
Cognitive misfit and firm growth in technology-oriented SMEs

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Abstract: In this study, we examine how the founding owner-managers' cognitive style, levels of formalisation in their firms, and the interaction of these two variables (cognitive misfit) are related to firm growth in technology-oriented SMEs. We found that an intuitive decision-making style, higher levels of formalisation, and their interaction were significantly associated with firm growth over a five-year period. There has been a recent surge of interest in entrepreneurs' cognition (Mitchell et al., 2002, 2007) and the role of context on cognitive processes (Baron, 1998). Our findings suggest that incorporating individual cognition within a PO fit approach from the field of organisational behaviour can further our understanding of the key role of the founding owner-managers play in the subsequent growth of their firms. The implications of these findings for practitioners, researchers, and policy makers are developed.

Keywords: entrepreneur; founder; owner-manager; cognitive style index; CSI; firm growth; cognitive misfit; cognition; person-organisation fit; technology.

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1 Introduction

Small to medium-sized enterprises (SMEs) are the main drivers of economic and job growth for most economies and innovations produced by technology-oriented new ventures play a pivotal role in economic growth and prosperity (Baron and Markman, 2003). Founding owner-managers of these firms will likely face many challenges as their firms mature and grow (e.g., Covin and Slevin, 1997; Hanks et al., 1994; Kazanjian and Drazin, 1990). Rarely does a founder possess all of the individual attributes necessary to successfully lead and grow a business from creation to maturity (Stevenson and Jarillo, 1990). The value of founders to their organisations may decrease as their firms grow and they are often replaced by professional managers (Jayaraman et al., 2000).

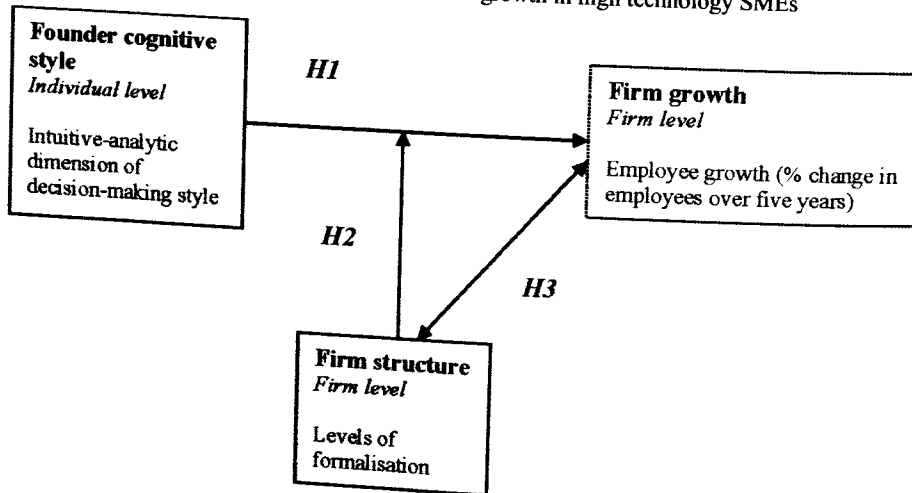
In the entrepreneurship literature, there has been a growing recognition that firm growth is a complex outcome that is influenced by a host of factors (Shane and Venkataraman, 2000). Several authors have proposed multi-theoretic and multi-level models of firm performance and growth (e.g., Baum et al., 2001; Chrisman et al., 1998; Lumpkin and Dess, 1996). Baum et al. (2001) concluded that multiple individual dimensions of the owner-manager, both directly and indirectly through interactions with other level factors, affect firm growth and success. Moreover, they found that the owner-managers of small firms have more influence over their firms' growth than established macro theories (Hannan and Freeman, 1977; Pfeffer and Salancik, 1978) would predict.

In an attempt to incorporate the important role of the entrepreneur in the entrepreneurial process, there is an emerging stream of research on entrepreneurial cognition. These cognitions are 'knowledge structures used to make assessments, judgments, or decisions involving opportunity evaluation, venture creation, and growth' and are fundamental to understanding entrepreneurial behaviour [Mitchell et al., (2002), p.97]. Individual differences in cognitive processing lead to different entrepreneurial

behaviours and outcomes and entrepreneurs' cognitions often diverge from the normative/rational model (Baron, 1998, 2004; Mitchell et al., 2002, 2007). Many researchers have suggested that applying intuition in decision making is less effective than employing more rational models (e.g., Kahneman et al., 1982). However, there is a growing appreciation that under some conditions, intuition may be more effective than employing more rational models (e.g., Blattberg and Hoch, 1990; Khatri and Ng, 2000).

In this study, we employ a PO (person-organisation) fit approach, incorporating the founding owner manager's cognitive style, levels of formalisation in his or her firm, and their interaction to examine firm growth in technology-oriented SMEs. Our framework is presented in Figure 1.

Figure 1 Cognitive style, firm structure, and firm growth in high technology SMEs



In the following sections, we present the theoretical foundations and develop the main components of our framework, derive hypotheses, present the results of the empirical tests, and discuss the implications of our findings and avenues for future research.

2 Conceptual background and hypotheses

There is an emerging recognition in the entrepreneurship literature that understanding the relationships between entrepreneurs (persons) and their firms (organisations) as they grow and mature may be enhanced through a PO fit approach (Baron and Markman, 2003; Brigham and De Castro, 2003). The basic premise of the PO fit approach is that the greater the congruence between the relevant attributes of the person and the organisation, the more positive the individual's outcomes. PO fit studies have consistently demonstrated significant relationships between numerous dimensions of fit and relevant individual outcomes (see Kristof, 1996 and Kristof-Brown et al., 2005 for comprehensive reviews of PO fit). Baron and Markman (2003) developed the idea of 'entrepreneurial fit' and concluded that while the PO fit literature is well developed and likely to be highly useful in understanding entrepreneurial processes and outcomes, there has been minimal effort to integrate its conceptualisations or measures with the field of entrepreneurship.

Herein, we apply one particularly promising facet of PO fit to the study of firm growth in technology-oriented SMEs. In this study, we follow these previous approaches by examining how a PO fit approach, specifically the facet of cognitive misfit, is related to firm growth for technology-oriented SMEs.

While a number of dimensions of PO fit have been identified and tested, in this paper, we follow Chan (1996) who was the first to demonstrate that the interaction of individual cognitive style and the work context style demands (related to organisational structure) was a viable facet of PO fit. Chan (1996) called the incongruence on these variables as 'cognitive misfit' and found that lower degrees of fit lead to negative outcomes for employees. More recently, Brigham et al. (2007) extended the PO fit approach from employees to the study of owner-managers and reported significant associations between the interaction of cognitive style and levels of formalisation and the individual owner outcomes of satisfaction, intentions to exit, and actual turnover. While to date, cognitive misfit has been empirically linked to only individual level outcomes, it, along with the component parts, may be an especially relevant facet of PO fit with respect to firm performance in small firms (Baron and Markman, 2003; Brigham et al., 2007). In this study, we extend the PO fit approach from individual level to firm level outcomes, specifically firm growth in SMEs. The main components of the framework (see Figure 1) are described in the following sections.

2.1 Cognitive style: intuition-analytic

Cognitive style is acknowledged as an important determinant of individual behaviour (Sadler-Smith and Badger, 1998). First introduced by Klein (1951) as perceptual attitudes that regulate an individual's cognitive functioning, cognitive style has been defined as an individual's stable preferences for modes of perceiving, remembering, thinking, and problem solving (Messick, 1976) and consistencies in cognitive functioning with respect to acquiring and processing information (Ausburn and Ausburn, 1978). Cognitive style has been conceptualised as high-order heuristics that individuals use to process information (Kozhevnikov, 2007; Messick, 1976). Cognitive styles include a broad grouping of models and measures including decision-making styles (e.g., Kirton, 1976), learning styles (e.g., Kolb, 1984), and personal styles (e.g., Myers-Briggs type indicator, Myers and McCaulley, 1985).

The study of cognitive style is extremely broad and the many different conceptualisations, models, and labels have been a source of confusion and consternation. Within the field, there has been a movement to unify existing models and dimensions within a single overarching dimension (Kozhevnikov, 2007). Allinson and Hayes (1996) presented the initial theoretical development and validation study for the cognitive style index (CSI). They theorised that while there are a number of dimensions on which cognitive style has been differentiated, the superordinate dimension of intuition-analysis encompasses all of these, acting as a high-order heuristic. The CSI measure places individuals on a continuum anchored at one end by a more holistic and heuristic-based logic labelled 'intuitive'. The other end of the continuum is anchored by more analytic and rational-based logic labelled 'analytic'. While Allinson and Hayes (1996) presented evidence supporting their unitary dimension of cognitive style, there have been recent studies calling the single factor solution into question and positing that that intuition and analysis are two separate, though interrelated, dimensions representing different modes of information processing and cognitive systems (Coffield et al., 2004; Hodgkinson and

Sadler-Smith, 2003). A revised scoring system for the CSI treating the analytic and intuitive dimensions as separate factors was proposed by Hodgkinson and Sadler-Smith (2003). Accordingly, to assist scholars in comparing both approaches, we also conducted a post hoc analysis following the procedures outlined by Hodgkinson and Sadler-Smith (2003) with similar results. In this study, we therefore followed the original scoring procedure for the CSI because the scale itself was not the primary focus and its use was helpful in the analysis.

2.2 *Intuitive decision making*

Based on their recent review of intuition, Dane and Pratt (2007, p.40) stated that 'rational decision making is highly dissimilar to intuition' and that intuition differs from the rational or analytic approach on four core characteristics: 'Intuition is a

- 1 nonconscious process
- 2 involving holistic associations
- 3 that are produced rapidly
- 4 result in affectively charged judgments' (2007, p.36).

Miller and Ireland (2005) stressed that intuition should not be viewed as simply the opposite of rationality, but rather as a concept that is distinct from explicit logic and analysis. In the same vein, Sadler-Smith and Shefy (2004, p.81) proposed that intuition is a form of cognition that operates as both 'knowing' or 'expertise' (e.g., Klein, 2003; Simon, 1989) and 'feeling' (Damasio, 1994) and that rational analysis should be viewed as parallel systems and not as opposites. This suggestion is echoed in the work of Mitchell et al. (2005), who bridged the polar-extremes approach by suggesting that entrepreneurial intuition is a cumulative process of 'coming to consciousness' (2005, p.664).

The idea that managers may not follow purely rational and logical approaches to decision making has a long history in the management literature (e.g., Barnard, 1938; Simon, 1976). Mintzberg (1994) makes the case that there has been too much emphasis on rational analysis for managers and that effective managerial decision making requires both rational and intuitive modes of decision making (Pondy, 1983; Simon, 1987). This is consistent with a basic tenet of cognitive style, which is that the poles of different dimensions are value free and that the utility of a particular style preference will depend on the information processing demands associated with the situation or context.

Researchers have begun to examine the different factors that may influence the effectiveness of intuitive decision making in more detail. Dane and Pratt (2007) presented a model illustrating a number of factors influencing the effectiveness of intuitive decision making, including domain knowledge (drawn from expert schemas, learning, and heuristic schemas) and task characteristics (consisting of judgmental tasks and environmental uncertainty). Dane and Pratt (2007) concluded that the use of intuition is good in some situations, particularly more unstructured situations, but bad in others. Khatri and Ng (2000) proposed that 'intuitive synthesis' (comprised of judgment, experience, and gut-feeling) is more appropriate when a manager is dealing with strategic (non-routine) decisions than day-to-day operational (routine) decisions and more

effective in an unstable environment than a stable environment. Agor (1990) stated that the use of intuition is more appropriate when there is a high level of uncertainty in the environment, little precedent for action in the face of emerging trends, limited or no data, and several viable solutions.

From a cognitive style perspective, in organisational settings, analytic individuals will subscribe to the bureaucratic norm and prefer work settings that are oriented towards careful routines, are governed by logic, and are clearly structured and organised. In contrast, intuitive individuals will prefer freedom from rules and regulations and a work setting that is activity based, flexible, and unstructured (Allinson and Hayes, 1996; Kirton, 1989). With respect to entrepreneurship, Allinson et al. (2000) asserted that intuitive approaches to information processing are more compatible with entrepreneurial activity than rational approaches. Busenitz and Barney (1997) found that more cautious, methodical, and analysing decision makers will be attracted to large organisations, while less rational thinkers and those more susceptible to the use of certain biases and heuristics will prefer an entrepreneurial context. A growing body of research suggests that entrepreneurs are more prone to use heuristics in their decision making than managers and that this plays a role in their decisions to engage in entrepreneurship in the first place (Baron, 1998, 2004; Busenitz and Barney, 1997; Forbes, 1999). Despite the use of heuristics, often being associated with non-rational processing and sub-optimal outcomes, employing a heuristic-based logic may be more prevalent and advantageous among entrepreneurs who tend to operate in more time sensitive, uncertain, and complex contexts (Busenitz and Barney, 1997; Mitchell et al., 2007). Technology-oriented SMEs often operate in 'high velocity' entrepreneurial environments where strategic decisions need to be made quickly with limited data or precedent (Eisenhardt, 1989).

There is empirical evidence supporting this connection. Allinson et al. (2000) reported that the mean CSI score for Scottish entrepreneurs (high growth owner-managers) was significantly more intuitive than the mean CSI score from previous samples of managers in general. Khatri and Ng (2000) examined senior managers' intuitive decision making across three different industries: banking, utilities, and computer. Based on prior assumptions and respondents' perceptions of levels of competition and pace of technological change, they determined that the computer industry was least stable of the three industries and served as a proxy for an uncertain and unstable environment. Khatri and Ng (2000) reported that senior managers in the computer industry relied more on intuition than their counterparts in the more stable industries. Furthermore, intuitive synthesis was found to be significantly positively associated with firm performance measures in the less stable computer industry and significantly negatively associated with measures of performance in the more stable utilities industry. Sadler-Smith (2004) reported that a more intuitive style (as measured by the general decision-making style questionnaire) was a significant predictor of employee growth for a sample of owner-managers of small firms in the UK. Thus, given that high technology SMEs represent a relatively entrepreneurial environment that is more conducive to effective decision making using an intuitive style, we offer the following hypothesis:

Hypothesis 1 In technology-oriented SMEs, the more intuitive the founding owner-manager's decision-making style, the greater the employee growth in his or her firm.

2.3 Formalisation

There is an established positive correlation between firm size and levels of formalisation within a firm (e.g., Child, 1973; Daft and Bradshaw, 1980; Katz and Kahn, 1978; Kazanjian, 1988; Olson, 1987). As organisations age and grow, systems, routines, and standardised operating procedures multiply (Blau and Scott, 1962; Hanks et al., 1994), formal structure increases (Dobrev and Barnett, 2005), and rational, bureaucratic forms enlarge to conform to institutional norms and rules (Scott, 1975). While the causal relationship between firm size and structure is often construed as the former driving the latter, we propose that especially in small firms, formalisation may also be driving firm growth and subsequently, size. This reciprocal relationship is indicated in Figure 1.

Drawing from the life cycle literature, firms in the start-up stage typically have simple organisational structures and very low levels of formalisation (Greiner, 1972; Hanks et al., 1994). The growth stage is characterised by increased formalisation, including written and established documentation, policies, procedures, and routines (Olson and Terpstra, 1992). Stevenson et al. (1993) constructed a two-by-two matrix with levels of formalisation and delegation of responsibility on the respective axis, resulting in four archetypal strategies of coordination. The firm's general manager must make choices regarding the trade-offs between delegation and formalised controls. For a firm to reach the coordinated level of 'professional management' (the optimal type for growth), the manager must establish relatively high levels of formalised controls and delegation of decision making authority (Stevenson et al., 1993).

In their study of technology-oriented SMEs, Hanks et al. (1994) identified a cluster of firms that were not growing and suggested that this might be a case where the owners' unwillingness to delegate or institute formal controls effectively arrested the development of these firms. Much like the above discussion on intuition, increasing formalisation would not be expected to be positively related to firm performance in all situations. However, in the context of owner-managed SMEs, the willingness of the founding owner manager to adopt some formalisation and move towards a more professionally managed firm may be a key step in promoting future growth. Increased formalisation is typically associated with efficiency gains that may allow the firm to survive, increase profits, and reinvest in future growth (Stevenson et al., 1993). Thus, while acknowledging the likely reciprocal nature of the relationship, we offer the following hypothesis:

Hypothesis 2 In technology-oriented SMEs, higher levels of firm formalisation will be positively related to employee growth.

2.4 Cognitive misfit

Having discussed in isolation the relationships between decision-making style and formalisation with firm growth, the question of interest is how does cognitive misfit (operationalised as the interaction of cognitive style and formalisation) relate to firm growth?

Firms that successfully transition from the start-up stage to the growth stage may face dramatic structural changes and growing pains along the way (Olson and Terpstra, 1992). These changes may be particularly difficult and challenging for the founding owner-manager (Hambrick and Crozier, 1985). Changes with respect to formalisation may have negative effects with respect to autonomy and job satisfaction (Greiner, 1972).

Many founders who are well suited to deal with the challenges associated with early stages are poorly suited to be effective managers and deal with the challenges characteristic in a large organisational context (Willard et al., 1992). More specifically, many structural aspects of the firm (including formalisation) will tend to increase as firms mature. Along with these structural changes across stages follow corresponding changes in the types of issues and dominant problems typically faced by the owner manager of technology-oriented SMEs (Kazanjian, 1988; Kazanjian and Drazin, 1990).

In their initial validation study of the CSI, Allinson and Hayes (1996) presented correlation evidence supporting the theorised link between an individual's cognitive style and his or her preference for formal structure. Individuals with a more intuitive decision-making style preferred lower levels of structure and formalisation, whereas individuals with a more intuitive decision-making style preferred higher levels of structure and formalisation. While an individual with a preferred intuitive style may be well suited for the more entrepreneurial, start-up stages of the business, he or she will move towards cognitive misfit as the firm matures and becomes more structured and more congruent with an analytic style. While this scenario will likely lead to more negative individual level outcomes for the intuitive owner-manager (Brigham et al., 2007), the relationship between cognitive misfit and subsequent firm growth has not been examined.

One could assume that since cognitive misfit is related to negative outcomes at the individual level, this would also hold true at the firm level and that poor individual outcomes for founding owner-managers would translate into poor subsequent performance for their firms. For example, job satisfaction is a common individual outcome in PO fit studies (Kristof-Brown et al., 2005). Cooper and Artz (1995) suggested that owner satisfaction should be viewed as a key outcome in entrepreneurship research and should generally be positively related to firm performance as more satisfied owners are likely to have better relationships and be more likely to reinvest in their firms. As higher levels of cognitive misfit have been linked to lower levels of owner satisfaction and other negative individual outcomes (Brigham et al., 2007), they might also be related to poorer firm performance outcomes.

However, assuming that a relationship holds across levels discounts the many complexities and intervening factors that can arise. For example, with respect to satisfaction, one could argue that if an entrepreneur is more personally satisfied, a result of cognitive fit, he or she might decide to arrest the development of the firm and be content with a lifestyle business (Hanks et al., 1994). Sexton and Bowman (1984) argued that the decision to grow or not to grow is a conscious choice of the entrepreneur. It is important to realise that the owners' motives and intentions to grow their businesses are heterogeneous and one should not assume that growth is always a desired consequence of the decision to go into business (Orser et al., 2000). Blatt (1993) found that roughly one-half of the owners of newly registered businesses do not seek growth of their firms, and O'Farrell and Hitchens (1988) reported that a high proportion of small firms are more interested in maintaining their current level of profitability than in growth. Furthermore, the decision to seek business growth is not purely motivated by economic factors, but is often the result of a variety of motivational factors (Kolvereid, 1992; Orser et al., 2000). Brigham and De Castro (2003) reported that for a sample of owner-managers, more intuitive styles (using the CSI) were significantly and positively correlated with growth intentions for their firms and owner-managers' growth intentions have been found to be a significant predictor of actual growth (Orser et al., 2000). Intuitive owner-managers may

be better suited to operate in more uncertain and complex environments (Allinson and Hayes, 1996; Khatri and Ng, 2000; Sadler-Smith, 2004) and handle the risk, change, and uncertainty associated with growth strategies.

We propose that more intuitive founding owner-managers, with their general preference for firm growth, will be willing to accept some increases in formalisation to achieve growth, despite the negative individual outcomes that may come with greater formalisation. On the other hand, more analytic individuals, with their predisposition for control and formalisation, would be more likely to keep their firms highly centralised (unwilling to delegate) and/or may tend to over-formalise their firms. Intuitive individuals, who can tolerate the negative individual effects of formalisation, may be better suited to develop professionally managed firms and make the necessary trade-offs between efficiency and effectiveness. While some general contextual characteristics related to small technology-oriented firms may enhance the effectiveness of intuitive decision making, increased formalisation may also promote the systems and production of information that are vital for the more rational analyses that owner-managers surely conduct in the day-to-day operation of their firms. Admittedly, we are plowing new ground by extending cognitive misfit to firm level outcomes. Given the competing arguments above, regarding the nature of the interaction, the following hypothesis should be considered as exploratory:

Hypothesis 3 In high technology SMEs, formalisation will moderate the relationship between the founding owner managers' decision-making style and employee growth. At higher levels of formalisation, firms with more intuitive founders will have greater employee growth than firms with more analytic founders.

3 Methods

3.1 Sample

Our sampling frame consisted of companies listed in the *2000 Rocky Mountain High Technology Directory*. The directory's authors states:

"Companies have been included if they develop and/or manufacture proprietary products that incorporate state of the art technology. In addition, software firms, research, development, and testing companies and laboratories have been included to have certain consulting and engineering firms that have significant technical expertise."

The list of firms was refined to exclude subsidiaries and not-for-profit companies and also those companies with no contact information or where the listed contact(s) did not hold a principal position within the organisation. In 2001, a detailed survey was mailed to the owner-managers of the identified firms. From a possible 1,207 firms, 267 usable questionnaires were returned constituting an effective response rate of 22.1%.

Subsequently, primarily using the 2005 edition of the *Rocky Mountain High Technology Directory*, we gathered additional data on our original set of firms. In order to test the hypotheses at hand, it was necessary to further refine our sample. We used the 2001 survey data to ensure that our sample consisted only of respondents who were principals (CEO or president), founders of their respective firms, had significant

ownership in their firms (greater than 10%), and were involved in the day-to-day operations of their firms. Additionally, only firms that had reported number of employees (using the 2005 directory) and where the same respondent as in 2001 was confirmed as remaining a principal in the firm (using either the 2005 directory or direct telephone contact verification by the researchers) were included. To meet the accepted definition of an SME, we included only firms reporting fewer than 250 employees in the 2000 directory. There were three cases where variables used in the model were missing and these were excluded from the analysis. This left 121 founding owner-managers and their firms on which the analyses in this study were conducted. The firms included in the study had an average of 23 employees. The mean age of the firms was 15 years and the average founding owner-managers' ownership was 67%.

3.2 Variables and measures

3.2.1 Dependent variable

- Percentage change in number of employees: Following Baum et al. (2001), this variable was calculated by subtracting the number of firm employees reported in 2000 from the number of firm employees reported in 2005 and dividing this result by the number of firm employees reported in 2000. This provided a percentage change in the number of employees over a five-year period. The data were obtained from the 2000 and 2005 editions of the *Rocky Mountain High Technology Directory*.

3.2.2 Main effects

- Formalisation: This variable was measured in the 2001 survey using ten items from Hanks et al. (1994). Examples of items include, 'formal policies and procedures guide most decisions' and 'lines of authority are specified in a formal organisation chart'. Responses were indicated on a 7-point Likert-type scale ranging from 7 = strongly agree to 1 = strongly disagree. All ten items were summed to create a total score for the scale with a higher score indicating a greater degree of formalisation in the organisation.
- Decision-making style: The CSI consists of 38 items, each requiring the subject to respond on a true-uncertain-false scale. The closer the individual's total CSI score to the maximum of 76, the more analytical the respondent. Conversely, the nearer the CSI score to the minimum of zero, the more intuitive the respondent. In their initial validation study of the CSI (Allinson and Hayes, 1996), temporal stability and construct and concurrent validity were demonstrated. Their findings suggested that the CSI measures a continuous variable that is approximately normal in its distribution. A replication study to further validate the CSI was undertaken by Sadler-Smith et al. (2000), who concurred with the measure's designers that the CSI displayed both construct and concurrent validity and showed good reliability across a diverse range of samples.

3.2.3 Control variables

- Number of employees in 2000: This variable was obtained from the 2000 directory. We used a natural log transformation to normalise the variable.

- **Manufacturing or service:** This variable was created using the detailed descriptions of the firms' business activities as reported in the 2000 directory. Using the descriptions, we identified firms that were involved in manufacturing (coded as 1). All other firms were categorised as service firms (coded as 2). We believe that controlling for this variable is important as firms focused primarily on manufacturing might have more of an efficiency focus.
- **Firm profitability:** This variable was measured by a single item through the 2001 survey. The respondent was asked to indicate whether the firm had incurred a loss (coded as 1), the firm was break-even (coded as 2), or the firm had showed a profit (coded as 3) for the previous year.
- **Satisfaction:** Satisfaction has been identified as an important factor in the founders' decisions and intentions regarding future firm growth (Cooper and Artz, 1995). This variable was measured using an established scale developed by Quinn and Staines (1979). They define satisfaction as 'affective reaction to the job' and the definition and measure is intended to refer to and measure what they label as 'facet free job satisfaction'. The measure consists of five items, scored on a Likert-type scale, with higher summed scores representing greater levels of satisfaction.
- **Owner's age:** Respondents were asked to indicate their age within six different categories.
- **Delegation:** This single item asked respondents to indicate the extent to which they delegate decision making. Based on the framework of Stevenson et al. (1993), which posits that a manager's willingness to delegate is a key to becoming a professionally managed firm and achieving growth, we included this variable as a control. Responses to the statement, 'I delegate decision making whenever possible' were indicated on a 7-point Likert-type scale ranging from 1 = to no extent to 7 = to a great extent.

4 Results

Means, standard deviations, intercorrelations (using Pearson correlations) for the variables used in the models, and reliabilities (α) of all scales are presented in Table 1.

To test the hypothesised main effects and interaction effect, we used hierarchical regression analysis and the results are reported in Table 2. It should be noted that some of our control variables are ordinal in nature and may only be approaching intervalness. Care should be taken when interpreting these variables. Fortunately, regression analysis is generally robust against minor violations of its assumptions (Pedhazur, 1982) and there are no hypotheses directly involving these variables. Following Aiken and West (1991), and for ease of interpretation, we entered the control variables in the first block. Next, the main effects were entered in the second block. Finally, the interaction term, representing cognitive misfit, was entered in the third block. To reduce the possibility of multicollinearity between the main effects and their interaction, the main effect variables were centered (Aiken and West, 1991). Collinearity diagnostics were run to check for potential problems of multicollinearity between the variables included in the regression models. All variance inflation factors (VIFs) were below 1.4. We also examined the

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Table 1

tolerances, condition indexes, and variance proportions. All of these results suggested that multicollinearity was not a problem in the current study.

Table 1 Means, standard deviations, and correlations^a

	<i>Mean</i>	<i>s.d.</i>	1	2	3	4	5	6	7	8	9	10
1 Satisfaction	21.03	4.26	.70									
2 Delegation	3.89	1.70	-.05									
3 Owner's age	4.26	1.13	.16	-.02								
4 Employees 2000	23.13	36.29	.03	.20*	.11							
5 Firm profitability	2.47	.83	.15	-.05	.09	-.08						
6 Mfg (1)/service (2)	1.50	.50	.09	.03	-.12	.08	-.18					
7 Formalisation	40.21	13.01	.11	.22*	.08	.26**	.12	-.01	.55			
8 CSI	34.34	13.99	-.02	-.09	.05	-.22*	.09	.16	.03	.59		
9 Intuitive	21.23	6.44	.03	.05	-.08	.11	-.11	-.14	-.02	.87**	.50	
10 Analytic	21.57	8.93	-.01	-.10	.02	-.26**	.06	.16	.03	.94**	.65**	.55
11 Employee growth	.21	1.07	-.23*	.19*	-.06	-.12	.10	.11	.17	.08	.08	-.07

Notes: ^a N = 121; *significant at $p < .05$ and **significant at $p < .01$

Figures in *italics* along the diagonal represent the reliabilities of scales.

For 'employee growth', the main effects model makes a significant contribution over and above the base model ($\Delta R^2 = .102, p < .001$). Also, as hypothesised, the full model (including the interaction term) makes a significant contribution over and above the main effects model ($\Delta R^2 = .026, p < 0.05$).

Table 2 Results of hierarchical regression analysis: overall CSI model

Variable	Employee growth		
	Base model	Main effects	Full model
(Constant)	.294	.793	.752
Satisfaction	.060**	.066**	.068**
Delegation	.135*	.093	.098
Owner's age	.011	.023	.038
# of employees 2000 (Ln)	-.190**	-.338***	-.352***
Firm profitability	.254*	.258*	.278*
Manufacturing (1)/service (2)	.284	.338	.333
Formalisation		.334**	.387***
Decision making style (CSI)		-.235*	-.260**
Decision-making style (CSI) x formalisation			.184*
R^2	.176**	.278***	.304***
Adjusted R^2	.132	.227	.248
R^2 change	.176*	.102**	.026*

Notes: $N = 121$; ***significant at $p < .001$; **significant at $p < .01$ and *significant at $p < .05$

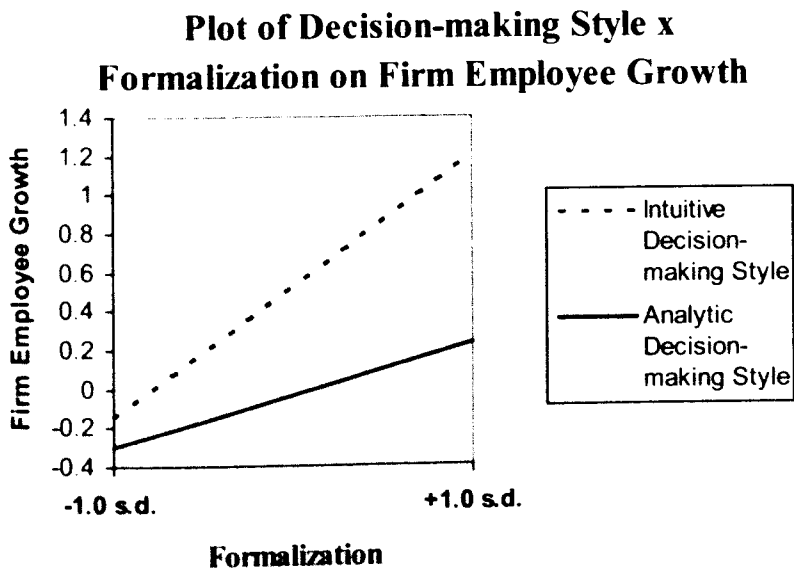
Source: Unstandardised beta coefficients are reported following Aiken and West (1991)

For the full model, the control variable of prior firm profitability was significant and positively associated with employee growth. Three control variables were significant predictors: satisfaction and the number of employees in 2000 were negatively associated with employee growth and firm profitability was positively associated with employee growth. Both main effects variables were significant predictors. The positive coefficient for formalisation ($p < .001$) indicates that more formalisation was associated with higher employee growth. The negative coefficient for decision-making style (the combined CSI score) indicates that a more intuitive style was positively associated ($p < .01$) with employee growth. The inclusion of these main effects explained an additional 10.2% of the variance over the control variables. These results support Hypothesis 1 and Hypothesis 2.

The additional variance accounted for by the interaction term (2.6%) is consistent with interaction effect sizes in both the psychology and organisational behaviour literature (1% to 3%; see Aiken and West, 1991). Interactions are very susceptible to

measurement error and may greatly underestimate true effect sizes and sample sizes of approximately 400 are normally recommended for detecting small effects through interactions (Aiken and West, 1991). Given our relatively small sub sample, $n = 121$, the detection of a significant interaction is very encouraging. The overall R^2 for the model was .304. Following procedures recommended by Aiken and West (1991), the interaction was plotted (see Figure 2) and indicated that for less formalised work environments, more intuitive owner-managers had only slightly higher employee growth than their more analytic counterparts, but as formalisation increased, more intuitive owner-managers experienced a significantly higher rate of employee growth. This provides support for Hypothesis 3.

Figure 2 Plot of significant interaction (from Table 2)



4.1 Post hoc analysis

There is an ongoing debate among cognitive style researchers as to the factor structure of the CSI and whether it should be treated as a single unitary construct (Kozhevnikov, 2007). Hodgkinson and Sadler-Smith (2003) provided a strong case that intuitive and analytic approaches are likely not opposite ends of the same continuum, but rather are negatively correlated constructs representing different information systems. Hayes et al. (2003) responded to the criticisms of Hodgkinson and Sadler-Smith (2003) and concluded that the CSI is 'a psychometrically sound instrument'. In their review of cognitive style, Coffield et al. (2004) concluded that the CSI performed well as a decision-making style measure, but with a two-factor caveat.

Table 3 Results of hierarchical regression analyses: intuitive and analytic separately regressed on employee growth

Variable	Employee growth			Employee growth		
	Base model	Main effects	Full model	Base model	Main effects	Full model
(Constant)	.294	.743	.609	.294	.848	.879
Satisfaction	-.060**	-.066**	-.068**	-.060**	-.064**	-.066**
Delegation	.135*	.099	.112*	.135*	.092	.090
Owner's age	.011	.023	.044	.011	.016	.023
# of employees 2000 (<i>Ln</i>)	-.190**	-.310***	-.321***	-.190**	-.343***	-.354***
Firm profitability	.254*	.255*	.275*	.254*	.249*	.262*
Manufacturing (1)/service (2)	.284	.320	.331	.284	.325	.317
Formalisation		.316**	-.265**		.338**	.393***
Intuitive		.189*	.216*		-.228*	-.246**
Intuitive x formalisation						
R^2	.176**	.266***	.292***	.176**	.275***	.293***
Adjusted R^2	.132	.214	.234	.132	.224	.236
R^2 change	.176*	.090**	.025*	.176*	.099**	.018

Notes: $N = 121$; ***significant at $p < .001$, **significant at $p < .01$ and *significant at $p < .05$

Source: Unstandardised beta coefficients are reported following Aiken and West (1991)

In light of the ongoing debate and criticisms, we decided to take the opportunity to test our model using the two-factor scoring procedure proposed by Hodgkinson and Sadler-Smith (2003). They recommend that the analysis and intuition components of the CSI be treated as separate subscales before being combined to calculate an overall score, and they note that the value of using the separate analytic and intuitive scores, in contrast to the overall score, will depend on the amount of correlation between the two factors. After calculating separate scores for the 17 intuition and 21 analytic items that comprise the CSI, the correlation between the two factors was $-.641$, the negative correlation lending support to the negative constructs idea, with the high correlation leading us to question the extent to which the underlying information systems might actually differ. However, in the spirit of comparison, we proceeded to test our model using each separate factor. As presented in Table 3, we replaced the overall CSI score with both the intuitive and analytic scores in separate models, calculating interaction terms based on the new values. For the most part, the results were consistent with our initial model (see Table 2). This leads us to suppose that calls for additional precision are justified, but not yet fully answered.

5 Discussion

In this study, we present a test of founding owner-managers' cognitions, firm formalisation, and their interaction – cognitive misfit and the relationships to firm growth. Our findings suggest that for technology-oriented SMEs, a more intuitive decision-making style, higher levels of formalisation, and the interaction of style and formalisation are significantly associated with employee growth over a five-year period. These findings have important implications for both practitioners and researchers, but we caution the reader not to over-generalise the results. Future research is needed to explore the nature of these relationships in more stable environments and in larger firms. In addition, prior research suggests that both intuitive and rational approaches to decision making must be employed by effective managers (e.g., Miller and Ireland, 2005; Mintzberg, 1976; Sadler-Smith and Shefy, 2004; Simon, 1987). While we report significant direct relationships between a more intuitive style and higher levels of formalisation with employee growth, abandoning more rational analysis or over-formalising the firm would in all probability have extremely negative consequences.

One of the most intriguing findings of this study is the apparent trade-off faced by founders in dealing with cognitive misfit. Prior research has demonstrated that intuitive owner-managers of more formalised SMEs will experience negative individual psychosocial outcomes (Brigham et al., 2007). However, with respect to subsequent firm growth, we found that intuitive founders in more formalised firms – a misfit situation – had better employee growth outcomes than their more analytic counterparts. This finding suggests that intuitive founders are likely forced to make difficult decisions between maximising individual or firm outcomes and that these different-level outcomes may not be aligned, as is often assumed.

Our results provide further evidence that these trade-offs do occur. As our goal was to clearly isolate the effects of cognitive misfit and its components on firm performance, we included satisfaction as a control in our model. Satisfaction was a significant predictor

and was negatively associated with performance. This relationship runs counter to some previous work that proposes that owner satisfaction and firm performance should be positively related (Cooper and Artz, 1995). This cross-levels relationship is likely complex and reciprocal and is an interesting avenue for future research.

Given that an owner-managers' preferred decision-making styles are presumed to be stable individual dimensions, but the levels of structure and formalisation within their firms are likely to change over time, cognitive misfit may be difficult to avoid. What prescriptive advice can we offer for the intuitive owner-manager who wants to grow his or her firm, but mitigate the negative individual outcomes associated with accompanying increases in formalisation? When individuals are in a state of cognitive misfit, they will employ certain specific coping behaviours to handle the conflict between their preferred decision-making style and the conflicting style demands being placed upon them. Decision-making style theory suggests that when experiencing cognitive misfit, intuitive individuals may employ analytic behaviours as part of their coping mechanisms and vice-versa. However, these coping behaviours are a source of individual stress and are not sustainable, and there is a strong tendency for individuals to return to their preferred decision-making style (Kirton, 1976).

When the founding owner-manager experiences high levels of cognitive misfit (the style demands of the work context are incongruent with his or her preferred cognitive style), coping behaviour will be required. The greater the degree of misfit, the more coping behaviour is required and, consequently, the higher amount of stress on the individual (Kirton, 1976; Pervin, 1968). The theory on decision-making styles proposes that the forming teams and changing the circumstances are both mechanisms for dealing with cognitive misfit and the resulting use of coping behaviour (Kirton, 1989). As decision-making style is presumed to be largely stable, the prescribed options for the owner-manager may be to change the circumstances or context. One way of doing this would be for owner-managers to attempt to control the levels of formalisation in their firms. We may observe this strategy in lifestyle businesses where intuitive founders arrest the development of their firms to keep the levels of formalisation low and maximise their individual psychosocial outcomes.

An alternative and possibly more advantageous prescribed strategy would be to form a team that can handle many of the firm demands that are incongruent with the founding owner-manager's preferred style (Kirton, 1989). While the design of this study did not allow for the examination of team compositions, this would appear a fruitful area for future research. Does having a team with a differing styles or styles different from that of the founder mediate both individual-level and firm-level outcomes? There is a growing body of research on decision-making style diversity within SME top management teams (e.g., West, 2007) and this may provide interesting insights on the PO fit relationship and mitigating the adverse individual level effects of cognitive misfit.

The model testing in this study also complements work in the PO fit literature, which has primarily focused on employees. We have expanded the traditional boundaries from the study of regular employees in large firms to founding owner-managers in their own small firms. This study demonstrates that relevant facets of PO fit can be applied to entrepreneurial contexts. This not only adds validity to the PO fit approach and measures, but also opens some interesting avenues for future research. A logical first step would be

to examine other dimensions of fit and other contextual variables that could be applied in a similar way to better understand both founder and firm outcomes.

This study has a number of limitations that suggest a bounded interpretation of results. First, we focused on founders of small technology-oriented firms in the US. Again, care must be taken in generalising our results to other populations. Second, as is often the case with field survey studies, it is impossible to rule out common method bias. In this study, we not only employ survey data, but data from an external source as well, which helps to mitigate the threat. In addition, we conducted a Harman's single-factor test (Podsakoff and Organ, 1986). The results of the analysis indicated that there was not one large single factor or general factor explaining a majority of the variance. While common method variance cannot be ruled out, it was not detected to be a significant problem in this study. Third, as the sampling frame consisted entirely of technology-oriented firms, it was not possible to make empirical comparisons with non-technology based firms. Fourth, intuition is a complex and multifaceted construct (Burke and Miller, 1999) and it is not clear which of these many diverse facets (e.g., expertise) are actually being 'tapped' by the CSI (Hodgkinson and Sadler-Smith, 2003).

6 Conclusions

In this study, we have taken an important next step in linking a PO fit approach to firm level outcomes in SMEs. This step is important for at least three reasons: first, the results suggest that better differentiation between the 'emergent' and the 'planned' growing of entrepreneurial ventures is possible and we therefore call for additional studies to speak to this point. Second, findings respond, in part, to the call to address the central question in entrepreneurial cognition research: how do entrepreneurs think? Mitchell et al. (2007), suggesting potential anomalies for future research to resolve. Interestingly, while congruence on the dimensions of cognitive misfit result in generally more positive individual outcomes, this relationship did not hold when applied across levels to subsequent firm growth outcome. As firm growth is a complex phenomenon that operates across levels, untangling these relationships is vital for understanding, not only on how individual, team, and firm-level constructs interrelate to affect outcomes and the larger entrepreneurial process. Gaining further insight into entrepreneurship and firm growth will require multi-theoretic and multi-level models (Baum et al., 2001; Shane and Venkataraman, 2000). Third, the strengths and weaknesses of the methods used suggest some of the next steps required in the measurement tasks coincident to progress in entrepreneurial cognition research, which, as suggested by Nunnally (1978), can progress no faster than its measures.

We are pleased to have been able to demonstrate that employing a PO fit approach from organisational behaviour is a valid and useful way to examine complex multi-level outcomes for technology-oriented SMEs. We hope that these findings might be helpful as scholars further explore the factors influencing the growth of such SMEs in the long run.

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