 2016	1997	China	Prediction	Li, C., Shi, Y., Wu, C., Wu, Z., & Zheng, L. (2016). Policies of promoting entrepreneurship and angel investment: Evidence from China. *Emerging Markets Review*, *29*, 154–167.
The effect of entrepreneurial context on the performance of new ventures	Lin et al., 2015	239	China	Actual	Lin, S., Rogoff, E. G., Foo, C. T., & Liu, X. (2015). The effect of entrepreneurial context on the performance of new ventures. *Chinese Management Studies*.
Social capital, capabilities, and entrepreneurial strategies: A study of Taiwanese high-tech new ventures	Lin et al., 2006	125	Taiwan	Actual	Lin, B. W., Li, P. C., & Chen, J. S. (2006). Social capital, capabilities, and entrepreneurial strategies: A study of Taiwanese high-tech new ventures. *Technological Forecasting and Social Change*, *73*, 168–181.
The influence of intellectual capital on organizational performance—Knowledge management as moderator	Ling, 2013	146	Taiwan	Actual	Ling, Y. H. (2013). The influence of intellectual capital on organizational performance—Knowledge management as moderator. *Asia Pacific Journal of Management*, *30*, 937–964.
Buddhist entrepreneurs and new venture performance: The mediating role of entrepreneurial risk-taking	Liu et al., 2019	1032	China	Actual	Liu, Z., Xu, Z., Zhou, Z., & Li, Y. (2019). Buddhist entrepreneurs and new venture performance: The mediating role of entrepreneurial risk-taking. *Small Business Economics*, *52*(3), 713–727.
Success drivers of online equity crowdfunding campaigns	Lukkarinen et al., 2016	60	Europe	Prediction	Lukkarinen, A., Teich, J. E., Wallenius, H., & Wallenius, J., (2016). Success drivers of online equity crowdfunding campaigns. *Decision Support Systems*, *87*, 26–38.
Entrepreneurs' passion and new venture performance in China	Ma et al., 2017	176	China	Actual	Ma, C., Gu, J., & Liu, H. (2017). 'Entrepreneurs' passion and new venture performance in China. *International Entrepreneurship and Management Journal*, *13*, 1043–1068.
What do they think and what do they say? Gender bias, entrepreneurial attitude in writing and venture capitalists' funding decisions	Malmström et al., 2020	131	Sweden	Prediction	Malmström, M., Voitkane, A., Johansson, J., & Wincent, J. (2020). What do they think and what do they say? Gender bias, entrepreneurial attitude in writing and venture capitalists' funding decisions. *Journal of Business Venturing Insights*, *13*, p.e00154.
The patent paradox in crowdfunding: An empirical analysis of Kickstarter data	Meoli et al., 2019	1422	Global	Prediction	Meoli, A., Munari, F., & Bort, J. (2019). The patent paradox in crowdfunding: An empirical analysis of Kickstarter data. *Industrial and Corporate Change*, *28*, 1321–1341.
High performance work systems in emergent organizations: Implications for firm performance	Messersmith & Guthrie, 2010	2018	USA	Actual	Messersmith, J. G., & Guthrie, J. P. (2010). High performance work systems in emergent organizations: Implications for firm performance. *Human Resource*

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Study	Cite	Sample Size	Location	Context	Reference
					Management: Published in Cooperation with the School of Business Administration, The University of Michigan and in alliance with the Society of Human Resources Management, *49*(2), 241–264.
Institutional distance and cross-border venture capital investment flows	Moore et al., 2015	1037	Europe	Prediction	Moore, C. B., Payne, G. T., Bell, R. G., & Davis, J. L. (2015). Institutional distance and cross-border venture capital investment flows. *Journal of Small Business Management*, *53*, 482–500.
On equity crowdfunding: Investor rationality and success factors	Nitani et al., 2019	319	Europe	Prediction	Nitani, M., Riding, A., & He, B. (2019). On equity crowdfunding: Investor rationality and success factors. *Venture Capital*, *21*(2–3), 243–272.
How entrepreneurs build brands and reputation with social media PR: Empirical insights from start-ups in Germany	Pakura & Rudeloff, 2020	349	Germany	Actual	Pakura, S., & Rudeloff, C. (2020). How entrepreneurs build brands and reputation with social media PR: Empirical insights from start-ups in Germany. *Journal of Small Business & Entrepreneurship*, 1–28.
How entrepreneurs seduce business angels: An impression management approach	Parhankangas & Ehrlich, 2014	595	USA	Prediction	Parhankangas, A., & Ehrlich, M. (2014). How entrepreneurs seduce business angels: An impression management approach. *Journal of Business Venturing*, *29*, 543–564.
Working passionately does not always pay off: The negative moderating role of passion on the relationship between deliberate practice and venture performance	Park et al., 2019	119	Netherlands	Actual	Park, S., Martina, R. A., & Smolka, K. M. (2019). Working passionately does not always pay off: The negative moderating role of passion on the relationship between deliberate practice and venture performance. In *The anatomy of entrepreneurial decisions* (173–195). Springer, Cham.
The deal structuring stage of the venture capitalist decision-making process: Exploring confidence and control	Payne et al., 2009	52	USA	Prediction	Payne, G. T., Davis, J. L., Moore, C. B., & Bell, R. G. (2009). The deal structuring stage of the venture capitalist decision-making process: Exploring confidence and control. *Journal of Small Business Management*, *47*, 154–179.
Forecasting success in equity crowdfunding	Ralcheva & Roosenboom, 2020	2171	United Kingdom	Prediction	Ralcheva, A., & Roosenboom, P. (2020). Forecasting success in equity crowdfunding. *Small Business Economics*, *55*(1), 39–56.
Being at the right place at the right time: Does the timing within technology waves determine new venture success?	Schlichte et al., 2019	727	Europe	Prediction	Schlichte, F., Junge, S., & Mammen, J. (2019). Being at the right place at the right time: Does the timing within technology waves determine new venture success? *Journal of Business Economics*, *89*(8), 995–1021.
Network ties, reputation, and the financing of new ventures	Shane & Cable, 2002	136	USA	Prediction	Shane, S., & Cable, D. (2002). Network ties, reputation, and the financing of new ventures. *Management Science*, *48*(3), 364–381.
Is leadership language 'rewarded' in crowdfunding? Replicating social entrepreneurship research in a rewards-based context	Short & Anglin, 2019	1000	Global	Prediction	Short, J. C., & Anglin, A. H. (2019). Is leadership language 'rewarded' in crowdfunding? Replicating social entrepreneurship research in a rewards-based context. *Journal of Business Venturing Insights*, *11*, p. e00121.
Networking ability and the financial performance of new ventures: Moderating effects of venture size, institutional environment, and their interaction	Semrau & Sigmund, 2015	283	Germany and Brazil	Actual	Semrau, T., & Sigmund, S. (2012). Networking ability and the financial performance of new ventures: A mediation analysis among younger and more mature firms. *Strategic Entrepreneurship Journal*, *6*, 335–354.
With a little help from my friends? How learning activities and network ties impact performance for high tech startups in incubators	Sullivan et al., 2021	316	USA	Actual	Sullivan, D. M., Marvel, M. R., & Wolfe, M. T. (2021). With a little help from my friends? How learning activities and network ties impact performance for high tech startups in incubators. *Technovation*, *101*, p.102209.
Nascent ventures' green initiatives and angel investor judgments of legitimacy and funding	Truong & Nagy, 2021	154	United Kingdom	Prediction	Truong, Y., & Nagy, B.G. (2021). 'Nascent ventures' green initiatives and angel investor judgments of legitimacy and funding. *Small Business Economics*, *57*(4), 1801–1818.
Founder need to belong, tertius iungens orientation and new venture performance	Wei et al., 2021	149	China	Actual	Wei, L. Q., Zou, X., & Ormiston, M. (2021). Founder need to belong, tertius iungens orientation and new venture performance. *Journal of Organizational Behavior*, *42*, 48–67.
What impact does intellectual property have on the business performance of technology firms?	Willoughby, 2013	184	USA	Actual	Willoughby, K. W. (2013). What impact does intellectual property have on the business performance of technology firms? *International Journal of Intellectual Property Management*, *6*(4), 316–338.
Incubator networks and new venture performance: The roles of entrepreneurial orientation and environmental dynamism	Wu et al., 2020	205	China	Actual	Wu, W., Wang, H., & Tsai, F.S. (2020). Incubator networks and new venture performance: The roles of entrepreneurial orientation and environmental dynamism. *Journal of Small Business and Enterprise Development*.
Social networks of female tech-entrepreneurs and new venture performance: The moderating effects of entrepreneurial alertness and gender discrimination	Xie & Lv, 2016	316	China	Actual	Xie, X., & Lv, J. (2016). Social networks of female tech-entrepreneurs and new venture performance: The moderating effects of entrepreneurial alertness and

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Study	Cite	Sample Size	Location	Context	Reference
					gender discrimination. *International Entrepreneurship and Management Journal*, *12*, 963–983.
The impact of network orientation of e-commerce enterprises on the performance of start-ups	Xue et al., 2019	153		Actual	Xue, X., Lang, C. C., & Guo, H. (2019). The impact of network orientation of e-commerce enterprises on the performance of start-ups: Mediated by resource integration ability. In: Proceedings of the 2019 2nd International Conference on E-Business, Information Management and Computer Science (1–7).
A non-additive decision-aid for venture capitalists' investment decisions	Zacharakis & Shepherd, 2005	41	USA	Prediction	Zacharakis, A., & Shepherd, D. A. (2005). A non-additive decision-aid for venture capitalists' investment decisions. *European Journal of Operational Research*, *162*, 673–689.
Technology strategy and software new ventures' performance: Exploring the moderating effect of the competitive environment	Zahra & Bogner, 2000	116	USA	Actual	Zahra, S. A., & Bogner, W. C. (2000). Technology strategy and software new ventures' performance: Exploring the moderating effect of the competitive environment. *Journal of Business Venturing*, 15, 135–173.
Prior experience and social class as moderators of the planning-performance relationship in China's emerging economy	Zhang et al., 2013	313	China	Actual	Zhang, Y., Yang, J., Tang, J., Au, K., & Xue, H. (2013). Prior experience and social class as moderators of the planning-performance relationship in China's emerging economy. *Strategic Entrepreneurship Journal*, *7*, 214–229.
Women hold up half the sky? Informal institutions, entrepreneurial decisions, and gender gap in venture performance	Zhao & Yang, 2021	7626	China	Actual	Zhao, E. Y., & Yang, L. (2021). Women hold up half the sky? Informal institutions, entrepreneurial decisions, and gender gap in venture performance. *Entrepreneurship Theory and Practice*, *45*, 1431–1462.
Founding team capabilities and new venture performance: The mediating role of strategic positional advantages	Zhao et al., 2013	372	USA	Actual	Zhao, Y. L., Song, M., & Storm, G. L. (2013). Founding team capabilities and new venture performance: The mediating role of strategic positional advantages. *Entrepreneurship Theory and Practice*, *37*, 789–814.
Unlocking founding team prior shared experience: A transactive memory system perspective	Zheng, 2012	98	China	Actual	Zheng, Y. (2012). Unlocking founding team prior shared experience: A transactive memory system perspective. *Journal of Business Venturing*, *27*, 577–591.
Patents, trademarks, and their complementarity in venture capital funding	Zhou et al., 2016	299	USA	Prediction	Zhou, H., Sandner, P. G., Martinelli, S. L., & Block, J. H. (2016). Patents, trademarks, and their complementarity in venture capital funding. *Technovation*, *47*, 14–22.
An interactive perspective of managers' functional experience and managerial ties of new ventures in transition economies	Zhu, 2020	206	China	Actual	Zhu, Y. (2020). An interactive perspective of managers' functional experience and managerial ties of new ventures in transition economies. *Technology Analysis and Strategic Management*, *32*, 292–305.

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