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Mediating role of innovation heuristics on the relationship between pioneering innovative orientation and organisational performance: Insights from diverse stakeholders

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Abstract We conducted two studies (N = 263) to examine the relationship between the pioneering-innovative orientation of managers, innovation heuristics and organisational performance. Study 1, containing a diverse stakeholder sample (n = 201) found that the two hypothesised innovation heuristics, i.e., search and adapt heuristics and fast and frugal heuristics, significantly mediated the relationship between the pioneering innovative orientation and perceived organisational performance. In Study 2, analysis based on a sample of senior business leaders and entrepreneurs (n = 62) confirmed that pioneering innovative orientation and the two identified innovation heuristics significantly predicted the 3-year average annual turnover of firms.

Introduction

Decision makers actively use heuristics as they help in making smarter decisions (Gigerenzer, Todd & ABC Research Group, 1999). For instance, sales professionals use various customer choice heuristics to persuade customers and improve sales (Whittler & Whittier, 2013). Heuristics play an exceptionally vital role in different entrepreneurial decisions (Nouri, Imanipour, Talebi, & Zali, 2018). However, managers may not use innovation heuristics unless they are motivated to, despite the available heuristic faculties. If managers are not motivated for new accomplishments, scaling new heights (pioneering), and transforming the status quo (innovative), they are unlikely to search and implement innovation heuristics to improve organisational performance. Pioneering-innovative orientation (PIO) is defined as the need for unique, path-breaking accomplishment (pioneering) and transforming the status quo (innovative) (Khandwalla, 1985a, 1985b; Ramachandran & Ramnarayan, 1993). The PIO has been found to contribute to high organisational performance, development

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of human resources, and the overall economic development of society (Dayal, Kanungo, & Mendonca, 1995).

According to the bounded rationality approach, decision makers often rely on heuristics driven by intuition while making decisions in an uncertain and complex business environment. Heuristics are defined as simple rules of thumb that help make adaptive decisions in a fast and frugal manner (Mousavi & Gigerenzer, 2017). Manimala (1992), in his seminal work on entrepreneurial heuristics using the case survey method, identified as many as 186 decision heuristics used by managers and entrepreneurs. He organised 186 heuristics into 57 categories, which he found relevant for enhancing the adaptability and performance of entrepreneurial ventures. Although the long list of 186 heuristics divided into 57 categories appears non-parsimonious, it offers a valuable reference for a range of heuristics used by decision makers in everyday work life. The present research aims to identify the latent construct of innovation heuristics based on Manimala's work. We consider this goal worthy of pursuit for two reasons: one: to position entrepreneurial orientation, innovation heuristics, and organisational performance in a theoretical framework; and two: to demonstrate that innovation heuristics enhance satisfaction amongst various corporate stakeholders and contribute to organisational performance. We further elaborate on the second point as follows.

Since heuristics are not based on rational logic or written policies, their prevalence in organisational life is difficult to ensure unless various corporate stakeholders perceive them as legitimate. Although decision makers may not make a conscious effort to seek legitimacy for their decision heuristics, the heuristics at hand must not jeopardise organisational improvement. When managers make decisions based on thumb rules deviating from standard operating procedures of the organisation, an internal perception about the efficacy of such thumb rules in generating the perceived organisational performance (POP) will help in their internal adoption and success. Finally, heuristics do not originate in a vacuum. Instead, as stated previously, we hypothesise heuristics to emerge from the pioneering innovative orientation of managers. Therefore, we build the concept of innovation heuristics between the constructs of pioneering innovative motive and psychological measures of perceived organisational performance in Study 1.

Theoretical review and hypothesis development

We offer a theoretical review of the key constructs used in the current research. We begin by reviewing recent research on pioneering innovative orientation (PIO), followed by the theoretical roots of the construct of innovation heuristics and their hypothesised mediating role between PIO and organisational performance. We also offer the reasons for choosing the specific outcome measures of organisational performance.

Pioneering innovative management – A base for organisational performance

The construct of PIO originates from the seminal work of Khandwalla (1984, 1985b) as part of a major research project on indigenous enterprise management undertaken in the late 1970s at the Indian Institute of Management Ahmedabad (IIMA). The project's purpose was to identify suitable management models that would help improve the performance of organisations in emerging economies like India. Khandwalla found Western management models inadequate for solving the rapid growth and performance problems of organisations in poor and emerging economies.

Based on the data of 75 large to midsize Indian business organisations, Khandwalla found that organisations that flourish in emerging markets are the ones where management reflects a policy commitment to pioneer new products, services, or technology and innovate through experimentation, risk-taking, creativity, and flexibility (Khandwalla, 1985b, p. 161). Organisations witnessed stagnation and decline when management displayed a commitment to the status quo or rigidity. Khandwalla termed his discovery as pioneering innovative management or PI orientation and considered it a base for economic development in developing societies (Khandwalla, 1985a).

During the liberalisation and economic reforms of the 1990s in India, studies on pioneering innovative management grew with the push for dynamism and innovation amongst Indian enterprises. The studies were primarily led by Indian researchers (Manimala, 1992; Ramachandran & Ramnarayan, 1993; Sinha, 1996). Pioneering an innovative style is considered a vital management model in management entrepreneurship for pursuing competitive advantage (Covin & Miles, 1999). A recent synthesis of entrepreneurial orientation research (Wales, Covin, & Monsen, 2020) acknowledges PIO as a distinct top management style. The PIO construct is often used interchangeably with a more generic term called entrepreneurial orientation, reflecting the pioneering, innovative orientation of top management in a firm.

A wide range of recent studies shows many firm-level benefits of PIO, such as the creation of wealth, improved organisational performance (Schachtebeck, Groenewald, & Nieuwenhuizen, 2019), improvement in a firm's strategic renewal, reputation, financial performance (Shu, de Clercq, Zhou, & Liu, 2019), and adoption of quality management practices (Bello-Pintado, Kaufmann, & Merino Diaz de Cerio, 2018). Based on the items adopted from Khandwalla's scale, Mueller, Titus, Covin, and Slevin (2012), in their study on 101 nondiversified American manufacturing firms, found that a moderate level of entrepreneurial orientation leads to a higher average (industry-adjusted) growth rate of a firm's sales revenue in the past 3 years. However, the firm's average sales revenue took a curvilinear path when management style displayed a very high pioneering innovative orientation due to a high level of market uncertainty associated with highly innovative products and services. Another study by García-Villaverde, Parra-Requena, and Ruiz-Ortega (2017) involving 224 CEOs from Spanish footwear firms found a positive influence of CEOs' entrepreneurial orientation on sales and profitability of new footwear products in the past 3 years. In line with these studies, we also hypothesise the following:

H_1: PIO is positively related to organisational performance.

Situating managerial heuristics between pioneering innovative orientation and organisational performance

We begin this section by positioning managerial heuristics in the context of PIO and organisational performance. We discuss how business heuristics can prove damaging if they do not stem from PIO and are not perceived as related to innovation, using the case example of Better Place and Tesla Motors. We further outline why we selected only innovation heuristics as mediators from an extensive list of 186 heuristics identified by Manimala. We then present arguments and supporting literature to hypothesise the mediating role of innovation heuristics between PIO and organisational performance. Finally, we offer relevant literature for hypothesising the mediating role of search and adaptation heuristics (SAH) and fast and frugal heuristics (FFH) between PIO and organisational performance.

Innovation heuristics: A reflection of entrepreneurial orientation

Management research suggests using heuristics in management decisions to improve adaptability and performance. For a detailed review of how heuristics serve as an adaptive tool in the business, readers can refer to Artinger, Petersen, Gigerenzer, and Weibler (2015). Depending upon the context, numerous cognitive and behavioural heuristics could be used in management decisions. However, all heuristics are not equally efficient as heuristics are environment-specific (Dekker & Remic, 2019; Gigerenzer & Gaissmaier, 2011). For instance, a typical business heuristic, "do not put all your eggs in a single basket", may be more adaptive to the investment decisions but less adaptive for diverting entrepreneurial effort to many ventures simultaneously. It is not uncommon to see many managers and entrepreneurs high on PIO but unable to transform the same into organisational performance if they work with misplaced heuristics. The entrepreneurial orientation of top management may stagnate or backfire if management works with heuristics poorly adapted to a business ecology (Artinger et al., 2015). Moreover, if the pioneering efforts of top management are not perceived as adaptive by internal stakeholders, employees and investors may resist or not cooperate with the management decisions.

For instance, the failure of Better Place, an electric vehicle company with an innovative business model, is often attributed to the many poor decisions and maladaptive hunches of the company's founder Shai Agassi. Shai Agassi, driven by his "narcissistic personality" (Ben-Hur & Blum, 2018), did not care much whether his employees or investors were satisfied with his business heuristics of making Better Place a premium electric car brand by choosing partners based on personal and community ties, offering key leadership positions in the company to trusted family and friends, splurging investor money for opening grand showrooms and offices, and relying on personal charisma to entice customers and get tax exemptions from governments.

In contrast, Tesla Motors, led by Elon Musk, achieved tremendous success in a similar segment by strategically executing the innovation heuristics enshrined mainly in Tesla Masterplan I and II (Rothaermal, 2017). Elon Musk's strategic heuristics of sticking with the manufacturing of only fully electric vehicles and not a hybrid car, starting the electric vehicle business by first building a sports car, using sports niche and income to build an affordable mass-market electric vehicle, not giving any special advantage to friends and family members, relying on social media rather than spending money on advertising, and creating a vertically integrated clean energy company sharply contrast with Shai Agassi's management approach. While both Tesla Motors and Better Place were innovators in the electric vehicle segment, the strategic innovation heuristics of Elon Musk, rooted in his entrepreneurial orientation, helped him outperform established players and cross the chasm (Moore, 2014). In contrast, the personality-orientated business heuristics of Shai Agassi rooted in his narcissistic personality not only led to his acrimonious exit from the company but also the bankruptcy of the Better Place company (Ben-Hur & Blum, 2018).

Manimala lists choosing business partners based on "personal, family, caste, and community ties" (Heuristic #60, Category XVII) or doing business at a familiar place (Heuristic #110, Category XXXII), and paternalistic orientation (Heuristic #64, Category XX), as heuristics used by successful entrepreneurs in his long list of 186 heuristics. However, a similar set of heuristics chosen by Better Place CEO Shai Agassi proved counterproductive to the venture. The innovative business model of Better Place was undone by the misplaced managerial heuristics, leading to the bankruptcy of the company, which was projected to herald the electric vehicle renaissance in the world. PIO nudges leaders to reflect dynamism by breaking away from the status quo, exploring and adopting various forms of innovation as per the top management's vision. Therefore, our research focuses on the role of innovation heuristics, instead of other heuristics given by Manimala, for relating pioneering innovative drive with organisational performance.

Relation of search and adapt heuristics with pioneering innovative orientation and organisational performance

We define heuristics as simple thumb rules that guide the managerial decision about organisational performance. A habit of deviating from standard operating procedures is termed as an innovation heuristic (Kheirandish & Mousavi, 2018). The current research hypothesises two types of innovation heuristics, i.e., search and adapt heuristics (SAH) and fast and frugal heuristics (FFH). We define SAH as the thumb rule of deviating from standard operating procedures related to the search and implementation of adaptive information to improve organisational performance. Examples of such heuristics would be "ideas are an important resource, look for them everywhere (Heuristic #3)", "never set any geographical limit to one's search for ideas and opportunities (Heuristic #19)" (Manimala, 1992).

Since innovations come in myriad forms, our interest lies in understanding how pioneering management intuitively searches for and implements a particular thumb rule for innovation. According to Kheirandish and Mousavi (2018), exploring beyond the standard way of operating involves

discovery and action based on heuristics. According to Leyden and Link's (2015) entrepreneurial process theory, searching for new ideas and innovation are essential steps in the entrepreneurial process. As per entrepreneurial process theory, increasing the size of the search space increases the subjective likelihood of entrepreneurial success. However, the entrepreneurial process theory further predicts that due to the high cost and untenability of exhaustively searching for innovative ideas, pioneering innovators adopt search heuristics from a specific context or social network based on their subjective likelihood of success.

Furthermore, Fis and Çetindamar (2013), in their study of 172 Turkish entrepreneurs, found that first-time entrepreneurs search information more intensively, and the intensity of entrepreneurial information search is positively related to the future growth of their ventures. In line with these researches, we also predict that PIO will be positively related to SAH and SAH will be positively related to organisational performance. Therefore, we hypothesise the following:

H_2: PIO is positively associated with SAH.
H_3: SAH is positively associated with organisational performance.

Relation of FFH with pioneering innovative orientation and organisational performance

Fast and frugal heuristics (FFH) are defined as task-specific decision strategies that are quick in execution and economical in resource use (Gigerenzer, 2008; Hoffrage & Reimer, 2004). Operationally, we define FFH as simple decision rules that guide users in determining whether the chosen novel alternative is quick to execute and uses few resources to improve performance. Examples of FFH in organisational context would be: "Slow and steady wins the race. Expand and diversify only when the first venture is firmly established (Heuristic #122)" vs. "Grow as fast as possible, grabbing all opportunities to acquire and retain momentum and morale" (Heuristic #123) (Manimala, 1992).

Efficient management is usually executed with speed while minimising resource consumption. Pioneering innovative managers, especially in the context of emerging economies, prefer pursuing ideas that can be implemented fast while reducing the expenditure of resources as much as possible. Moreover, fast and frugal heuristics may contribute to business performance by improving financial asset allocation (DeMiguel, Garlappi, & Uppal, 2009), making marketing campaigns viral (Schulze, Schöler, & Skiera, 2014), and bringing microlevel positive evaluation and satisfaction with the management decisions (Whitley & Ball, 2002). Baum and Wally (2003), in their study involving 361 CEOs from American manufacturing companies, found that the speed of CEOs' decisions about searching for and implementing innovation significantly predicted a firm's performance measured in terms of profit percentage of assets and sales and employment growth. Moreover, CEOs' decision-making speed mediated the relationship between various firms' characteristics, including the firm's dynamism with profit, sales, and employment growth. It led us to hypothesise the following:

H_4: PIO is positively associated with FFH.
H_5: FFH is positively associated with organisational performance.

Mediating role of SAH and FFH between pioneering innovative orientation and organisational performance

We ask a specific research question: Can PIO materialise in POP in the absence of innovation heuristics? A vast body of literature in economics and management suggests the positive impact of entrepreneurial orientation and innovation on the firm's growth and profitability (Audretsch, Coad, & Segarra, 2014). Our interest lies in exploring the likely paths a manager high in PIO may follow. It is unlikely that management at the PIO level would rely on merely best practices, display "home country bias" (Coleman, Maheswaran, & Pinder, 2010), or exploit personal networks or community ties (Manimala, 1992) for growth in a competitive and uncertain world. Despite multiple avenues for growth being available, a high PIO would motivate managers to search and implement innovative heuristics adapted to performance that are fast in execution and less resource-intensive.

A manager high on PIO would be keen to explore innovative and adaptive ideas from multiple sources like personal experience, online search, social networks, experts, books, media, and other outlets. It is not uncommon amongst founders and business leaders to formally appoint advisors, independent directors, or approach professional think tanks to receive advice on new alternatives or business opportunities. According to the endogenous growth theory, entrepreneurial management relies on internal knowledge and innovation rather than exogenous factors such as the business environment or government policies (Romer, 1994). SAH is an internal cognitive resource of the firms that provides a mental model to entrepreneurial leaders for improving organisational performance. Therefore, we hypothesise SAH as a mediator between PIO and organisational performance. It led us to hypothesise the following:

H_6: SAH mediates the relationship between PIO and organisational performance.

A search heuristic may be adaptive but not necessarily fast and frugal. For instance, the search heuristic "never set any geographical limit to one's search for ideas and opportunities" (Heuristic #19; Manimala, 1992) is beneficial but time-consuming and not cost-effective. Parallel to their search heuristics, pioneering leaders also keep the speed and cost of executing a heuristic in their minds. Theoretically, an ideal search is an infinite process. Therefore, pioneering leaders would not be able to decide if considerations about speed and frugality could sequentially come only after exhausting the heuristic search process.

Research suggests that people use subjective stopping rules while doing information searches based on the extent to which a given search satisfies the requirement (Browne, Pitts, & Wetherbe, 2007). In the absence of such subjective stopping rules, the search process may go on indefinitely. Human beings are satisficers not optimisers, while making decisions (Gigerenzer & Gaissmaier, 2011). The stopping rule

is a crucial characteristic of FFH (Artinger et al., 2015). Therefore, we hypothesise a parallel mediation, not a sequential mediation, of FFH when pioneering leaders engage in search heuristics. Thus, when a pioneering leader judges a searched heuristic to be both adaptive and fast and frugal, she may temporarily stop searching more heuristics and implement it to improve organisational performance. Accordingly, we hypothesise the following:

H_7: FFH mediates the relationship between PIO and organisational performance.

Based on the above discussion, we conceptualise our research model as given in Fig. 1.

Method

Data collection

Data was collected through mailed questionnaires using a purposive sampling approach as it helps select a representative target group matching the purpose of the study. Purposive sampling is a recommended and commonly used sampling procedure in social science and management research where a small subset of the target population typically manifests the variables under study. The description of the tools used for data collection is given in the following section. The sample consisted of a mix of management interns, business executives, and entrepreneurs. All of the questionnaires administered were self-rating scales. Participants were asked to indicate the extent to which the scale statements applied to them while making decisions in their work organisation.

Sample

A typical managerial environment consists of various stakeholders like founders, executive directors, managers at multiple levels, consultants, and many fresh MBAs as the technical core. Therefore, after screening out incomplete questionnaires, we took a sample (N = 201) consisting of a mix of mid-level managers (12.4%, n = 25), entrepreneurs (5.5%, n = 11), management trainees, (10%, n = 20), and final year MBA students (72.1%, n = 145). There were 38.3% (n = 77) men and 61.2% (n = 123) women in the sample. The mean age and work experience of the sample were 23.74 (SD = 3.74, range = 21–61) and 2.54 (SD = 1.82) years, respectively. One person preferred not to report gender, while 17 people did not report their age.

Sample size sufficiency analysis

Statistical power analysis using G-power software was employed for doing sample size analysis. The statistical power analysis suggested a total sample size of 119 cases sufficient for a model containing three predictors (PIO, two innovation heuristics) with a medium effect size (f^2 = 0.15) and power of 0.95. We also looked at Cohen's statistical power table (Cohen, 1992), which suggested a sample size of at least 59 cases for achieving a statistical power of 80% with an R^2 value of at least 0.25 and the possibility of a 5% probability of error for the hypothesised model. However, for a 1% probability of error and minimum R^2 of 0.10, a minimum of 176 cases were required to achieve the minimum statistical power of 80%. The current sample size of 201 cases appears sufficient for testing the proposed model, keeping these sample size recommendations in mind.

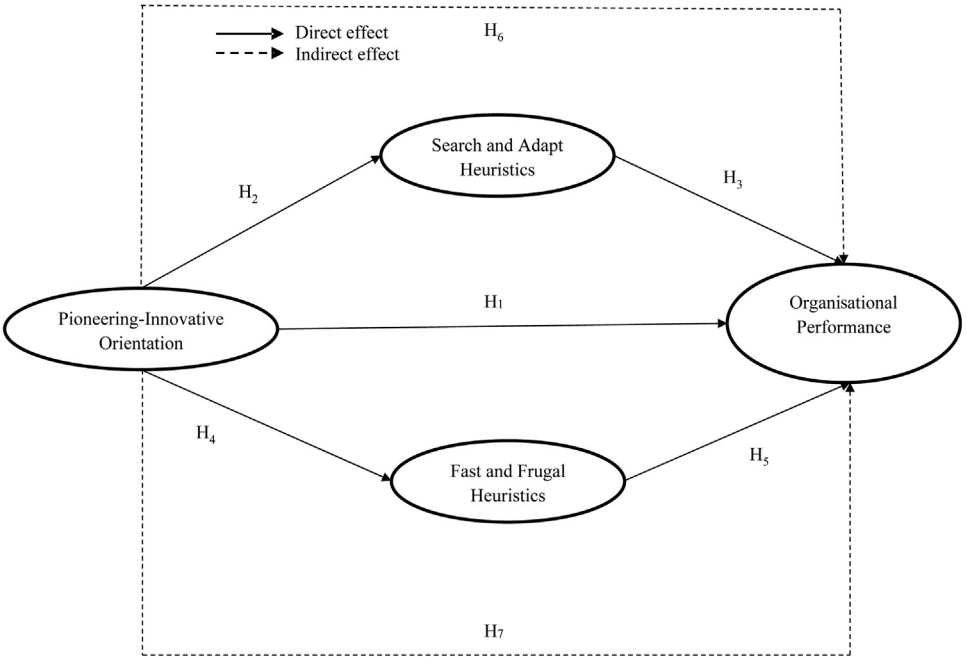

Fig. 1 Research model.

Tools

Development of an innovation heuristic scale

To develop an innovation heuristics scale, we selected 19 innovation-related heuristics from a total of 186 managerial heuristics given by Manimala (1992). Manimala identified the heuristics based on an extensive case survey method followed by content analysis and field validation. We identified innovation heuristics based on the keywords "ideas," "look," "search," "adapt," "flexible," "innovation," and related terms reflecting deviation from standard operating procedures to search adaptive thumb rules. As per our operational definition, we generated eight more statements measuring the fast and frugal aspect of innovation heuristics. The 27 innovation heuristics were put to exploratory factor analysis using the principal axis factoring method and direct oblimin rotation. The principal axis factoring is a recommended method for factor analysis in case the data distribution shows a significant deviation from normality (Costello & Osbourne, 2005). When underlying factors are considered to be theoretically correlated, the oblique rotation method offers a more reproducible factor solution (Field & Miles, 2010). We identified a factor if it met the Kaiser's Eigenvalue criteria of one and contributed to at least a 5% variance in the factor solution (Field, 2013). Three items were deleted due to low factor loadings. We did not delete more items at this stage because we expected a more parsimonious solution during confirmatory analysis using PLS-SEM. Table 1 summarises the results of factor analysis, with both factors jointly explaining around 54% of the variance.

Based on the content of the items, we named these factors SAH (α = 0.95) and FFH (α = 0.91).

PI orientation (PIO) scale

We used the 10-item PIO scale to measure PIO based on Khandwalla's (Khandwalla, 1985a, 1985b) studies. Theoretically, PIO is modelled upon the 10 types of innovations undertaken by entrepreneurial ventures, of which five innovation types (i.e., product, process, market, supply, and industrial organisations) are based on Schumpeter's (1934) study. A sample item of the scale is, "Have you introduced a new product/service or a new quality of an existing product/services?" The study participants were asked to respond to these questions on a three-point scale ranging from 1 to 3 (1 = "No", 2 = "Undecided", and 3 = "Yes") depending upon the extent to which it is true for them while taking decisions in the organisation for which they are currently working. The scale showed good reliability (α = 0.72) on the current sample.

Perception of organisational performance

We used psychological scales to measure organisational performance due to the nonavailability of data about the financial performance of organisations to which the study participants belonged. Most of the companies for which participants worked were unlisted private companies whose financial data were not publicly available. Researchers in the past have also used the subjective ratings of the participants about the general perception of a firm's economic indicators (e.g., Lee, Park, & Lee, 2013; Menon, Bharadwaj, & Howell, 1996). Lee et al. (2013) have used a similar measure named perceived corporate performance, consisting of the perceived competitive advantage of one's organisation in terms of sales growth, market share, profit growth, and return on investment (p. 1722). We used two psychological scales, i.e., organisational excellence scale and perceived organisational performance scale, to measure the perception of performance. Using two scales helped enhance diversity and concurrent validity in measuring the perceived organisational performance.

Organisational excellence scale measures the perceived level of excellence rated on internal behavioural variables such as culture or leadership. In contrast, the perceived organisational performance scale measures general perception about whether an organisation was perceived as doing well financially in terms of external growth indicators such as cash flows, market share, and sales growth. By using two parallel measures of firms' perceived internal and external performance, we anticipate strengthening the proposed research model's predictive relevance and concurrent validity, especially when quantitative data about the financial performance of the firms could not be incorporated.

As important stakeholders in organisational functioning and peer knowledge, employees and interns intuitively hold perceptions about a firm's financial health and performance. Furthermore, as most of the studied firms were small to midsize startup companies, employees and interns would not face many difficulties in having a fair subjective perception of organisational performance. Although we did not find any relevant literature throwing light on how accurate interns are about their perception of the financial performance of their employing firms, students do their background search and peer feedback about a company's financial health and performance before entrusting their career to them. Moreover, a measurement invariance test performed later did not suggest significant measurement differences in interns' responses and other groups. Besides, it is not easy to hypothesise that interns will do well on their job without having a fair perception of their employer's financial and organisational performance. For instance, a study of 185 employers recruiting 392 interns from an AACSB-accredited business college found that students and employers attach massive value to the internship experience. The internship performance of the students significantly predicted their future career success (Gault, Leach, & Duey, 2010). We offer more details of the two psychological scales used to measure organisational performance perception.

Organisational excellence scale

Grunig's (1992) review suggests enormous diversity and the lack of unanimity amongst scholars for defining organisational excellence. Hence, we operationally defined organisational excellence as the extent to which an organisation scores on the characteristics of excellent companies offered

Table 1 A summary of the exploratory factor analysis and reliability analysis of the innovation heuristics scale (N = 201).

SN	Items	Item-total correlation	Communality	Factor loadings	
				SAH	FFH
Hi9	Be flexible in one's ideas and plans.	0.77	0.685	0.878	
Hi14	Never stop searching for new ideas and opportunities.	0.699	0.576	0.824	
Hi16	Introduce new products, modify existing products, and/or change strategies periodically.	0.692	0.585	0.822	
Hi2	Ideas are the most important resource. Look for them everywhere.	0.726	0.655	0.806	
Hi3	Look for new (product) ideas amongst personal contacts (friends, hobby clubs, professional associations, customer complaints, previous job contacts, etc.).	0.777	0.716	0.798	
Hi11	Never be constrained by rigid plans and narrow visions. Act according to opportunities.	0.729	0.586	0.763	
Hi17	Keep the organisation fresh and dynamic by periodically inducting young people into it who have new ideas and the drive to implement them.	0.769	0.65	0.729	
Hi18	Launch new products on a trial basis, receive feedback, and slowly widen the market.	0.692	0.546	0.686	
Hi10	Do not get stuck to one idea. Be prepared to leave it at the slightest indication of failure, and develop new ideas.	0.659	0.473	0.675	
Hi4	Look for new (product) ideas amongst technological developments abroad, especially amongst new, rare, or specialised products developed abroad.	0.661	0.667	0.629	
Hi8	Look for new (product) ideas in the general environment (existing practices and changes in the legal, political, religious, social, and cultural domains).	0.687	0.495	0.609	
Hi5	Look for new (product) ideas amongst one's own vision of the future, special talents, and innovative research findings, or amongst the special skills of one's associates and staff.	0.707	0.582	0.601	
Hi15	Never set any geographical limits to one's search for ideas and opportunities.	0.604	0.403	0.598	
Hi13	Never be complacent about successes, but keep on striving for excellence through new ideas (Do not repeat success strategies until they fail).	0.706	0.522	0.598	
Hi1	Be a pioneer in the choice of products. Avoid highly competitive, low margin, run-of-the-mill products.	0.578	0.37	0.562	
Hi19	Management is an art; play it by ear. Rely on experience and intuition. Trust one's gut feelings more than formal analysis of data, trial runs, expert opinions, etc.	0.698	0.58	0.542	
Hi6	Look for new (product) ideas amongst the components, substitutes, complements, neglected ranges, supply gaps, deficiencies, and inadequacies of existing products.	0.691	0.493	0.526	
Hi12	Treat personal problems/handicaps/ mishaps as indications to change one's line of thinking/occupation.	0.545	0.302	0.479	
Hi25	When I make changes in my product, I focus on how fast & simple it will become for customers while adopting it.	0.695	0.687		0.809
Hi24	Innovation is driving the market toward smaller but more efficient products/services.	0.57	0.5		0.766
Hi22	The best innovative product/service in a domain is one that accomplishes the domain-specific task in a minimum number of steps and maximum simplicity.	0.696	0.656		0.746
Hi23	Product/service improvisation means identifying and eliminating all unnecessary steps in design and use.	0.659	0.587		0.738
Hi27	A faster way to challenge and involve employees to give them time to explore new ideas/products on their own.	0.582	0.473		0.687

(*continued*)

Table 1 (*Continued*)

SN	Items	Item-total correlation	Communality	Factor loadings	
				SAH	FFH
Hi26	I welcome all new ideas, but ideas that are fast and frugal in bringing returns are likely to be funded and supported first than those which promise only long-term benefits.	0.645	0.537		0.664
Hi21	Innovation is the quickest way to create an uncontested market and beat competition.	0.661	0.614		0.625
Hi20	Innovation is the fastest way to create new market leadership.	0.773	0.688		0.478
	Eigenvalue			12.7	1.32
	Percentage of variance explained			48.86	5.07
	Cronbach's Alpha			0.95	0.91

Note: KMO test value for sampling adequacy = 0.95, Bartlett's χ^2 (325) = 3593.53, $p < 0.001$; Eigenvalue = Kaiser's eigenvalues criteria, extraction method: principal axis factoring with direct oblimin rotation.

by Peters and Waterman (1982). Organisational excellence was measured using a scale from Sharma, Netemeyer, and Mahanjan (1990), which is based on eightfold criteria of excellence given by Peters and Waterman (1982). The scale consisted of 16 items, with two items devoted to each attribute of excellent companies. A sample item of the scale is "The organisation is flexible and quick to respond to problems". All the items of this scale (α = 0.94) were measured on a 7-point Likert-type scale with response options varying from 1 ("Strongly Disagree") to 7 ("Strongly Agree"). The participants were asked to indicate the extent to which the scale items apply to the organisations for which they were working.

Perceived organisational performance (POP)

Based on Lee et al. (2013), we define perceived organising performance as an employee's general perception about organisational outcomes. Operationally, POP was defined as the participants' subjective evaluation of organisational performance on financial parameters like cash flows, market sales, sales growth, return on investment (RoI), and net worth. The scale was adapted from Menon et al. (1996) and Moorman (1995). This scale item can be seen in Appendix A. The seven-point Likert-type scale's response options varied from 1 ("Decreasing Rapidly") to 7 ("Increasing Rapidly"). The scale reported the Cronbach's alpha reliability coefficient of 0.92 on the current sample (N = 201). Organisational excellence scale and POP correlated moderately with each other (r = 0.597, $p <$ 0.01, 95% CI 0.50–0.68). It suggests that both the measures are concurrent yet distinct organisational performance measures.

Validation and analytical strategy

As the variables studied in the present research reported significant univariate and multivariate non-normality, we preferred partial least squares structural equation modelling over covariance-based structural equation modelling. This is because, in the case of significant deviation from normality, small sample sizes, and complex models, partial least squares structural equation modelling has been proven to offer more robust estimates than covariance-based structural equation modelling (Hair, Hult, Ringle, & Sarstedt, 2016). To keep the model parsimonious, we analyse the effect of input variables on organisational excellence and POP separately as two different measures of perceived organisational performance as per our research model.

Results and discussion

Table 2 offers descriptive statistics, correlation, reliability, and validity estimates on the hypothesised variables.

As presented in Fig. 1, all the correlations are significant and in the hypothesised direction. Furthermore, a partial least square modelling using SmartPLS 3 also confirmed the correlations as hypothesised in the proposed model (see Fig. 1), confirming all the seven research hypotheses (H_1–H_7).

Mediation analysis of innovation heuristics between PIO and organisational excellence

We tested the mediating role of the innovation heuristics between PIO and organisational excellence. The mediation analysis of individual direct and indirect effects based on Nitzl, Roldan, and Cepeda (2016) is presented in Table 3.

Table 3 shows the estimates for the direct effect (c'), the indirect effects (a_1xb_1, a_2xb_2), the total indirect effect ((a_1xb_1) + (a_2xb_2)) and the differential mediation effect ((a_1xb_1) - (a_2xb_2)). We also report a bootstrap 90% confidence interval for direct and indirect effects due to the directional nature of hypothesised relations. In comparison, a 95% confidence interval for the comparison of mediation effects is reported due to the non-directional nature of hypothesised differences in mediation paths. According to Cepeda, Nitzl, and Roldán (2017), "If the confidence interval (CI) for a mediation effect (products) does not include 0 value, it means the mediating effect is significantly different from 0″ (p. 186). Except for a non-significant direct effect of PIO on organisational excellence, all the direct effects in the hypothesised multiple mediation model were significant.

Table 2 Descriptive statistics, correlations, discriminant, and convergent validity of the model (Study 1).

	M	*SD*	Composite reliability	AVE	1	2	3	4
1. Fast and frugal heuristics	21.42	4.77	0.91	0.71	**0.84**	0.62 [0.40-0.79]	0.33 [0.15-0.63]	0.71 [0.51-0.87]
2. Organisational excellence	84.34	16.53	0.93	0.66	0.55***	**0.81**	0.27 [0.12-0.55]	0.76 [0.65-0.85]
3. PI orientation	6.74	1.89	0.77	0.63	0.20 **	0.16**	**0.79**	0.31 [0.13-0.63]
4. Search and adapt heuristics	15.94	4.43	0.92	0.79	0.62***	0.69***	0.19**	**0.89**
5. Perceived organisational performance	24.86	5.92	0.92†	-	0.49***	0.61***	0.23**	**0.53*****

Note: Fornell-Larcker criterion shown below the square root of average variance extracted (AVE) values (in bold) while Heterotrait-Monotrait Ratio (HTMT) is shown above the diagonal.
†Cronbach's Alpha.
**$p<0.01$.
***$p<0.001$.

The indirect effects of PIO on organisational excellence through SAH (a_1xb_1; β = 0.181, 90% *BCa* [0.119, 0.245]) as well as FFH (a_2xb_2; β = 0.043, 90% *BCa* [0.010, 0.080]) were found to be significant along with the total indirect effect ((a_1xb_1) + (a_2xb_2); β = 0.224, 90% *BCa* [0.129, 0.325]).

We also calculated variance accounted for (VAF) to estimate the magnitude of mediation effects. A VAF value below 20%, more than 20% but less than 80%, and more than 80% indicate zero mediation, partial mediation, and full mediation, respectively (Hair et al., 2016; Nitzl et al., 2016). Although the direct effect of PIO on organisational excellence was found to be non-significant, the VAF values presented in Table 3 suggest partial mediation of two heuristics between PIO and organisational excellence. Furthermore, a comparison of the two mediating effects suggested that SAH had a comparatively stronger mediation influence than FFH ($\Delta\beta$ = 0.139, 95% *BCa* [0.064, 0.222]).

Validity

The results shown in Table 2 suggest that the proposed model has a statistically accepted convergent and discriminant validity. We tested the convergent validity using the Fornell-Larcker criterion and the Heterotrait-Monotrait ratio (HTMT) of correlations. Although the Fornell-Larcker criterion appears to be the dominant approach of testing discriminant validity for variance-based models, Henseler, Ringle, and Sarstedt (2015) have recommended the HTMT ratio due to the comparatively proven robustness of the latter. The square root of average variance extracted (AVE) values shown in bold on the diagonals in Table 2 were higher than all off-diagonal values indicating that the Fornell-Larcker criterion has been satisfied. Again, all the HTMT ratio values are below the prescribed 0.85 threshold (Kline, 2011), and $HTMT_{inference}$ confidence intervals (shown in squared brackets) are less than 1 showing the discriminant validity of the model.

Mediation analysis of innovation heuristics between PIO and POP

We further analysed the hypothesised model's predictive validity by considering POP as an alternative outcome variable parallel to organisational excellence. Fig. 3 presents the model outlining the hypothesised path direction with regression estimates of the two heuristics' mediation effect when POP is regressed on PIO.

The results presented in Table 4 confirm a significant direct effect of SAH (β = 0.35, t = 4.73, $p < 0.001$, 95% CI [0.27, 0.66]) and FFH (β = 0.26, t = 3.48, $p < 0.001$, 95% CI [0.14, 0.50]) on POP.

Furthermore, the indirect effects confirmed a significant full mediation influence of SAH (β = 0.07, 95% CI [0.015, 0.124]) and FFH (β = 0.05, 95% CI [0.016, 0.100]) when POP variable is regressed on PIO. The analysis of two separate models suggests that innovation heuristics were consistent in mediating the path between PIO and organisational excellence and POP.

Multi-group invariance analysis

We conducted a multi-group analysis to observe whether the reflective parameters for the founders' group (N = 11) significantly differ from managers (N = 25), management trainees (N = 20), and interns (N = 144) as hypothesised in the research model. One case was deleted (Case ID: 106) from the analysis because of missing data on the grouping variable. Except for one marginal significance ($\Delta\lambda$ = -0.06, p = 0.049) for one indicator (i.e., Ex10) of organisational excellence, the results presented in Table 5 suggest that the estimates of outer loadings do not significantly differ when founders are compared with the other three groups suggesting invariance of the reflective constructs as presented in the hypothesised model.

We also compared male (N = 77) and female (N = 123) groups based on 5000 subsamples and found that except for one indicator for the FFH (i.e., Hi23, $\Delta\lambda$ = -0.13, $p < 0.05$), construct loadings remain invariant across gender. Again, we

Table 3 Mediation analysis of innovation heuristics between pioneering-innovative orientation and organisational excellence (Study 1).

Direct effects	Coefficients	Bootstrap 90% confidence intervals					Conclusion
		Percentile Lower 5%	Upper 95%	Bias corrected Lower 5%	Upper 95%		
Pioneering-innovative orientation → Organisational excellence (H_1:c')	0.061^{nsig}	−0.043	0.161	−0.040	0.164		H1 not accepted (correlation supported)
Pioneering-innovative orientation → Search and adapt heuristics (a_1)	0.278**	0.094	0.321	0.164	0.391		H2 accepted
Pioneering-innovative orientation → Fast and frugal heuristics (a_2)	0.306**	0.111	0.333	0.192	0.414		H4 accepted
Search and adapt heuristics → Organisational excellence (b_1)	0.652***	0.416	0.654	0.524	0.762		H3 accepted
Fast and frugal heuristics → Organisational excellence (b_2)	0.139*	0.072	0.355	0.001	0.284		H5 accepted
Indirect effects	**Point estimate**	**Percentile**		**Bias corrected**		**VAF**	**Conclusion**
H_2:a_1xb_1	0.181^{sig}	0.051	0.177	0.119	0.245	74.8%	H6 accepted, partial mediation
H_3:a_2xb_2	0.043^{sig}	0.015	0.085	0.010	0.080	41.3%	H7 accepted, partial mediation
Total indirect effect (a_1xb_1) + (a_2xb_2)	0.224^{sig}	0.066	0.262	0.129	0.325	78.6%	Partial mediation
Comparison of mediating effects		**Bootstrap 95% confidence intervals**					
		Lower 2.5%	Upper 97.5%	Lower 2.5%	Upper 97.5%		
(a_1xb_1) − (a_2xb_2)	0.139^{sig}	−0.009	0.149	0.064	0.222	-	Search and adapt heuristics have a stronger mediation effect as compared to fast and frugal heuristics

Note: sig: significant; nsig: not-significant ($p = 0.891$).
*$p < 0.05$.
**$p < 0.01$.
***$p < 0.001$.

Table 4 Mediation analysis of innovation heuristics between PI orientation and perceived organisational performance (Study 1).

Path	$\beta^{\dagger}$	*SE*	*t*	95% CI	*F*	R^2	Conclusion
Direct effects							
PI orientation → Search and adapt heuristics	0.19	0.16	2.76**	[0.129, 0.772]	7.64**	0.04	H2 accepted
PI Orientation → Fast and frugal heuristics	0.21	0.17	3.00**	[0.180, 0.869]	8.99**	0.04	H4 accepted
Search and adapt heuristics → Perceived organisational performance	0.35	0.10	4.73***	[0.271, 0.659	33.31***	0.34	H3 accepted
Fast and frugal heuristics → Perceived organisational performance	0.26	0.09	3.48***	[0.139, 0.500]			H5 accepted
PI orientation → Perceived organisational performance	0.11	0.19	1.85	[−0.022, 0.712]			H1 not accepted (correlation supported)
Indirect effects							
PI orientation → Search and adapt heuristics → Perceived organisational performance	0.07	0.03	-	[0.015, 0.124]	-	-	H6 accepted
PI orientation → Fast and frugal heurist → Perceived Organisational Performance	0.05	0.02		[.016, 0.100]	-	-	H7 accepted
Total indirect effect	0.12	0.04	-	[0.044, 0.196]	-	-	

†Standardised direct effects and completely standardised indirect effects are reported in the table.
**$p < 0.01$.
***$p < 0.001$.

carried out a second set of measurement invariance tests with POP as the outcome variable. Except for one indicator of FFH (i.e., Hi25) showing marginal significance in the difference of outer loadings between a group of founders and interns ($\Delta\lambda$ = -0.13, p = 0.046), the results presented in Table 5 suggest invariance of the reflective constructs for the designation as well as gender variables.

Common method variance analysis

Common method variance refers to variability in sample data due to measurement methods rather than the actual constructs used in the research model. Common method bias is one of the major sources of both random and systematic measurement error that may arise because of context, specific psychometric tools, or methods used in research that lead to response bias. We crosschecked method variance default models using two methods, i.e., Harman's single factor test and Kock's full collinearity test. Harman's single factor test hypothesised that if there is common method bias in the data, a single latent factor would explain most (>50%) of the covariance amongst the measures (Podsakoff, MacKenzie, Lee, & Podsakoff, 2003, p. 889). As per Harman's single factor test, an unrotated single factor solution of all the forced variables would explain more than 50% of the variance if common method variance is present in the data. Moreover, the ratio of chi-square to its degree of freedom for the single factor solution remains less than 2:1 when common method bias is present in the data (Taormina & Gao, 2013).

According to Kock's full collinearity tests (Kock, 2015), common method bias is present if the variance inflation factor (VIF) for latent constructs in a research model exceeds a value of 3.3. For the current study, the maximum variance explained value achieved for Harman's single-factor solution was 36.07% with a chi-squared to df ratio as 4.86 (χ^2 (1653) = 8029.50, $p < 0.001$), suggesting no common method bias. Furthermore, Kock's full collinearity tests yielded the range of inner VIF values for all constructs presented in research models between 1.10 and 2.05. Therefore, we conclude that there is no common method bias in the proposed research model.

Robustness check

Sarstedt et al. (2019) suggest analysing nonlinear effects, endogeneity, and unobserved heterogeneity for checking the structural model's robustness. We offer an assessment of nonlinear effects and endogeneity as we have already offered an analysis of measurement invariance across relevant groups. Ramsey's RESET test is a robust test for checking model specification errors that may occur due to omitted variables, incorrect functional form, simultaneous equation problems, and heteroskedasticity (Ramsey, 1969). We tested the latent variable scores of the two heuristics for quadratic influence on the variable organisational excellence. We found a non-significant Ramsey's RESET test (F(3, 191) = 2.63, p = 0.052), suggesting the absence of any nonlinear or quadratic effect in the model. Also, the relationship between PIO and SAH (F(1, 197) = 0.47, p = 0.469) and FFH (F(3, 197) = 0.68, p = 0.412) did not manifest any significant deviation from linearity.

Endogeneity refers to a situation when a regressor is correlated with the error term of the dependant variable. Endogeneity may arise due to the use of nonexperimental data, weak instruments, mis-specified functional forms, omitted variables, and measurement error (Park & Gupta, 2012; Plümper, 2011). An assessment of endogeneity using

Table 5 (a) Results of multi-group analysis for the outcome variable organisational excellence. (b Results of multi-group analysis for the outcome variable perceived organisational performance.

Paths	Result of MGA for founder vs. other groups						Result of MGA for gender	
	Difference in loadings ($\Delta\lambda$)			p			Difference in loadings ($\Delta\lambda$)	p
	Founder vs. managers	Founder vs. management trainee	Founder vs. intern	Founder vs. managers	Founder vs. management trainee	Founder vs. intern	Male vs. female	
Ex10 ← Excellence	−0.021	−0.108	−0.057	0.426	0.323	0.049	−0.009	0.847
Ex11 ← Excellence	−0.019	−0.113	−0.042	0.491	0.188	0.180	−0.014	0.669
Ex12 ← Excellence	−0.025	−0.068	−0.002	0.266	0.312	0.901	−0.001	0.958
Ex13 ← Excellence	0.012	−0.088	−0.016	0.705	0.292	0.419	0.000	0.996
Ex14 ← Excellence	0.011	−0.016	−0.017	0.772	0.683	0.438	−0.044	0.088
Ex15 ← Excellence	−0.006	0.109	−0.012	0.872	0.259	0.638	0.002	0.925
Ex8 ← Excellence	−0.027	0.094	0.007	0.291	0.338	0.797	−0.004	0.867
Hi2 ← SAH	−0.093	−0.153	−0.001	0.383	0.117	0.584	0.056	0.153
Hi21 ← FFH	−0.023	0.005	−0.007	0.754	0.801	0.898	0.028	0.742
Hi22 ← FFH	−0.046	0.071	−0.009	0.280	0.425	0.683	0.026	0.666
Hi23 ← FFH	0.036	−0.070	−0.024	0.514	0.442	0.557	−0.132	0.019
Hi25 ← FFH	−0.025	0.026	−0.063	0.689	0.993	0.127	−0.037	0.552
Hi3 ← SAH	−0.097	−0.130	0.042	0.360	0.283	0.621	0.067	0.081
Hi9 ← SAH	−0.019	0.320	−0.086	0.792	0.149	0.088	−0.092	0.050
Pi2 ← PI orientation	−0.343	−0.150	−0.292	0.216	0.552	0.369	−0.277	0.316
Pi6 ← PI orientation	0.074	0.156	−0.349	0.904	0.685	0.237	0.026	0.975
Pi8 ← PI orientation	0.254	−0.056	0.630	0.292	0.705	0.102	0.254	0.477

Paths	Difference in loadings ($\Delta\lambda$)			p			Difference in loadings ($\Delta\lambda$)	p
	Founder vs. managers	Founder vs. management	Founder vs. intern	Founder vs. managers	Founder vs. management	Founder vs. intern	Male vs. female	
Ei1 ← POP	−0.051	0.081	−0.009	0.333	0.323	0.804	0.018	0.647
Ei2 ← POP	−0.018	0.043	−0.023	0.977	0.71	0.959	−0.038	0.303
Ei3 ← POP	−0.058	−0.081	−0.085	0.464	0.331	0.214	0.021	0.532
Ei4 ← POP	0.042	0.004	0.059	0.300	0.929	0.135	0.028	0.485
Ei5 ← POP	0.082	−0.009	0.066	0.247	0.939	0.219	0.028	0.514
Hi2 ← SAH	−0.011	−0.118	0.004	0.865	0.168	0.670	0.033	0.621
Hi21 ← FFH	−0.016	0.082	0.005	0.811	0.364	0.983	−0.028	0.606
Hi22 ← FFH	−0.039	0.092	−0.048	0.379	0.349	0.280	−0.035	0.444
Hi23 ← FFH	0.055	−0.070	0.073	0.465	0.381	0.215	−0.038	0.472
Hi25 ← FFH	−0.053	−0.065	−0.126	0.503	0.329	0.046	−0.020	0.739
Hi3 ← SAH	−0.139	−0.001	0.071	0.237	0.819	0.147	0.022	0.684
Hi9 ← SAH	−0.053	0.032	−0.119	0.613	0.963	0.065	−0.018	0.803
Pi2 ← PI orientation	−0.352	−0.134	−0.277	0.198	0.619	0.369	−0.262	0.330
Pi6 ← PI orientation	0.079	0.163	−0.348	0.878	0.698	0.213	0.012	0.989
Pi8 ← PI orientation	0.261	−0.069	0.606	0.284	0.674	0.092	0.247	0.487

Note: Excellence: organisational excellence; SAH: search and adapt heuristics; FFH: fast and frugal heuristics; POP: perceived organisational performance; PI orientation: pioneering-innovative orientation.

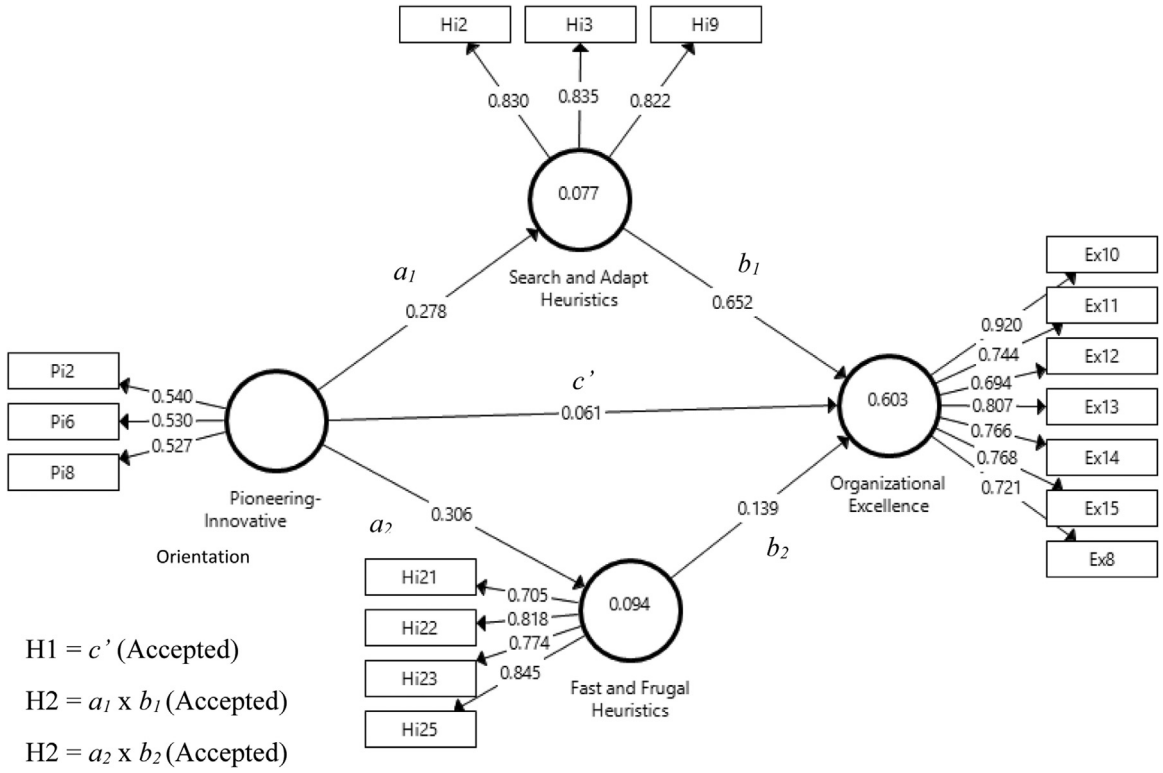

Fig. 2 A multiple mediator model of mediating roles of search and adapt heuristics and fast and frugal heuristics between pioneering-innovative orientation and organisational excellence.

the Gaussian copula approach based on Sarstedt et al. (2019) did not yield significant Gaussian copulas for any regressor for the research model presented in Fig. 2 ($p > 0.05$). More specifically, hypothesising the three predictors of organisational excellence as endogenous offered nonsignificant Gaussian copulas of –0.03319 for PIO ($p = 0.288$), –0.0504 for SAH ($p = 0.368$), and 0.074 FFH ($p = 0.422$). Therefore, the absence of any significant nonlinear effects and endogeneity indicates the robustness of the structural model.

Study 2

The purpose of Study 2 was to investigate further the influence of PIO, SAH, and FFH on a financial measure of

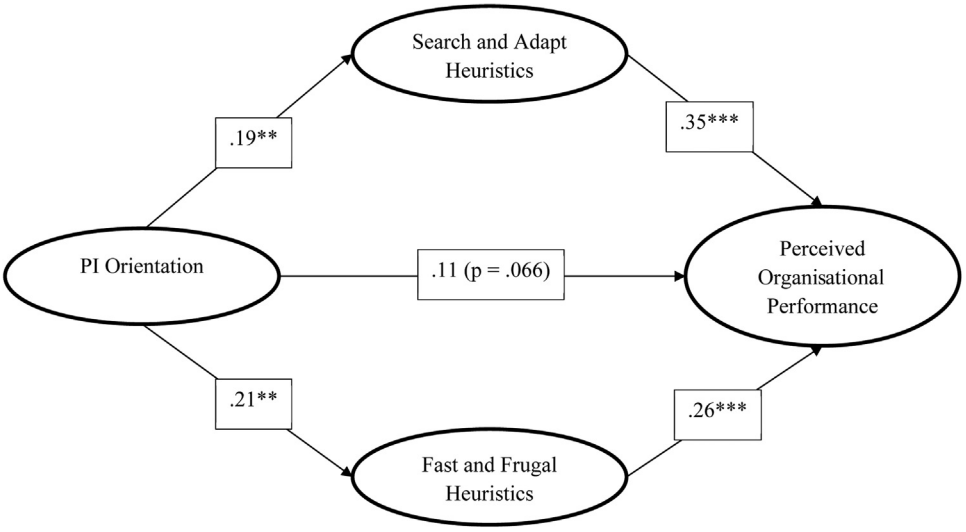

Fig. 3 Standardised regression coefficients of the relationship between PI orientation and perceived organisational performance as mediated by innovation heuristics. $^{**}p < 0.01$. $^{***}p < 0.001$.

organisational performance based on a sample of senior business leaders and entrepreneurs. We have already cited the research literature in the hypothesis development section, indicating a positive relationship between study variables and organisational performance. However, considering the overrepresentation of MBA interns in the Study 1 sample and the use of rating scales for measuring organisational performance, an analysis of the predictors using a sample of senior business leaders on a financial measure of organisational performance is desirable.

Method

Variables

A person with work experience of 10 or more years at a strategic level was defined as a senior business leader. The examples include Vice Presidents, Managing Directors, CHROs, or heads of a division or department. We described an entrepreneur as a founder or co-founder of a legally registered firm that has existed for at least three past financial years. As per the criteria set by the Ministry of Commerce and Industry (2019), a startup in India is a business entity that is less than 10 years old, has an annual turnover of less than rupees 100 crores (around US$14 million), working toward innovation, development, commercialisation of the process or services for generating wealth and employment (p. 6).

Procedure

We identified the profiles of senior business leaders and entrepreneurs from LinkedIn® and personal references. As LinkedIn makes the members' work experience and designation details publicly available, we screened 50 profiles of business professionals having more than 10 years of experience at the strategic level and 50 profiles of entrepreneurs. After establishing a network with the target sample, a pre-participation telephonic conversation was established to explain the study's purpose and seek the participants' consent. A total of 76 participants agreed to participate in the online survey, out of which 62 usable responses were received. The analysis sample consisted of 30 senior business leaders and 32 entrepreneurs with average work experience of 15.90 (SD = 4.62, range = 11–28) years and 11.75 (SD = 7.51, range = 1–31) years, respectively. There were 48 men and 14 women in the sample. Nine females reported themselves as senior business leaders, and five reported to be entrepreneurs. The average age of senior business leaders and entrepreneurs were 41.50 (SD = 9.98, range = 25–62) and 35.97 (SD = 9.17, range = 22–53) years, respectively.

To measure the organisational performance, we followed up with all the participants to share the annual turnover data of their organisations averaged over the past three years. Since private limited companies are not legally required to publicly publish their financial data, many participants expressed unwillingness to share the full financial data of the previous 3 years. However, upon multiple follow-ups, a total of 54 participants agreed to share the annual turnover data (in INR crores) averaged over the past 3 years. A total of eight participants did not agree to share any data about the financial figures of their organisations. We have taken the 3-year average annual turnover (in INR crores) of the 54 organisations to measure organisational performance for further analysis in this study.

We used the PI orientation scale and innovation heuristics scale which are described in Study 1. We did not repeat the organisational excellence or POP scale to keep the survey's length small, and to focus on the revenue-orientated assessment of the organisational performance.

Results

A partial correlation analysis after controlling the effect of age, gender, and work experience for the sample (N = 54) indicated a significant correlation between PIO (r = 0.73, $p < 0.001$) and the two innovation heuristics (r_{SAH} = 0.77, $p < 0.001$; r_{FFH} = 0.68, $p < 0.001$) with the 3-year average annual turnover of companies. Moreover, a hierarchical regression analysis (see Table 6) suggested a significant influence of PIO (β = 0.35, $p < 0.01$), SAH (β = 0.39, $p < 0.01$), and FFH (β = 0.24, $p < 0.05$) on the 3-year average annual turnover of the companies.

These findings are consistent with Study 1, suggesting a positive relationship between PIO, SAH, FFH, and psychological measures (organisational excellence and POP) of organisational performance. Moreover, after controlling the effect of gender, age, and work experience of the business leaders, the three study variables (i.e., PIO, SAH, and FFH) accounted for 71% of the variance in the reported 3-year averaged annual turnover of the organisations (ΔR^2 = 0.71, F (6, 47) = 20.73, $p < 0.001$).

Discussion

We conducted two studies to analyse the relationship between PIO, innovation heuristics, and organisational performance. Results of Study 1 offer support for the hypothesised model. Two innovation heuristics identified in the present research, i.e., SAH and FFH, significantly mediated the path between the PIO and organisational performance measures. Furthermore, a comparative analysis of multiple mediators suggests that SAH plays a comparatively stronger mediation influence than FFH between PIO and the measures of organisational performance. A stronger mediation role of SAH implies that organisational outcomes are perceived better when PIO is adaptive rather than merely fast and frugal in implementation.

Further, the research model reflected sufficient reliability and validity of the constructs. The robustness check and multi-group analysis suggest that the estimates are reasonably robust and invariant across the study groups. Study 2 further supported the hypothesised relationship in a different sample of experienced business leaders and entrepreneurs. Study 2 suggested that the study variables PIO, SAH, and FFH are positively related to the financial performance of the organisations.

Table 6 Results of a hierarchical regression analysis for predicting three-year averaged annual turnover of firms (in INR crores), Study 2 ($N = 54$).

Variables	Step 1				Step 2			
	b	*SE*	β	*t*	*b*	*SE*	β	*t*
Gender	14.72	57.59	0.04	0.26	−27.42	32.60	−0.07	−0.84
Age	−2.22	4.26	−0.14	−0.52	0.60	2.35	0.04	0.25
Work experience	5.09	6.35	0.22	0.80	1.99	3.48	0.09	0.57
PI orientation					13.11	4.27	0.35	3.07**
Search and adapt heuristics					10.64	3.06	0.39	3.48**
Fast and frugal heuristics					4.81	2.03	0.24	2.38*
F	0.32				20.73***			
df	3				6			
df_{error}	50				47			
R^2	0.02				0.73			
ΔR^2					0.71			

Note: Gender: female = 0, male = 1; SE: coefficient standard error; *df*: degrees of freedom.
*$p < 0.05$.
**$p < 0.01$.
***$p < 0.001$.

Theoretical contribution and managerial implications

Previous research has proved that successful managers significantly use heuristics in their day-to-day business decisions (Manimala, 1992). However, a review of research on heuristics used in organisations indicates that heuristics' performance is highly contextual, contrasting, or even contradictory (Loock & Hinnen, 2015). The present study can be critically positioned on the continuum whose two extremes are heuristics-and-biases school (Gilovich, Griffin, & Kahneman, 2002) and the fast and frugal school (Gigerenzer & Brighton, 2009). We adopt a positive view of heuristics by studying and expanding the implications of innovation heuristics for the perceived organisational performance. While our study variables indicate strategic implications, we have not studied heuristics purely in a strategic context. Rather, the present research is more orientated towards looking at the perceived organisational performance implications of innovation heuristics from the corporate stakeholder's perspective.

This research contributes to the theory by testing innovation heuristics as a bridge between PIO and organisational performance. The two studies found a consistent positive relationship between PIO, innovation heuristics, and organisational performance. Moreover, we contribute to the literature by testing the mediating variables that form the connection between PIO and organisational performance, as all the pioneering orientations may not translate into performance. More mediators or moderators could play their role between PIO and performance, which can be explored in future research.

Applications

The present research outcomes hold important implications for the managers and researchers of innovation heuristics. First, by understanding how innovation heuristics work, managers will become more aware and capable of harnessing PIO for organisational performance. Second, our findings suggest that entrepreneurs and business leaders significantly use innovation heuristics to create a positive perception of their product or organisation's performance. Managers can benefit by routinely incorporating innovation heuristics to generate a positive perception of their organisation's performance.

Next, our research would explain the frugal innovation behaviour of indigenous and small firms. For example, frugal innovations in India at the popular level, sometimes also called jugaad (meaning improvisations), are mainly instances of adaptive heuristics implemented by deviating from the standard usage of an instrument or process (Radjou, Prabhu, & Ahuja, 2012). Large firms also try jugaad products to improve their performance. However, small firms and startups seem to have advantages over large firms. An emphasis on structure and formalisation in bigger companies often proves inconvenient for testing "quick and dirty" innovation heuristics. In contrast, innovation heuristics flourish in informal organisations where the scope of deviation from standard operating procedures is greater. Moreover, our conception of innovation heuristics as simple rules for improving organisational performance can be related to the construct of entrepreneurial hustle, which refers to urgent and unorthodox action on the part of the entrepreneur that contributes to the entrepreneur's leadership effectiveness and venture legitimacy (Fisher, Stevenson, Neubert, Burnell, & Kuratko, 2020).

Limitations and future research directions

The present research is based on survey data drawn through purposive sampling methodology, which may be considered a limiting factor for generalising the study findings. However, survey data is widely used in organisational research, and purposive sampling can be a useful method for drawing

inferences if sample characteristics are adequately specified (Gravetter & Forzano, 2012). Apart from relevant sample details, we have presented sample power analysis and robustness check results, which may help interpret, apply, and generalise the research findings. Furthermore, we have employed the most advanced and recent techniques for the multiple mediation analysis (Cepeda et al., 2017) using the PLS-SEM technique, which is fairly robust to sample size variations and deviations from normality (Hair et al., 2016). Due to space and quantitative methodology limitations, we could not diagnose the actual instances of PIO and innovation heuristics amongst the participants. In the future, a separate study involving in-depth qualitative interviews with business leaders and entrepreneurs may offer a better scope of verifying the PIO of leaders and the use of innovation heuristics with their impact on organisational performance.

The present research findings offer scope for some extended research questions, extending the current line of research and contributing to the literature connecting innovation and heuristics. In the future, the proposed model could be tested to observe if innovation heuristics are similarly predictive of additional measures of firm success. Besides, it would be worthwhile to examine sectoral and structural level variations to the present model by doing a measurement invariance test across sectors in future studies. Finally, it would make a fascinating analysis for future studies to examine how innovation heuristics perform in the presence of key cognitive biases (Gudmundsson & Lechner, 2013).

Conclusion

Despite the hypothesised positive relationship between entrepreneurial motives and organisational excellence, organisations' PI efforts may not always lead to organisational excellence. We address this gap by testing whether innovation heuristics mediate between PIO and organisational performance. Study 1 suggests that SAH and FFH are the two robust mediators between PIO and organisational performance. The second study carried on a sample of entrepreneurs and business leaders again confirmed a positive association between hypothesised variables and the 3-year averaged annual turnover of studied organisations.

Declaration of Competing Interests

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.

Supplementary materials

Supplementary material associated with this article can be found in the online version at doi:10.1016/j.iimb.2022.12.001.

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