

**Deliberate practice among South African small business owners:  
Relationships with education, cognitive ability, knowledge, and success**

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Abstract

The study examines antecedents and outcomes of deliberate practice activities in South African small businesses. Deliberate practice consists of individualized self-regulated and effortful activities aimed at improving one's current performance level. Interview and questionnaire data from 90 South African business owners showed a direct impact of deliberate practice on entrepreneurial knowledge as well as an indirect effect on business growth via entrepreneurial knowledge. Cognitive ability and education were identified as antecedents of deliberate practice. Findings underline the importance of continuous proactive learning efforts in small business. The results of this study are relevant for policy makers, consultants, and credit providers.

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The study examines antecedents and outcomes of deliberate practice activities in South African small businesses. Deliberate practice consists of individualized self-regulated and effortful activities aimed at improving one's current performance level. Interview and questionnaire data from 90 South African business owners showed a direct impact of deliberate practice on entrepreneurial knowledge as well as an indirect effect on business growth via entrepreneurial knowledge. Cognitive ability and education were identified as antecedents of deliberate practice. Findings underline the importance of continuous proactive learning efforts in small business. The results of this study are relevant for policy makers, consultants, and credit providers.

Scientists from various disciplines agree about the importance of small business to economic growth and personal wealth (e.g., Autio, 2005; Kirzner, 1997). The small business sector as a major source of employment and income is argued to be even more important to the economies in developing countries (Mead & Liedholm, 1998). In Africa, about 25% of the people employed outside agriculture depend on this sector for their livelihood; improving the conditions for small business is thus seen as a solution to poverty alleviation and unemployment (Mead & Liedholm, 1998). Given the importance of small business to the people and their economies in the developing world, scientific effort should be directed toward understanding the psychological factors that foster successful small business activities in these regions.

In this study, we use the concept of deliberate practice from expertise research to better understand the process of learning in small business in developing contexts. Deliberate practice consists of individualized self-regulated and effortful activities aimed at improving one's current performance level (Ericsson, Krampe, & Tesch-Roemer, 1993). We identify such activities in small business owners and test relationships with knowledge and success. We also investigate antecedents of deliberate practice. In doing so, we add to previous research an emphasis on the active role of the business owner as a learner.

The importance of knowledge and learning in business has been accentuated by a number of researchers from different research traditions (e.g., Barney, Wright, & Ketchen, 2001; Cohen & Levinthal, 1990; Davidsson & Honig, 2003; Grant, 1996; Rauch, Frese, & Utsch, 2005). From a resource based view, learning and the ability to change are among the most important capabilities that firms can possess (Barney, Wright, & Ketchen, 2001). The resource based view is grounded in the perspective that firms achieve sustainable competitive advantage by continuously developing existing and creating new resources and capabilities in response to rapidly changing market conditions (Wernerfelt, 1984). Recently, the resource based view has been extended to also include cognitive abilities of the owners (Alvarez & Busenitz, 2001) by viewing their expanding knowledge base as a potential competitive advantage of the firm. Given the importance attributed to learning in the literature, it is surprising that research on how business owners learn and accumulate relevant knowledge are still rare (Agndal, 1999; Ravasi & Turati, 2005). At the same time, researchers have accentuated learning and knowledge as key factors in the promotion of small business in the developing world and have pointed to a need of applicable research (e.g., Maas & Herrington, 2006). We seek to address these gaps by

developing and testing a cognitive model of learning in small firms in a developing context that focuses on the main actor in the business: the owner.

While organizational researchers have traditionally focused on large organizations and the firm as the unit of analysis to investigate how new knowledge is acquired and disseminated throughout the organization (e.g., Nonaka, 1991), we are interested in how owners in small businesses develop their *individual* competencies to successfully run their businesses. A revived interest in the business owner as the unit of analysis is reflected in a number of recent studies in small business research (e.g., Baum & Locke, 2004; Frese et al., 2007; Davidsson & Honig, 2003) and even most organizational scholars acknowledge the impact of the individual on organizational outcomes, for example, by viewing individual learning as a prerequisite to learning at the organizational level (e.g., Kim, 1993). “New knowledge always begins with the individual” (Nonaka, 1991: 97). In this study we analyse small business from the perspective of the owner who carries essential knowledge and heavily influences all aspects of the firm (Baum, Frese, Baron, & Katz, 2007).

Two arguments suggest that processes of learning are of particular importance in the domain of small business and that the concept of deliberate practice may increase our understanding of such processes. The first argument pertains to the importance of adaptability in modern work environments (Ford, 1997), known as the capability to adjust one’s skills and knowledge in the face of novel situations or requirements. The changing nature of work (Howard, 1995), technological developments, and increased customer demands (Thayer, 1997) require business owners to engage in continuous learning. The increasing necessity to learn within work environments (Sonnetag, Niessen, & Ohly, 2004) affects employees on all levels of modern organizations, but business owners in an even more profound way than employees or

managers in larger organizations. Managers typically receive training, instruction, and coaching to acquire necessary knowledge and skills. The organization helps in identifying learning needs and in initiating appropriate actions (cf. Steers, 1991). Business owners, in contrast, have to carry out all these tasks by themselves and, thus, need to assume a more proactive stance toward learning.

Our second argument involves the importance of learning for the discovery and exploitation of new business opportunities in small business. Opportunity recognition and exploitation are studied in the field of entrepreneurship research (Shane & Venkataraman, 2000) and they are of particular interest during the creation of new firms (Davidsson & Honig, 2003). Such processes, however, are also relevant to the development and growth of small business and they may still occur in later phases of the business (cf. Baron & Katz, 2007; Bosma, Jones, Autio, & Levie, 2007). Previous research, for example, has revealed a positive relationship between the perception of opportunities in small business and growth (Davidsson, 1991). Thus, in order to achieve growth, small business owners - like entrepreneurs - may have to engage in processes of exploring new products or markets and exploiting new business opportunities. Knowledge facilitates the accomplishment of such tasks. Knowledge affects the owner's capacity to recognize (Shane, 2000; Simon, Houghton, & Savelli, 2003) and evaluate valuable business opportunities and to develop initial ideas into new products or services (Ravasi & Turati, 2005). In contrast, cognitive limits and the lack of specialization of knowledge preclude individuals from identifying certain opportunities (Shane, 2000). After the discovery of a potential opportunity, when faced with ambiguity and uncertainty, relevant knowledge enables business owners to make better decisions and take more knowledgeable actions (Minniti & Bygrave,

2001; Reuber & Fischer, 1999). The process from the initial intuition to the launch of a new product incorporates a learning process in which the owner plays the key role.

In summary, continuous learning and the acquisition of new knowledge appear to be of particular importance for successful task accomplishments in small business. Experientially acquired knowledge (Reuber & Fischer, 1994) that facilitates managing the business and recognizing and acting on business opportunities has previously been referred to as entrepreneurial knowledge (Politis, 2005). We suggest that the concept of deliberate practice from expertise research may help increase our understanding of how business owners accomplish the task of continuous learning and acquiring relevant knowledge.

### ***Deliberate practice applied to small business***

The role of deliberate practice for continuous learning and subsequent acquisition of outstanding performance has been emphasized in research on expertise development in domains such as music and chess (Ericsson et al., 1993; Ericsson & Lehmann, 1996). Deliberate practice comprises individualized self-regulated activities with an explicit goal of competence improvement. Charness, Krampe, and Mayr (1996) distinguish casual practice from deliberate practice in terms of intensity. Such regular activities are “specifically designed to improve the current level of performance” (Ericsson et al., 1993: 368). A growing body of literature suggests that activities of deliberate practice facilitate remarkable environmental adaptation and learning across different domains (Ericsson, 1996; Ericsson et al., 1993; Ericsson & Lehmann, 1996).

Applying deliberate practice to business requires choices and adjustments to be made. Important adjustments concern the content of deliberate practice (Charness et al., 1993). Deliberate practice activities are different across domains varying according to the specific tasks and requirements

of a domain (Ericsson et al., 1993). Tasks in small business are typically broad and diverse and include little repetition (Reuber & Fischer, 1994). The traditional view of expertise development through narrowly defined task repetition may thus not hold in small business. Instead, owners may have to engage in a *variety* of learning activities and the variety of such activities may be more relevant to the development of expertise than mere repetition of isolated activities (cf. Baron, 2007). Recent studies with teachers (Dunn & Shriner, 1999) and insurance agents (Sonnentag & Kleine, 2000) suggest that in work contexts, deliberate practice comprises a wide range of activities such as mental simulation, seeking feedback, professional reading, consulting experts, or exploring new strategies. In small business and other ill-structured task domains (where practice leading to improvements cannot easily be observed, cf. Dunn & Shriner, 1999), continuously engaging in activities with a learning goal *per se* is an essential constituent of deliberate practice and represents much of the repetitive element of deliberate practice. Through the repetitive performance of activities with a learning goal, learning itself is likely to become more salient throughout business owners' tasks thereby facilitating the acquisition of new knowledge (Cohen & Levinthal, 1990), attention to relevant situational aspects (cf. Sonnentag, 1998), and the development of routines to approach relevant tasks (Ravasi & Turati, 2005).

Deliberate practice is argued to impact the cognitive system. If we assume, along with others, that two independent systems of thought exist (e.g., Hodgkinson & Sadler-Smith, 2003; Kahneman, 2003; Lieberman, 2007), we take an approach emphasizing system 1. System 1 operates largely at a conscious level, involves analytic thought, is intentional, slow, effortful, but flexible and adaptive. System 2, on the other hand, is automatic, involves intuition, and is described as fast, preconscious, and effortless. Theoretically, a system 1 approach fits the concept of deliberate practice. The theory of deliberate practice proposes conscious and effortful

activities to improve one's current level of performance. Thus, system 1 variables should be especially relevant to the study of deliberate practice. From a practical point of view, system 1 variables can be more easily changed by interventions such as training or special education - an approach suggested by local experts (e.g., Maas & Herrington, 2006). In our study we address system 1 because this has been rarely done in the past.

By emphasizing the role of deliberate practice in small business, we propose a cognitive model of learning (Figure 1). In this model we distinguish between cognitive abilities and the owner's prior knowledge (as prerequisites of learning), deliberate practice (as actual learning behaviour), and current knowledge and success (as learning outcomes). We model success (as an economic outcome of learning) as business growth.

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Insert Figure 1 about here

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Thus, our study seeks to make two contributions to the literature. First, we add to a better understanding of the learning process by simultaneously examining and modeling the specific impact of cognitive ability, the owners' prior knowledge, and learning behaviour on current entrepreneurial knowledge and success. Previous research on expertise development assessed the impact of deliberate practice on performance but did not consider the impact of cognitive abilities or the mediating effect of domain-specific knowledge. We include cognitive ability because of its assumed importance for learning at work (Sonnentag, Niessen, & Ohly, 2004) and its well-documented relationship with performance (Schmidt, Hunter, & Outerbridge, 1986). Studies in work environments, on the other hand, have examined both the impact of cognitive

ability as well as the mediating effect of knowledge but these did not include current learning behaviour (Schmidt et al., 1986).

Second, we seek to contribute to an understanding of the business owner as an active learner. Our model is distinct from previous models of learning in small business. Whereas we agree that business owners learn from past experience (e.g., Reuber & Fischer, 1994) and specifically from positive and negative consequences of past decisions leading to an update of choice probabilities (Minniti & Bygrave, 2001), our emphasis is somewhat different. Owners learn *from* the past. But they also learn *for* the future. Owners learn *from* success. But they also learn *for* success. While owners may look back, observing the consequences of past decisions, they also look ahead, anticipate developments, gather information, and develop necessary new skills. Learning in small business incorporates repetition and incremental optimization (Ravasi & Turati, 2005) but it also goes beyond. In this study, we are interested in how owners learn for present and future tasks, how they build their competencies and acquire new knowledge. We thereby view business owners as proactive agents of their own learning and development.

### ***The context of our study: South Africa***

Our research question is done in the context of South Africa. There are important theoretical and practical reasons for increasing our understanding about success factors (especially the role of learning and knowledge) in small business in developing countries such as South Africa.

Small businesses are a major source of employment and income in many countries in the developing world (Mead & Liedholm, 1998). It is widely recognized that small businesses contribute to the development of the economies in these countries. Policy makers specifically see a large potential of increasing and improving small business activities in South Africa. Following

the legacy of the apartheid regime, South Africa has performed more poorly on a number of small business indicators than most developing countries – despite favorable economic conditions (Maas & Herrington, 2006). Results from six years of Global Entrepreneurship Monitor (GEM) research identified low education and lack of knowledge and entrepreneurial skills as the main limiting factors for small business activity in South Africa (e.g., Maas & Herrington, 2006). During the apartheid era, the indigenous population of South Africa was denied access to the educational system and the most basic qualifications required in small business. In 2003 (Orford et al., 2003), discrimination in the education system was still mentioned as an important factor limiting small business activity in South Africa. The apartheid regime moreover prevented black South Africans from owning businesses except in very limited areas. Thus, business owners in South Africa are typically poorly educated and have only limited small business experience. Experiential self-directed learning of basic entrepreneurial knowledge and skills should therefore be especially relevant in South African small business. In line with this assertion, Maas and Herrington (2006) recommend focusing on the improvement of individual entrepreneurial capabilities on all levels of the educational system, and they call for more rigorous and applicable research. Knowledge about psychological success factors in South African small business may also be relevant to small business in similar settings. Like South Africa, many developing countries in Africa are transformational countries that have recently opened up to private ownership (by blacks) and capitalism (e.g., Namibia, Kenya, Zimbabwe, cf. Frese et al., 2007). Privatization programs, which many other developing countries have embarked on, open up new business opportunities. Knowledge and skills at the individual level are required for those opportunities to be successfully exploited. Such factors are often argued to be even more important for small business owners in developing contexts (e.g., Honig, 1998;

Honig, 2001; Luetz, 2007). Results from meta-analysis support this claim: Relationships of human capital variables and success were shown to be significantly higher in developing countries compared to developed countries (Unger, Rauch, Frese, & Rosenbusch, 2006). Taken together, self-directed learning and the role of knowledge appear to represent important factors for success of small business owners in developing countries and countries in transition.

### ***Deliberate practice, knowledge, and success***

Deliberate practice has been associated with superior performance in a number of different domains such as sports (Starkes, Deakin, Allard, Hodges, & Hayes, 1996), music (Ericsson et al., 1993), and chess (Charness et al., 1996). In music, for example, where deliberate practice consists of practicing alone on the instrument, high performance was associated with the accumulated time of deliberate practice (Ericsson et al., 1993).

Recently, deliberate practice was also found to be positively related to performance in the insurance business as a domain of work (Sonnetag & Kleine, 2000). In contrast to studies in the arts and sports, only the current amount of deliberate practice showed positive relationships with performance whereas no relationship was found for accumulated deliberate practice. Compared to music and sports, environmental change, dynamism, and uncertainty are more pronounced in work settings. Existing knowledge and skills may, therefore, quickly become obsolete (Reuber & Fischer, 1999). In work contexts, previously acquired skills, practices, and routines may even have to be unlearned. As a consequence, knowledge and skills at work do not accumulate in the way they do in some of the domains in which deliberate practice was studied.

We assume that current deliberate practice is positively related to performance in small business. More precisely, deliberate practice is assumed to increase skills and knowledge which

then in turn affects performance (cf. Charness et al., 1996; Ericsson et al., 1993; Sonnentag & Kleine, 2000). This indirect effect has not yet been tested empirically.

The explicit goal of competence improvement and the continuous effort incorporated in deliberate practice help explain the presumed relationships of deliberate practice with knowledge and success. Goals in general have self-regulatory functions facilitating self-monitoring and informative feedback of one's task accomplishment (Frese & Zapf, 1994; Locke & Latham, 1990). Conscious monitoring as implied in deliberate practice (Ericsson et al., 1993) allows individuals to recognize feedback and to better realize when there is a problem. In a study by VandeWalle, Brown, Cron, and Slocum (1999), sales representatives with a higher learning goal orientation (a habitual goal preference in achievement settings to develop competence) acquired new skills and knowledge more readily, which in turn positively impacted their performance. Similarly, mastery orientation in training led to increased planning, monitoring, and corrective behaviour. This in turn significantly contributed to the acquisition of new knowledge (Ford, Smith, Weissbein, Gully, & Salas, 1998). A focus on learning appears to be particularly effective when tasks at hand are complex (Noel & Latham, 2006) which is typically the case in small business. Theoretically, it is argued that the use of learning goals leads to strategy generation and knowledge acquisition and thus to better performance (Noel & Latham, 2006). Finally, being continuously engaged in deliberate practice leads to proceduralization of acquired knowledge and skills (Anderson, 1982). This process helps transform declarative factual knowledge into more readily applicable practical knowledge and routines.

Acquired knowledge in turn is associated with high performance. Differences between average and high performers are attributed to a higher amount of accessible knowledge which they can easily retrieve from memory when needed (Chi, Glaser, & Rees, 1982), and in

particular, to a higher level of domain related declarative and procedural knowledge (Glaser, 1984). Positive relationships between knowledge and performance were also found in work environments (Schmidt et al., 1986) and in a training experiment including complex decision-making tasks (Ford et al., 1998).

In sum, the importance of knowledge and self-regulated learning appear critical to the performance in work environments in general and to success in small business in particular (e.g., Shane, 2000, Shepherd & DeTienne, 2005). Deliberate practice may help owners to update existing knowledge of their market, to develop their know-how to better recognize and exploit opportunities, and to better respond and adapt to changing environments. Our theoretical arguments lead to the following hypotheses:

*Hypothesis 1a: Deliberate practice is positively related to entrepreneurial knowledge.*

*Hypothesis 1b: Entrepreneurial knowledge is positively related to success.*

*Hypothesis 1c: Deliberate practice has an indirect effect on success, which is mediated by entrepreneurial knowledge.*

### ***Cognitive ability and education as prerequisites of learning***

Figure 1 depicts cognitive abilities and prior stock of knowledge as antecedents of learning. We examine education as prior knowledge.

#### ***Education***

The positive relationship between education and business success is empirically well-established (Rauch & Frese, 2000). A recent meta-analysis (Unger et al., 2006) reported a significant overall relationship between human capital indicators (including education) and success. This relationship remained positive and significant under all moderating conditions. Researchers

agree that education leads to knowledge and skills that enable business owners to find opportunities and to cope with problems better and, therefore, be more successful (e.g., Cooper, Gimeno-Gascon, & Woo, 1994). Unfortunately, however, most often researchers do not distinguish between education and its presumed outcome: knowledge. Education is simply used as a proxy for knowledge. This is problematic because such an approach overlooks individual differences in learning. All individuals are implicitly expected to learn equally well from experience. Clearly, this is not the case (e.g., Ford et al. 1998; Sonnentag, 1998). In the present study we want to explicate the causal claim from education as an experience measure representing prior knowledge via current entrepreneurial knowledge to success. Along with other researchers we assume positive effects of education on current knowledge and business success. However, we assume these effects to be indirect. We thereby add to previous research a focus on the process between education, the acquisition of current knowledge, and success. As previous knowledge assists in the accumulation of new knowledge (Davidsson & Honig, 2003), and education incorporates ongoing learning activities that may help individuals develop superior learning strategies, we assume education to be positively related to deliberate practice. In sum, we propose the following hypotheses:

*Hypothesis 2a: Education is positively related to deliberate practice.*

*Hypothesis 2b: Education has an indirect effect on entrepreneurial knowledge which is mediated by deliberate practice.*

*Hypothesis 2c: Education has an indirect effect on business growth which is mediated by deliberate practice and entrepreneurial knowledge.*

*Cognitive ability*

Cognitive ability is a consistent predictor of skills and performance in a number of domains (e.g., Schmidt & Hunter, 1998; Schmidt, et al., 1986; Ree, Earles, & Teachout, 1994). Cognitive ability is particularly important for the acquisition of knowledge and skills (Hunter, 1986; Schmidt et al., 1986) and in complex tasks that require individuals to process new information (Hunter & Hunter, 1984; Kanfer & Ackerman, 1989). Since changing work requirements make learning and skill acquisition a continuous necessity, cognitive ability is argued to become increasingly important for performance at work (Sonnentag & Frese, 2002). Surprisingly, little research has been done concerning the effects of cognitive ability in small business. One exception is a study by Frese and co-workers (Frese et al., 2007) who found positive relationships between cognitive ability and success in Southern African business owners. A number of studies in other domains have demonstrated effects of cognitive ability on performance (Schmidt et al., 1986). Training studies, furthermore, identified general cognitive ability as a good predictor of training success (Jensen, 1998; Schmidt & Hunter, 1998). Increasing the acquisition of knowledge and skills (Hunter, 1986), cognitive ability may also be understood as a prerequisite of learning. Deliberate practice includes conscious intellectual regulation of action (Frese & Zapf, 1994) and constrains working memory. Business owners with higher cognitive ability and lower constraints on working memory may have more favorable initial conditions to engage in deliberate practice. Taken together, we hypothesize direct and indirect effects:

*Hypothesis 3a: Cognitive ability is positively related to deliberate practice.*

*Hypothesis 3b: Cognitive ability is positively related to entrepreneurial knowledge.*

*Hypothesis 3c: Cognitive ability has an indirect effect on entrepreneurial knowledge, which is mediated by deliberate practice.*

*Hypothesis 3d: Cognitive ability has an indirect effect on business growth, which is mediated by entrepreneurial knowledge.*

## **Methods**

### ***Sample***

The sample is comprised of 90 business owners from Cape Town (South Africa) and its surrounding suburbs/townships. We followed various strategies for drawing the sample. To include businesses that were usually not accessible via public registers we inquired at businesses in six large “industrial hives” (Blackheath, Mitchell’s Plain, Phillippi, and Athlone) and markets (Green Market Square and Train Station Market). The interviewers visited the business sites and carried out interviews on the spot or made appointments with the owners. To be accepted as foreigners in these industrial hives and markets (and also from a security standpoint), we started this research study by initially meeting with 50 participants of a previous study on other topics conducted by our research group in 1999 (reported by Frese et al., 2007). To include up-market businesses we draw a random sample of members from the Western Cape Business Opportunities Forum (WECBOF) database. Since multiple analyses of variance did not reveal differences between the two samples for the variables of interest we merged them into one sample of 90 business owners.

All participants were founders and owners of their businesses and ran them on a day-to-day basis. In order to exclude people who just bridged a period of unemployment and to get adequate reports on experiences and success, we further required participants to have operated their businesses for at least one year and, additionally, to have at least one employee (two participants from the 1999 sample had lost their employees). We included only black (31%) and

so-called colored (69%) business owners (the term 'coloured' is still used as a self-descriptive term for people of mixed background although this term is becoming 'politically incorrect'). Of the total sample, 86% were male. On average owners were 45 years of age ( $SD = 9.28$ ). Participants had been to school for 12 years on average ( $SD = 3.10$ ). Most businesses (69%) were formal (i.e., registered and tax paying). Fifty percent were engaged in manufacturing, the other half were active in the service and trade sector (tertiary sector). Businesses had been in existence for 8 years on average ( $SD = 5.69$ ). The majority of owners (78%) had between 1 and 10 employees ( $M = 13$ ,  $Mdn = 4$ ). The average starting capital corrected for inflation was 65,053 South African Rand (which is equivalent to approximately 8,780 USD).

### ***Procedure***

We used a structured interview as our main instrument. All interviews took place at the owner's workplace. On average, the interviews lasted 165 minutes. Interviewers were two graduate students of psychology. They received a thorough interviewer training, which included practical exercises on interviewing techniques as well as coding and rating exercises. This training program - in modified forms - has been successfully applied in a number of research projects in Africa since 1998 (Frese et al., 2007). During the interview, the interviewers wrote down participants' answers and these written accounts were rated by two independent raters (high noise levels at most business sites did not allow for tape recordings). An elaborate coding scheme providing explicit rating anchors along with regular feedback interviews helped provide good interrater reliabilities computed as intraclass-coefficients for factual (ICC[1,1]) and Likert (ICC[1,2]) items (Shrout & Fleiss, 1979) ranging between .96 and 1.00. After the interview the participants filled out a questionnaire assessing their practical business knowledge.

## *Measures*

### *Deliberate practice*

We took several steps to develop our measure of deliberate practice. Since we did not know about activities that can be performed as deliberate practice in small business beforehand (cf. Sonnentag & Kleine, 2000), we first conducted two pilot studies in Mombasa (Kenya) and Cape Town (South Africa). Altogether, we interviewed 35 business owners to test whether any of the deliberate practice activities identified in other domains were applicable to small business. During the interviews we first asked business owners for any activities they could think of that resulted in learning and the accumulation of knowledge and skills. We asked questions like “What do you do to improve your skills and knowledge as a business owner” or “Whenever you decided to do something differently in your business, what was the situation that led to these decisions?”. If the owners answered with a concrete activity we asked them how often they performed the activity and whether they did it on a regular basis. The interviewers wrote down the answers in a report which was then analysed. A number of owners reported being deliberately engaged in activities conducted to improve their business, their own skills, or their knowledge. Some owners described these activities in more abstract ways as “a mindset of constant learning” or as “always having a wondering mind”. When asked how they put this into action or what they actually did they reported activities such as “regularly going through the store to see everything with the eyes of the customer” or “trying out new things to see if they work or not”. We later made a list of all those activities that were performed with an explicit goal of competence enhancement, did not primarily serve the purpose of accomplishing work tasks, and which were performed on a regular basis. We compared these activities with deliberate

practice activities previously identified by Sonnentag and Kleine (2000) and Dunn and Shriner (1999) in actual work settings. We found six of our activities to fit the categories of deliberate practice activities identified by Sonnentag and Kleine (2000) for insurance agents: private conversation, firm meetings, exploring new strategies, mental simulation, asking customers for feedback, and consulting colleagues or experts. Additionally, we found four activities which had not previously been reported in the literature: attending workshops/training, professional reading, observing others, and controlling/checking. Since owners repeatedly stated during our pilot studies that they regularly engaged in one or more of these activities with a clear learning goal, we added these activities to our final set of deliberate practice activities. The deliberate practice activities that were identified are distinguishable from existing firm level constructs such as environmental scanning (Miller, 1987) due to their explicit focus on individual competence improvement. Moreover, although deliberate practice may incorporate individual level environmental scanning, it represents a much broader approach to learning from the environment (e.g., learning about new developments and techniques from professional reading).

For the present study, we wrote the 10 activities down on cards, which were presented to the owners during the course of the interview. Card by card, we asked the owners to indicate whether or not they perform the activity, and if so, whether they do it on a regular basis, and whether they do it to improve their skills and knowledge. We then asked the owners to give us a specific example of something they had done in the past and to indicate what they had learned by performing the activity.

Our final measure for deliberate practice includes quality and quantity of deliberate practice ( $\alpha = .94$ ). *Quantity* was measured as the sum of all activities owners carried out as deliberate practice. Based on Sonnentag and Kleine (2000), activities were only rated as

deliberate practice if they were primarily carried out to enhance owners' knowledge and skills, if the activity went beyond task accomplishment, and if owners were able to give a specific example. Raters agreed perfectly whether an activity was performed as deliberate practice or not ( $ICC[1,1] = 1$ ). *Quality* of deliberate practice was measured as evidence of learning. Interviewers asked for specific examples what the owners had learned from performing an activity. For each activity interviewers later assessed how much the owners had learned from engaging in this activity using a 5-point Likert scale ( $ICC[1,2]$  ranged between .95 and .98). We arrived at our measure of quality of deliberate practice by calculating the mean of evidence of learning across all activities. Quality and quantity of deliberate practice were then aggregated to form an overall index of deliberate practice (i.e., the mean of standardized scores were calculated; see Appendix).

#### *Entrepreneurial knowledge*

Our choice and development of knowledge measures was based on established research in cognitive psychology as well as considerations of special features and requirements of the study context. Cognitive psychologists sort knowledge into two categories: declarative (factual knowledge) and procedural (know-how) (e.g., Anderson, 1982). Knowledge is further characterized by different degrees of interconnectedness of elements of knowledge (also referred to as organization or structure of knowledge in memory, cf. Glaser & Bassok, 1989). We measured entrepreneurial knowledge with three tests: declarative business knowledge, procedural marketing knowledge, and business knowledge structure (overall  $\alpha = .75$ ). We focused on general entrepreneurial knowledge as relevant across multiple industries since we were interested in relationships and implications applicable to small business in general.

Declarative business knowledge was assessed using a multiple-choice test taken from Krauss (2003), which we adapted to the South African context with the help of local experts. The final version included 20 items. Some items covered more general business practice knowledge (e.g., “What is the best method for checking on business progress?”). Other items were specific to the South African context and covered current business knowledge (e.g., “Who should contribute to the unemployment insurance fund [UIF]?”). We aggregated the items to form an index.

Since all business owners have to apply practical marketing knowledge, we developed a situational interview scenario to test participants’ procedural marketing knowledge. In this scenario we asked the owners to take the role of a manager in a beverage company (none of the interviewees owned a beverage company). They were presented with the task to acquire all the information necessary to decide whether or not to introduce a new product (a diet lemonade called “lemon delight”) as well as all the information needed if they decided to go ahead. Borrowing from the literature (Kotler, 2002), we developed the following categories for the coding scheme: development of the market, market participants, trade, consumers, producers, marketing instruments, distribution channels, storage and transport of products, and the product environment. We formed a scale for procedural marketing knowledge ( $\alpha = .96$ ) equally weighting three single measures: number of correct ideas across all categories (knowledge quantity), completeness of the participant’s approach (knowledge quality, e.g., most important categories were covered), and overall marketing knowledge rated by the interviewers (ICCs ranged between .96 and .99).

Following Goldsmith and Kraiger (1997), we further developed a card-sorting test for measuring participants’ knowledge structure of business related concepts. Based on Oxford

(2003) and results from the pilot study, we chose four concepts (customer relationship, human resources, management, finance) with four to five subcomponents each. We only chose those subcomponents that the local experts had correctly assigned to the four broader categories in our pilot studies. The card-sorting test was part of the interview. Participants were asked to sort 19 cards into themes of concepts that belonged to each other (e.g., customer needs, back-up service, market research, advertising, and branding had to be sorted together to represent customer relationship). The final score for knowledge structure reflected correct category identification (if three subcomponents were correctly sorted into one pile) and the correct assignment of subcomponents to their proper categories ( $ICC[1,1] = 1$ ).

To support the construction of the three measures (i.e., declarative business knowledge, practical marketing knowledge, and knowledge structure) representing one common factor of entrepreneurial knowledge, we performed a confirmatory factor analysis in which the three measures loaded equally on one common factor. The model had an excellent fit ( $\chi^2 [2, n = 90] = 0.33, p = .85$ ; comparative fit index = 1.0, goodness of fit index = .99; root mean square error of approximation = .00) and the three measures had loadings of .70 or higher on the common factor.

#### *Cognitive ability*

We used 12 selected matrices from the Raven Progressive Intelligence Test (Snow & Swanson, 1992) to assess cognitive ability. These matrices were selected during the pilot study and were chosen based on item-total correlations, item difficulties, and their approximation of a normal distribution. The test was applied as part of the interview. We first explained principles for solving the matrices and presented 5 sample matrices with increasing difficulty for practice. Number of correct solutions of the 12 test matrices was taken as the measure of cognitive ability ( $\alpha = .74$ ).

*Education*

We formed a two-item index to measure the owners' education. The index combined number of years of formal education and the highest degree obtained by owners ( $\alpha = .93$ ).

*Business growth*

The latent variable business growth reflected percentage development of customers, sales, and profits for the years between 2000 and 2003 ( $\alpha = .89$ ). We asked for each year's development and computed separate growth rate indicators for customers, sales, and profits, respectively.

*Control variables*

We included the initial starting capital of the business and the owner's age as control variables since we were only interested in the success variance attributable to knowledge, deliberate practice, intelligence, and education. The initial starting capital, also discussed in the literature as a liability of smallness (e.g., Bruederl, Preisendoerfer, & Ziegler, 1992), was measured in South African Rand and corrected for inflation. Given the impact of age on cognitive variables (e.g., Salthouse, 2003) and potential effects on success, we also controlled for the owner's age in all exogenous variables.

*Method of Analysis*

To test our overall hypothesized model of entrepreneurial knowledge and business growth as well as the single hypotheses regarding direct and indirect effects we applied structural equation modeling (LISREL 8; Joereskog & Soerbom, 1996). We fixed the measurement model using aggregate measures and their reliabilities to ensure an adequate ratio of sample size to estimated parameters (using the minimum criterion 10 to 1 by Bentler & Chou, 1988). We used the square root of the reliabilities of observed variables as the factor loadings for the corresponding latent

variables and fixed the measurement error in the observed variables to  $(1 - \text{reliability})$  multiplied by the variance of the observed measure  $((1 - \text{reliability}) \times \text{variance})$  (Hofmann & Morgeson, 1999).

## Results

Table 1 presents the descriptive statistics and zero-order correlations for the variables in the study. Reliabilities are displayed in the diagonal computed as Cronbach's alpha.

Our overall scale of knowledge was significantly related to business growth. The three predictor variables deliberate practice, education, and cognitive ability showed significant relationships with both business growth and entrepreneurial knowledge. The only exception was the relationship between cognitive ability and business growth. Deliberate practice, education, and cognitive ability were interrelated with correlations ranging between  $r = .37$  and  $.48$ . Starting capital was significantly related to knowledge but showed no relationship with business growth.

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Insert Table 1 about here

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The hypotheses were tested simultaneously using structural equation modeling (Figure 2). We tested direct effects by examining parameter estimates of respective paths in the model and indirect effects using Sobel's first-order solution (MacKinnon, Lockwood, Hoffman, West, & Sheets, 2002). All hypotheses were directional and were tested one sided.

The model fit the data well ( $\chi^2 [4, n = 90] = 4.24, p = .38$ ; comparative fit index = 1.00; goodness of fit index = .99; root mean square error of approximation = .026). In support of our first hypothesis, deliberate practice showed a strong positive effect on entrepreneurial knowledge

( $p < .01$ ). Entrepreneurial knowledge was positively related to business growth ( $p < .05$ ), supporting Hypothesis 1b. Deliberate practice also showed an indirect effect on business growth via entrepreneurial knowledge (Hypothesis 1c;  $p < .05$ ). Education was significantly related to deliberate practice supporting Hypothesis 2a ( $p < .01$ ). Both indirect effects - education on knowledge via the mediator deliberate practice ( $p < .05$ ), as well as the indirect effect of education on business growth via deliberate practice and knowledge ( $p < .05$ ) - were significant, supporting Hypotheses 2b and 2c. Cognitive ability showed a positive relationship with deliberate practice (Hypotheses 3a;  $p < .05$ ) and with entrepreneurial knowledge (Hypothesis 3b;  $p < .05$ ). Deliberate practice mediated the relationship between cognitive ability and entrepreneurial knowledge (Hypothesis 3c;  $p < .05$ ). Entrepreneurial knowledge mediated the relationship between cognitive ability and business growth (Hypothesis 3d;  $p < .05$ ).

In a supplemental analysis we further examined the measures of deliberate practice: quantity and quality. Whereas quantity of deliberate practice was essentially based on factual information with perfect interrater agreement (asking whether owners engaged in concrete activities and to provide specific examples), quality of deliberate practice could have been biased by failure on the part of the interviewers to include all information. To test whether the inclusion of quality of deliberate practice had an impact on the results, we computed a second model without quality of deliberate practice. Exclusion of this variable did not alter the results. The reduced model showed good overall fit and revealed the same pattern of results as the full model. All hypotheses were supported. We conclude, therefore, that our results were not affected by the interview approach.

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Insert Figure 2 about here

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## Discussion

In this study, we applied the concept of deliberate practice adopted from research on expertise to the domain of small business. We developed a cognitive model of learning in small business focusing on the business owner. Our findings are consistent with the proposed cognitive model. Deliberate practice was shown to have a strong direct effect on entrepreneurial knowledge as well as an indirect effect on business growth. Business owners with higher cognitive ability and education engaged more in deliberate practice. Education also showed positive indirect effects on business growth. Cognitive ability was positively related to deliberate practice and to knowledge and had an indirect effect on business growth. Thus, our findings add to previous research in a number of ways.

First, we extend the applicability of deliberate practice to the domain of small business. Relationships of deliberate practice with success largely confirmed relationships found in other domains. While previous research has usually been based on single measures of expertise, we separately assessed cognitive (e.g., knowledge) and financial outcome variables as indicators of high performance. This allowed us to further specify the process between deliberate practice and performance and to test the mediating effect of entrepreneurial knowledge. While such mechanisms have previously been suggested (Sonnentag & Kleine, 2000; Ericsson et al., 1993) they had not yet been investigated empirically. Additionally, by adding business growth as a dependent variable, we further extend the relationships of deliberate practice to also incorporate economic outcomes.

Second, our emphasis on *current* deliberate practice activities is distinct from traditional expertise research which emphasized *past* deliberate practice (Ericsson et al., 1993). Current

deliberate practice appears to be specifically important in the context of work (cf. Sonnentag & Kleine, 2000). As another difference, deliberate practice at work does not involve highly repetitive elements. Corresponding to the multitude of tasks and requirements in contexts of work – and particularly in small business – individuals will have to be mindfully engaged in a variety of different activities.

Third, we add to the discussion of the utility of rational approaches to the analysis of cognition in small business. Researchers have voiced concern about the usefulness of such approaches in business especially with regard to decision making processes that involve time-consuming and often costly systematic processing of information (Allinson, Chell, & Hayes, 2000; Busenitz & Barney, 1997). Our findings demonstrate that owners may engage in thoughtful and deliberate information processing as implied in deliberate practice. Although such activities are effortful, positive relationships with knowledge and success suggest that engaging in such activities is worthwhile in small business.

Fourth, our study contributes to the growing body of psychological individual level approaches to small business success (Baum et al., 2007; Baum & Locke, 2004; Frese et al., 2007). Individual difference variables significantly explained variance in growth demonstrating the impact of the owner on business success.

Fifth, to our knowledge, this is the first study that looks at the relationship between cognitive ability and deliberate practice. This relationship is relevant to the discussion of talent and deliberate practice in expertise research. While expertise approaches argue that deliberate practice affects the cognitive system, our results suggest that deliberate practice may also be influenced by cognitive ability. This relationship is likely to hold for fluid measures of

intelligence such as those used in this study which are largely inheritable and developed in early childhood (e.g., Cattell, 1987).

Finally, we believe our study makes an important contribution to a better understanding of small business in developing countries and among minority groups. The particular importance of small business in the developing world is widely acknowledged. The topics of learning and knowledge have been accentuated by researchers and practitioners as key issues to foster success in small business in South Africa. To our knowledge, the present study is one of the first to theoretically address these issues.

### ***Future Research Directions***

Open questions for future research concern the role of further antecedents, mechanisms, and outcomes of deliberate practice. First, in this study we examined cognitive antecedents of deliberate practice. With regard to the extraordinary effort inherent in deliberate practice, it will be particularly interesting to examine potential motivational prerequisites of deliberate practice such as learning orientation or personal initiative.

Another issue concerns the role of learning and metacognitive skills. Metacognitive skills involve skills of planning, monitoring, and evaluation of one's progress during task completion (Keith & Frese, 2005; Schraw & Moshman, 1995). The positive relationship between education and deliberate practice may be a result of learning and metacognitive skills acquired during the period of education. Deliberate practice may similarly lead to noncontent related by-products. As argued in studies on instruction (Glaser & Bassok, 1989), outcomes of practice are likely to take the form of metacognitive changes and skills.

Second, our study suggests that deliberate practice essentially incorporates cognitive learning. Future studies could address deliberate practice relationships with other types of learning such as behavioural and action learning (Lundberg, 1995) or investigate to what extent deliberate practice is related to forms of incremental learning (single loop) or whether it leads to more fundamental changes of beliefs and strategies (double loop; Argyris & Schoen, 1978).

Third, deliberate practice may affect other elements of the cognitive system such as problem solving (Charness et al., 1996), metacognitive skills (Keith & Frese, 2005; Schraw & Moshman, 1995), or self-regulatory mechanisms (Baron, 2007). Baron, for example, suggests that deliberate practice - despite increasing domain specific knowledge – should refine several self-regulatory mechanisms and enhance basic cognitive systems. Another open question concerns the relationship between deliberate practice and tacit knowledge. Researchers may employ new knowledge elicitation techniques such as causal mapping to address this issue (Hodgkinson & Sparrow, 2002; Narayanan & Armstrong, 2005).

Finally, we restricted our study to an analysis of system 1 variables. While this restriction was deliberate, we do not assume that system 2 is not important in small business. Within dual-process conceptions – the dominant view in cognitive neuroscience (reviewed, e.g., by Lieberman, 2007; Sadler-Smith, 2007) – both systems are important and they serve different purposes (Hodgkinson & Sadler-Smith, 2003) with the predominance of each system depending on characteristics of the situation, the task, and the individual (Epstein, Pacini, Denes-Raj, & Heier, 1996). Current theory points to the relevance of intuition for small business performance (Sadler-Smith, 2004) while some controversy remains with respect to the relative importance of both systems. Future research could tackle some of these issues, for example, by exploring the hypothesis that superior business owners are marked by the capability to adapt the ways in which

information is processed as appropriate to the nature of the task and the situation (Baron, 2004; Hodgkinson & Sadler-Smith, 2003).

### *Limitations*

As with all empirical studies, this study has limitations. First, measuring success in small business is difficult (Krauss, Frese, Friedrich, & Unger, 2005; Wiklund, 1998). Our measures of sales, profit, and customer growth were self-report measures and not objective measures in the sense of exact profitability ratios. Exact profitability measures are difficult to obtain in small and micro business (Daniels, 1999). This is especially true in Africa where standard bookkeeping is uncommon (Shinder, 1997). We tried to circumvent these difficulties by asking for growth ratios instead of absolute figures. We were able to obtain a reliable single factor construct of business growth which captures important aspects of small business success (e.g., Covin & Slevin, 1997; Davidsson & Wiklund, 2000).

Another shortcoming arises from the use of self-report data which can be subject to a certain degree of response bias (Cook & Campbell, 1979). Three arguments suggest that such bias was not an issue in the current study. First, we applied structured interviews that showed excellent validity in meta-analytic research (Schmidt & Hunter, 1998). Our interviews incorporated probing and clarification of participants answers by well-trained interviewers. Probing the owners' answers and asking for concrete examples, for instance, when asking about the engagement in deliberate practice activities, allowed interviewers to easily detect common response bias such as acquiescence (a tendency to agree). Second, excellent agreement between two independent raters suggests that our measurements were reliable. Third, our study included a

number of objective measures such as the three knowledge tests and the test of cognitive ability. By their very nature, these tests are not subject to response bias.

Third, biases in the interviews may be possible. Supplemental analyses, however, suggest that this was not the case. A reduced model without quality of deliberate practice as a variable (which could have been biased by our interview procedure) showed no difference to the original model thereby demonstrating that the interview approach did not affect the results of our study.

Fourth, the cross-sectional design is a limitation. We argued that deliberate practice leads to the generation of entrepreneurial knowledge and in turn to business growth. Reverse causation, however, is also possible. Yet a causal interpretation of the relationship from deliberate practice to entrepreneurial knowledge to business growth is consistent with the literature on deliberate practice (e.g., Plant, Ericsson, Hill, & Asberg, 2005) and is in line with experimental research on the effects of learning goals (Dweck & Leggert, 1988).

Fifth, the small sample size of this study is a possible limitation, particularly when using structural equation modeling. Concerning the use of maximum likelihood estimates, Anderson and Gerbing (1988) point out that bias in parameter estimates are of no practical importance for sample sizes above  $N = 50$ . Although deviations from respective population values may occur, this does not affect statistical inference because the small sample sizes are accounted for by LISREL in the estimation of the standard errors. The application of structural equation modeling with small samples is further encouraged by results from a number of Monte Carlo studies: Hoyle and Kenny (1999) showed that technical problems nearly disappeared with samples approaching 100 or with higher reliabilities of the mediator. Biased parameter estimates, on the other hand, most often occurred when the unreliability of the mediator was ignored. Such bias is eliminated in latent variable modeling where measures are corrected for unreliability. We chose

LISREL as our method of analysis because structural equation modeling – in contrast to regression analysis - offers the advantage that parameters can be estimated simultaneously and that an overall model fit can be obtained. We also calculated the paths in our model using three independent ordinary least squares regression analyses. These analyses yielded equivalent coefficients to the LISREL path estimates. Taken together, we are confident that the estimates for our model are accurate and that potential problems arising from small sample sizes are not a major issue in the current study.

### ***Conclusions and Practical Implications***

The findings have a number of practical implications. First, in order to be successful business owners need to learn. Our findings suggest that the acquisition of expertise and business growth largely remains the responsibility of the owners themselves to deliberately engage in a variety of quality learning activities. Given business owners' high need for autonomy (Lumpkin & Dess, 1996; cf. Schumpeter, 1934), the concept of deliberate practice suggests a particularly suitable, widely applicable – albeit effortful – answer to both small business owners' needs and realities. Second, business owners need to learn how to learn. Consultants and policy makers can assist owners develop more efficient learning practices to promote success in small businesses. Owners can thereby be equipped with a more general tool which may help them acquire new skills and cope with changing environments. Third, our findings have implications for selection and assessment of business owners. If shown to predict business success in the long run, credit providers and venture capitalists may directly assess entrepreneurial knowledge and owners learning ability. Finally, our findings have implications for skill acquisition and performance at work in general. Our study and previous studies in the context of work (Sonnentag & Kleine,

2000) indicate that individuals engage in deliberate practice activities in work environments. Individuals differ with respect to the amount and quality with which they perform such activities. These differences are related to domain specific knowledge and work performance. Although uncertainty and dynamism may be more pronounced in small business, they become increasingly characteristic of modern workplaces (Howard, 1995, & Sonnentag & Frese, 2002). The framework of deliberate practice offers a promising individual level answer to organizations' needs to quickly and repeatedly adapt to changes in the workplace.

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**Table 1.** Descriptive Statistics and Intercorrelations<sup>a</sup>

<b>Variables and Scales</b>	<b>Mean</b>	<b>s.d.</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>
1. Business growth	16.08	31.54	(.89)						
2. Entrepreneurial knowledge <sup>b</sup>	.01	.82	.22*	(.75)					
3. Deliberate practice <sup>b</sup>	.00	.97	.27**	.65**	(.94)				
4. Education <sup>b</sup>	.00	1.93	.29**	.33**	.48**	(.93)			
5. Cognitive ability	6.97	2.71	.07	.41**	.37**	.39**	(.76)		
6. Starting capital	6505 <sup>c</sup>	22085 <sup>c</sup>	.11	.21*	.23*	.10	-.04	—	
7. Age of owner	44.58	9.27	-.12	-.01	-.16	-.48	-.10	-.06	—

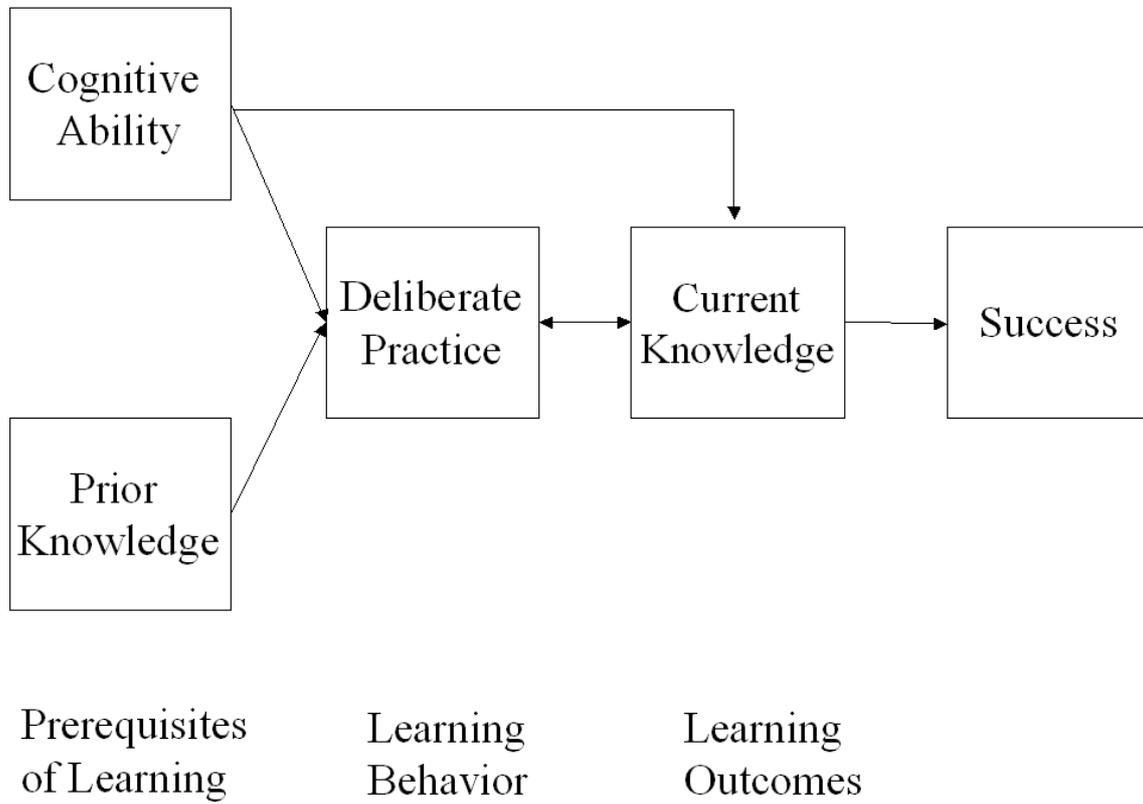
<sup>a</sup> Figures in parentheses are Cronbach's alphas.

<sup>b</sup> z-standardized data.

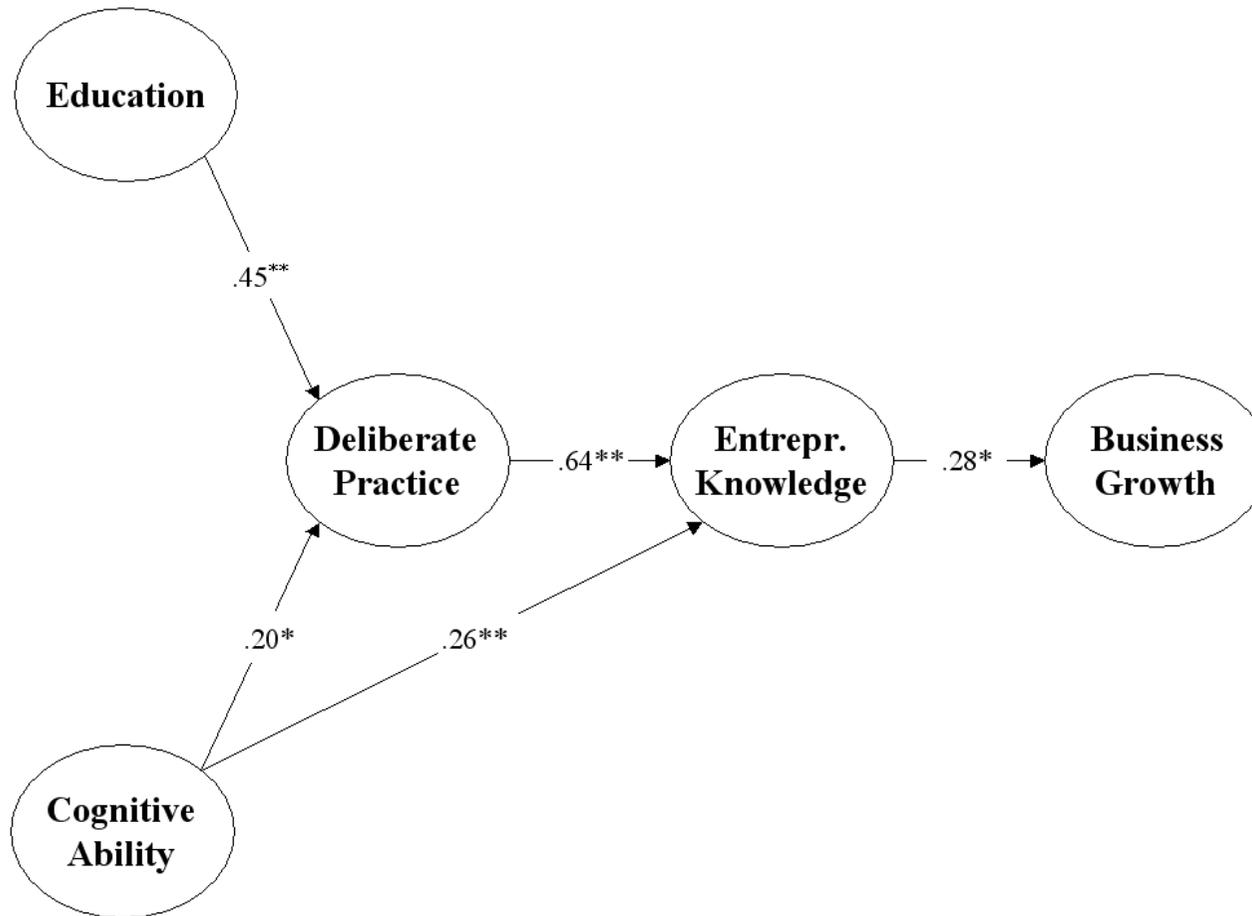
<sup>c</sup> South African Rands, (000).

\* $p < .05$

\*\* $p < .01$



**Figure 1.** Model of Learning: Prerequisites of Learning, Learning Behaviour, and Learning Outcomes



**Figure 2.** Effects of Education and Cognitive Ability to Deliberate Practice to Knowledge and Business Growth controlling for Starting Capital and the Owner’s Age (Standardized Parameter Estimates from Structural Equation Model). Fit statistics:  $\chi^2$  (4, n = 90) = 4.237, p = .38; independence model:  $\chi^2$  (21, n = 90) = 161.63; comparative fit index = 1.00; goodness of fit index = .99; root mean square error of approximation = .026; \*p < .05; \*\*p < .01.



**Table 2.** Measurement and Aggregation of Deliberate Practice (DPA)

<b>Deliberate Practice Activity (DPA)</b>	<b>Regular engagement in DPA with learning goal</b>	<b>Evidence of learning from DPA (quality of DPA)</b>	<b>Examples of owners' DPA</b>
Mental simulation	1 (yes), 0 (no)	1 – 5	<i>Having a wondering mind, walking around shop with eyes of a customer, thinking about how to do things in a more effective way to be well prepared for the future.</i>
Exploring new strategies	1 (yes), 0 (no)	1 – 5	<i>Trying out new products or services, trying out new designs and observing people's reaction.</i>
Consulting colleagues or experts	1 (yes), 0 (no)	1 – 5	<i>Asking advice from other owners or leaders, networking with other owners to learn from them, talking to colleagues about prices and new styles.</i>
Asking customers for feedback	1 (yes), 0 (no)	1 – 5	<i>Approaching clients to get feedback, asking existing clients about their needs, sending out questionnaires.</i>
Firm meetings	1 (yes), 0 (no)	1 – 5	<i>Staff meeting, brainstorming with employees to see where improvements are necessary.</i>
Private conversation	1 (yes), 0 (no)	1 – 5	<i>Talking to friends, meeting people in the pub, talking to spouse or other family members about business to pick up new ideas.</i>
Professional reading	1 (yes), 0 (no)	1 – 5	<i>Reading business related journals and magazines, business bulletins, books, brochures, scanning the internet, watching domain related videos.</i>
Workshops/ training	1 (yes), 0 (no)	1 – 5	<i>Attending seminars, workshops, or courses.</i>
Observing others	1 (yes), 0 (no)	1 – 5	<i>Looking for new ideas, visiting conventions, walking around the shops to find out about prices, adopting ideas from other companies.</i>
Controlling/ checking	1 (yes), 0 (no)	1 – 5	<i>Checking the stock to know what is selling, check business data in order to plan future development of company. Checking quality in order to detect mistakes and to find ways of improvement. Controlling the staff to identify training needs.</i>
Final measures	Sum of activities (0 – 10 = quantity)	Mean of quality of DPA	
	Mean of standardized final index of deliberate practice		