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Learning, innovation and firm performance: knowledge management in small firms

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\textbf{Abstract}

This study aims to examine the relationships between managerial learning as a facet of knowledge absorption (KA), firm innovation as a facet of knowledge exploitation (KE), and performance of small firms (i.e., firms with fewer than 50 employees). It builds on the knowledge-based view of the firm and the upper echelons theory to describe the effects of KA on KE, and that of KE on firm performance, in the small-firm context. Using survey data of 1441 small firms in New Zealand, the study applies a partial least squares approach to structural equation modelling to test the main hypotheses of the study. The main findings show the positive and significant effects of three types of managerial learning, namely, practice-based, proximal, and distal learning, on innovation and on innovation in firm performance. However, the curvilinear relationships suggest rather that the effects are finite and, potentially, confounded by factors unaccounted for in the models.  

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\textbf{Keywords:} knowledge absorption; knowledge exploitation; performance; small business

\textbf{Introduction}

The knowledge-based view (KBV) of the firm (Kogut and Zander, 1992; Nonaka and Takeuchi, 1995; Grant 1996a, 1996b; Spender, 1996) suggests that knowledge absorption (KA) and knowledge exploitation (KE) are the primary pillars of knowledge management (KM). KM underscores the role of knowledge in the development of a firm's sustainable competitive advantage and, therefore, the ability to reap superior rates of return (Cohen and Levinthal, 1990; Grant 1996a, 1996b, 1997). KA broadly refers to the identification, acquisition, and absorption of knowledge into a firm's internal repository of knowledge-based resources. KE broadly refers to the assimilation, transformation, utilisation, and capitalisation of a firm's knowledge-based resources in order to create value.

Previous studies on KM tend to focus on large and multinational firms such as Intel, IBM, Ericsson, KPMG, and Wal-Mart (McLaughlin et al., 2008; Ringel-Bickelmaier and Ringel, 2010). There is a dearth of empirical studies about how small firms (i.e., firms with fewer than 50 employees) (OECD, 2005) adopt KM and the corresponding effects of KM adoption on firm performance (Wong and Aspinwall, 2004; Desouza and Awazu, 2006; Cantu et al., 2009). This vacuum in the KM literature highlights the need for more studies involving a much larger sample of firms in order to generate robust and generalisable empirical evidence about KM in the small-firm context (Zack et al., 2009). Given the importance of small firms in the economic growth of developed and developing countries (Wong and Aspinwall, 2004;
Desouza and Awazu, 2006; Edvardsson, 2006), the current study examines the interplay between two particular facets of KA and KE – the owner-manager's engagement in learning and the firm's innovation levels – and the latter's impact on the performance of small firms.

More specifically, this study aims to make three contributions. First, it examines KA in small firms by describing the engagement of the firms' owner-managers in various learning activities. As the acquisition and absorption of knowledge within the small-firm context is less understood (Wong and Aspinwall, 2004; Edvardsson, 2006; Cantu et al, 2009; Lucas, 2010; Wang and Han, 2011), this study aims to offer a better understanding of the different learning activities of owner-managers that capture the KA activities of small firms. Building on the upper echelons theory (Hambrick and Mason, 1984; Carpenter and Fredrickson, 2001; Hambrick, 2007), we argue that engagement in learning activities by owner-managers is one of the processes through which small firms absorb external knowledge.

Second, it examines whether engagement in learning activities by owner-managers has positive contributions in the innovation outcomes of their respective firms (Snowden, 2003; OECD, 2005; Quintane et al, 2010; Wang and Han, 2011). Given the scarcity of empirical evidence about the salient aspects of KA on the innovation performance of firms (Zack et al, 2009; Lucas, 2010), the current study builds on the KBV to advance the theory that more intense engagement in KA activities can potentially endow the firm with strategic tacit knowledge that fuels the firm's innovation, which is a facet of KE.

Finally, it examines the effects of KE, as measured by innovation, on firm performance. The KBV suggests that deployment of strategic knowledge-based assets, such as tacit knowledge, impacts on the firm's competitive advantage and performance (Grant, 1997). The foregoing arguments are summarised in the conceptual model shown in Figure 1.

The article begins with a discussion of the theoretical basis of the study and the contribution of the KBV of the firm and upper echelons theory towards a more nuanced understanding of KM in the small-firm context. This is followed by a discussion of the research hypotheses that will be tested using the empirical data from a survey. The article then proceeds to a discussion of the results of the study. It concludes by identifying specific directions for future research.

**KA and exploitation in small firms**

The processes or activities associated with the absorption of external knowledge, and the latter's exploitation in order to create value for the firm, are central to understanding KM within firms (Snowden, 2003; Cantu et al, 2009). The current study broadly refers to KM as the management of knowledge-related activities including knowledge search, access, creation, organisation, sharing, transformation, exploitation, and reconfiguration. Wong and Aspinwall (2004) argue that some of the salient characteristics of small firms include flat and flexible organisational structures, the dominant role of owner-managers, elastic and adaptable processes, a unified culture, and highly-visible top management teams with proximity to the point of product or service delivery. These characteristics endow a small firm with organisational flexibility and adaptability that are critical to successful adoption and implementation of KM (Wong and Aspinwall, 2004; Cantu et al, 2009).

The current study builds on the KBV of the firm (Kogut and Zander, 1992; Nonaka and Takeuchi, 1995; Grant, 1996a, 1996b; Spender, 1996), which suggests that knowledge can potentially endow a firm with strategic assets, which form the basis of competitive advantage. The KBV is an extension of the resource based view (RBV) of the firm that highlights the importance of rare, inimitable, and non-substitutable resources to the competitive advantage and performance of firms (Wernerfelt, 1984; Barney, 1991; Moustaghfir, 2009; Mejri and Unemoto, 2010). The KBV posits that knowledge resides within individuals and knowledge creation is an individual activity (Grant, 1996a, 1996b). The primary role of firms is the integration and reconfiguration of knowledge to create value. Knowledge, especially tacit in nature, has been recognised as one of the firm's resources with the potential to contribute to its competitiveness (Barney, 1991; Kogut and Zander, 1992; Nonaka, 1994; Newbert, 2006; Moustaghfir, 2009). Acquiring and retaining knowledge, however, comes at a cost (Nonaka et al, 2000) and might, therefore, negatively impact on the firm's performance in the short-term, but generate benefits in the long-term through innovation (Diaz-Diaz et al, 2008). The importance of knowledge management and organisational learning for firm innovation was recently highlighted by Martín-de-Castro et al (2011). It becomes apparent that the processes through which the firm manages its knowledge-based resources are crucial in the optimal use of knowledge for the firm's sustainable competitive advantage.

The upper echelons theory suggests that KM in a small-firm context is primarily driven by the firm's owner-manager as the key decision maker of the organisation (Hambrick and Mason, 1984; Hambrick, 2007). This theory suggests that a small firm's strategic, operational, and tactical undertakings are mere extensions or reflections of the knowledge, skills, capabilities, and behaviour of the firm's key decision maker, in this case, the owner-manager (Gibcus et al, 2009). Previous studies have shown the strong influence of owner-managers of small firms in the overall strategic directions and operational activities of their respective firms (Hambrick, 2007; Gibcus et al, 2009).

Hence, KM in small firms can be driven primarily by the nature of knowledge-seeking activities undertaken by the
firms' owner-managers. Although a small firm may have other employees, the owner-manager plays a major and dominant role in terms of KM within the firm. Essentially, the owner-manager of a small firm is the organisation's 'institutional repository of knowledge' (Grant, 1997). Thus, the learning activities undertaken by the owner-manager form a primordial part in the process through which small firms absorb external knowledge. Engagement in learning activities leads to the acquisition, development, and refinement of the owner-manager's knowledge, skills, abilities, and capabilities, which Castanias and Helfat (2001) refer to as managerial resources. The KBV suggests that learning provides the opportunity for owner-managers of small firms to acquire or develop managerial resources that are critical for the firm's value-creating processes such as innovation. In the small-firm context, the development of managerial resources is of paramount importance because of the critical role of owner-managers in generating rents for the firm and in steering the long-term strategic directions of the business (Castanias and Helfat, 2001; Karami et al., 2006).

Hence, the current study considers the engagement by the owner-managers of small firms in various learning activities as a salient part of KA. Without necessarily precluding that there are many ways through which firms can engage in KA, we argue that in the context of small firms, learning by the owner-manager is one of the most effective ways that a small firm can absorb knowledge into the internal repository of the firm. In effect, we argue that managerial learning is a proxy for KA for the purposes of the current study.

When owner-managers of small firms engage in a variety of learning activities, they potentially absorb knowledge-based resources necessary to identify or develop new business ideas, operational, production or marketing techniques, solutions to strategic or operational problems, and business opportunities (Edvardsson, 2000; Carlu et al., 2009; Wang and Han, 2011).

However, the KM process in small firms does not terminate with mere absorption of knowledge through learning. If learning activities are the mechanism through which a firm absorbs knowledge, innovation is the process of combining complementary forms of knowledge to create a value for the firm (MacKinnon et al., 2002). Cohen and Levinthal (1990) call this product of the interaction of KA and KE absorptive capacity (Zahra and George, 2002). In this study, we argue that innovation is a manifestation of the capability of the firm to exploit knowledge to create value for the firm (Snowden, 2003; Wang and Han, 2011).

Innovation refers to the process of generating and using any idea, practice, or object that the adopting organisation regards as new (Zaltman et al., 1973; Damanpour and Evan, 1984; Damanpour, 1991; Hage, 1999). In this study, innovation is described using a multi-dimensional model that conceptualises innovation in four different ways: innovation in terms of products or services, operational processes, managerial or organisational processes, and sales and marketing activities (OECD, 2005).

Innovation is a resource-hungry endeavour. Engagement in learning activities is considered an effective way to equip small firms with the valuable human capital necessary in the form of knowledge and skills for firms' owner-managers to engage in innovation. Chen and Huang (2009) suggest that human capital enables firms to enhance their distinctive competencies and discover opportunities for innovation. Innovation is largely dependent on the ability of the firm to capitalise on its internal repository of knowledge (Quintane et al., 2011). The foregoing discussion on the linkage between KA and KE in the small-firm context underscores the following hypothesis:

H1: Engagement in learning activities by the owner-managers of small firms is positively associated with firm innovation.

Innovation and firm performance

It is clear in the literature that innovation is a strategic KE activity that oftentimes leads to development of competitive advantage, which is normally associated with above average returns (Thornhill, 2006; Craighead et al., 2009). An innovative firm is likely to gain a competitive edge that is critical to its survival and growth (Damanpour, 1991; Deshpande et al., 1993; Hult et al., 2004; Knight and Cavusgil, 2004). Innovation is considered an antecedent to first-mover advantages that increase the firm's ability to reap superior rates of return (Venkatraman, 1989; Lumpkin and Dess, 1996; Andreeva and Kianto, 2011). The introduction of innovative products, services, processes, or business models tailored to attractive niches is an additional opportunity for firms to stand out from the competition (Rosenbusch et al., 2011). By offering highly innovative products, small firms can avoid price competition and can create new demand and, thus, facilitate firm growth. If the innovating firm manages to set high barriers preventing competitors from market entry, the company's position in the industry is strengthened, and the innovation can lead to persistent above-average returns (Rosenbusch et al., 2011). Calantone et al. (2002) argue that the capability of an organisation to innovate is the most important determinant of firm performance.

Moreover, innovation allows firms to undertake three important KE-related processes. First, innovation is often triggered by mistakes and failures. Systematically analysing mistakes and failures and identifying ways to avoid them in the future can provide important learning opportunities that prompt the development of new or improved products or services. Second, innovation enables firms to identify, expand, and exploit emerging business and market opportunities. Innovative firms are able to track and respond to changing market demands and adapt strategically to the changes in their dynamic social, institutional, and technological environments. Third, innovative capacity can be viewed as a creative process of developing new business opportunities by offering new products or services to existing and current
markets. Recovery from failures, revitalisation through business expansion and creation of new business opportunities endow a small firm with enormous potential to increase its chances of survival and rates of positive returns. Hence, consistent with previous studies (e.g., Calantone et al., 2002; Darroch, 2005; Craighead et al., 2009), this study posits that:

**H2:** Innovation is positively related to firm performance.

### Methods and data

This study uses survey data from a 2009 nation-wide survey of 4165 firms in New Zealand. The sample firms were identified from a list provided by a commercial provider of business-to-business information in New Zealand. The study followed Dillman’s (2007) total design method in choosing the sample, as well as in developing, designing, pilot-testing, and administering the postal, self-administered questionnaire. The respondents to the questionnaire were owner-managers of the sample firms. Owner-managers specifically refer to individuals who have an ownership stake in the firms that they themselves manage in a variety of executive roles (e.g., proprietor, general manager, director, or CEO). The survey retrieved 1441 usable responses from owner-managers of firms that were classified as small (i.e., fewer than 50 employees) (Cameron and Massey, 1999; OECD, 2005). The overall response rate was 35%, which is well above the minimum acceptable rate for this type of mail survey (Bartholomew and Smith, 2006). The characteristics of the sample firms are shown in Table 1.

Two-thirds of the sample firms are very small with 10 employees or fewer. More than half of the firms are relatively young with ages ranging from 0-20 years. The majority of the firms are engaged in services. The owner-managers of these firms are relatively mature, with 72% of the respondents in the age range of 46-65 years. The owner-managers have relatively diverse educational levels, and more than 60% have attained at least a trade certificate or equivalent formal educational training.

### Measurement

#### Dependent variables

**Innovation** was measured by following the recommendations of the Oslo Manual (OECD, 2005). Four items asked the respondents to indicate, with a yes or no response format, whether they have developed or introduced new or significantly improved products or services, operational processes, organisational or managerial processes, and sales or marketing methods in the last 12 months. Previous studies have used similar measures in capturing firm-level innovation (Darroch, 2005; Quintane et al., 2011; Tseng et al., 2011).

**Firm performance** was measured by three items using a five-point Likert-type scale (1—strongly decreased, to 5—strongly increased), which asked the respondents to indicate the firm’s current performance (i.e., at the time of the survey) relative to that of the previous 12 months in terms of turnover, profitability, and productivity. These three measures of performance have been used repeatedly in previous studies to capture various facets of the multi-dimensional nature of firm performance (Darroch, 2005; Wang and Han, 2011).

### Independent variables

The independent variable in this study is engagement in learning activities by the owner-managers of the sample firms. Engagement in learning activities refers to the extent to which the owner-manager of the firm has engaged in specific learning activities in the past 12 months. Following the standard scale development process recommended by Bagozzi et al. (1991) and Netemeyer et al. (2003), we developed a set of items to describe various learning activities relevant to the New Zealand small and medium enterprise context. The first step in the scale development process is a review of the relevant literature to define the conceptual domain of engagement in learning activities. A preliminary list of items was developed to

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### Table 1 Characteristics of the sample firms

<table>
<thead>
<tr>
<th>Firm size</th>
<th>F</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>No employee</td>
<td>223</td>
<td>16</td>
</tr>
<tr>
<td>1-4 employees</td>
<td>490</td>
<td>35</td>
</tr>
<tr>
<td>5-10</td>
<td>402</td>
<td>28</td>
</tr>
<tr>
<td>11-20</td>
<td>195</td>
<td>14</td>
</tr>
<tr>
<td>21-30</td>
<td>66</td>
<td>5</td>
</tr>
<tr>
<td>31-49</td>
<td>34</td>
<td>2</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Firm age (years)</th>
<th>F</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-10</td>
<td>208</td>
<td>17</td>
</tr>
<tr>
<td>11-20</td>
<td>414</td>
<td>34</td>
</tr>
<tr>
<td>21-30</td>
<td>284</td>
<td>23</td>
</tr>
<tr>
<td>31-40</td>
<td>136</td>
<td>11</td>
</tr>
<tr>
<td>Over 40</td>
<td>168</td>
<td>14</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Sector</th>
<th>F</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manufacturing</td>
<td>539</td>
<td>38</td>
</tr>
<tr>
<td>Service</td>
<td>872</td>
<td>62</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Age of owner-managers</th>
<th>F</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>25-35</td>
<td>33</td>
<td>2</td>
</tr>
<tr>
<td>36-45</td>
<td>187</td>
<td>14</td>
</tr>
<tr>
<td>46-55</td>
<td>504</td>
<td>37</td>
</tr>
<tr>
<td>56-65</td>
<td>482</td>
<td>35</td>
</tr>
<tr>
<td>Over 65</td>
<td>155</td>
<td>11</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Educational qualification</th>
<th>F</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>No qualification</td>
<td>85</td>
<td>6</td>
</tr>
<tr>
<td>Secondary school qualification</td>
<td>341</td>
<td>26</td>
</tr>
<tr>
<td>National certificate 1–3</td>
<td>60</td>
<td>5</td>
</tr>
<tr>
<td>Trade certificate</td>
<td>277</td>
<td>21</td>
</tr>
<tr>
<td>Diploma, advanced trade certificate</td>
<td>206</td>
<td>16</td>
</tr>
<tr>
<td>Degree level or higher</td>
<td>327</td>
<td>25</td>
</tr>
</tbody>
</table>
describe the various activities that are relevant to small firms in New Zealand.

The second step is the review and validation of the list of items by a panel of experts. The panel consisted of researchers, policy analysts, and advisors, as well as business advisors representing academia, government (e.g., Ministry of Economic Development), and industry to evaluate content, comprehensiveness, parsimony, and face validity (Cavanaugh et al, 2001). After several iterations using the Delphi Technique of expert panel review (Linstone and Turoff, 1975; Brown, 1968), the panel recommended a final streamlined list of items that are relevant in measuring three types of learning activities, namely, practice-based, proximal, and distal. Practice-based learning includes learning activities that are embedded in the goal-directed activities of everyday management practice, such as learning through reflection on challenging work experiences, learning through observing, and learning through trial and error. Proximal learning activities involve learning from family, friends, peers, and trusted advisors such as accountants and bank managers. Distal learning activities include management training programmes, university courses, and seminars run by chambers of commerce (Deakins et al, 2012). The items use a five-point Likert-type scale (1—not at all, to 5—large extent) to measure the extent of engagement in a learning activity. Details of the items are provided in the next section. This study builds on the findings of previous studies (Edwardsson 2006; Cantu et al, 2009; Wang and Han 2011) in using engagement in learning activities as one of the manifestations of KA within a small-firm context.

Control variables
Firm size, firm age, nature of the industry, and the educational qualifications of owner-managers were accounted for as control variables. Firm size refers to the total number of employees. Firm age refers to the number of years a firm has been operating since inception. The nature of the industry refers to whether the firm is engaged in manufacturing or service activities. Educational qualifications describe the highest level of formal educational achievement of the owner-managers.

Data analysis and results
Common method bias analysis
Because of the mono-methodological nature of the study, Harman's single-factor test was performed (Harman, 1976). The results show that no single factor emerged and no factor accounted for more than 50% of the variance. These findings suggest that common method bias does not appear to be an issue in the current study.

Response bias analysis
Non-response bias was examined by comparing early respondents (i.e., respondents after initial wave of mail-out) with late respondents (i.e., respondents after second wave or after reminder card mail-out) (Rogelberg and Stanton, 2007). There were 995 (69%) early respondents and 446 (31%) late respondents in the sample group. Results of independent sample t-tests showed that the two groups did not differ significantly in terms of the age and education of owner-managers, nor in age and size of firms. The results suggest that non-response bias does not appear to be an issue in this study.

Main analysis
Structural equation modeling (SEM) using a partial least squares (PLS) approach was used to test hypotheses $H_1$ and $H_2$ aided by the software called WarpPLS v. 2 (Kock, 2011). The PLS approach to SEM is a variance-based path analysis, which has the capability to deal with complex models with violations of assumptions of multivariate analysis such as multi-collinearity and non-normal data distribution (Kock, 2011). This software is particularly useful in the current study, as it has an algorithm to calculate the linearised composite scores of the four categorical data groups describing innovation.

Following Anderson and Gerbing's (1988) two-step approach to SEM, confirmatory factor analysis (CFA) was performed on all of the constructs in order to examine the validity and reliability of the constructs used in the study (Brown, 2006). Details of the CFA in Table 2 show that all of the items measuring each of the five constructs loaded highly on the pre-determined factors (Brown, 2006).

The measurement model fits the data well, as shown by the significant loadings of items in their corresponding constructs at $P<0.05$ with low cross-loadings, which indicates the convergent validity of the constructs. The values of Cronbach's $\alpha$, composite reliability coefficients and Joreskog's $\rho$ were all above the minimum threshold of 0.70, which indicates item homogeneity, consistency, scale reliability and construct validity (Fornell and Larcker, 1981; Bagozzi et al, 1991; Kock, 2011).

Table 3 shows the means, standard deviation, and correlations of the seven constructs and variables used in the succeeding analysis. The bold figures are the square root values of the average variance extracted (AVEs) of each construct. AVE$^2$ values that are higher than the correlation coefficient values of each construct relative to other constructs are indicative of discriminant validity (Fornell and Larcker, 1981; Bagozzi et al, 1991). Overall, the results of fitting the measurement model to the data suggest that the constructs used in this study have satisfactory levels of construct validity, internal consistency (i.e., reliability), and convergent, as well as discriminant validity.

The second step of Anderson and Gerbing's (1988) approach to structural equation modelling requires the development and testing of the structural model in order to test the hypotheses. The results of fitting the proposed structural models to the data are shown in Figure 2. The structural models show the path coefficients of the relationships between the three types of learning, innovation, and firm performance, as well as the coefficients of determination ($r^2$ values). Model A shows the direct
Table 2 The measurement model

<table>
<thead>
<tr>
<th>Constructs and indicators</th>
<th>Standardised factor loadings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Practice-based learning (AVE = 0.78)</td>
<td>a = 0.78 CRC = 0.83 p = 0.92</td>
</tr>
<tr>
<td>Carrying out everyday managerial work activities</td>
<td>0.93</td>
</tr>
<tr>
<td>Reviewing what I did and thinking about how to do it better</td>
<td>0.87</td>
</tr>
<tr>
<td>Discovering what does and does not work (trial and error)</td>
<td>0.85</td>
</tr>
<tr>
<td>Proximal learning (AVE = 0.73)</td>
<td>a = 0.76 CRC = 0.82 p = 0.92</td>
</tr>
<tr>
<td>Learning from suppliers or customers</td>
<td>0.79</td>
</tr>
<tr>
<td>Getting advice from an accountant/bank manager</td>
<td>0.80</td>
</tr>
<tr>
<td>Learning from other people running a business</td>
<td>0.96</td>
</tr>
<tr>
<td>Learning from family and/or friends</td>
<td>0.87</td>
</tr>
<tr>
<td>Distal learning (AVE = 0.65)</td>
<td>a = 0.79 CRC = 0.82 p = 0.87</td>
</tr>
<tr>
<td>Attending occasional off-site management training courses, seminars, and workshops</td>
<td>0.73</td>
</tr>
<tr>
<td>Being mentored or coached</td>
<td>0.72</td>
</tr>
<tr>
<td>Getting information from business events</td>
<td>0.88</td>
</tr>
<tr>
<td>Getting information from Chambers of Commerce, economic development agencies, and professional and industry associations</td>
<td>0.85</td>
</tr>
<tr>
<td>Innovation* (AVE = 0.66)</td>
<td>a = 0.85 CRC = 0.84 p = 0.88</td>
</tr>
<tr>
<td>Product or service innovation</td>
<td>0.89</td>
</tr>
<tr>
<td>Operational process innovation</td>
<td>0.75</td>
</tr>
<tr>
<td>Organisational/managerial process innovation</td>
<td>0.88</td>
</tr>
<tr>
<td>Sales or marketing innovation</td>
<td>0.70</td>
</tr>
<tr>
<td>Firm performance (AVE = 0.69)</td>
<td>a = 0.89 CRC = 0.81 p = 0.87</td>
</tr>
<tr>
<td>Turnover</td>
<td>0.85</td>
</tr>
<tr>
<td>Profitability</td>
<td>0.84</td>
</tr>
<tr>
<td>Productivity</td>
<td>0.80</td>
</tr>
</tbody>
</table>

*Linear index of scores using WarpPLS's algorithm for standardising categorical or binary data.

Legend:
AVE – average variance extracted
a – Cronbach's alpha
CRC – composite reliability coefficient
p – Joreskog's rho

Table 3 Means, standard deviations, and correlations of variables

<table>
<thead>
<tr>
<th>Constructs and variables</th>
<th>Mean</th>
<th>SD</th>
<th>PRAC</th>
<th>PROX</th>
<th>DIS</th>
<th>INNOV</th>
<th>PERF</th>
<th>FS</th>
<th>FA</th>
<th>EDU</th>
</tr>
</thead>
<tbody>
<tr>
<td>Practice-based learning (PRAC)</td>
<td>3.10</td>
<td>0.29</td>
<td>0.88</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Proximal learning (PROX)</td>
<td>2.45</td>
<td>0.80</td>
<td>0.34*</td>
<td>0.85</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Distal learning (DIS)</td>
<td>1.65</td>
<td>0.20</td>
<td>0.28*</td>
<td>0.59*</td>
<td>0.81</td>
<td></td>
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<tr>
<td>Innovation (INNOV)</td>
<td>1.05</td>
<td>0.19</td>
<td>0.28*</td>
<td>0.28*</td>
<td>0.27*</td>
<td>0.81</td>
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<tr>
<td>Performance (PERF)</td>
<td>2.75</td>
<td>1.48</td>
<td>0.22*</td>
<td>0.17*</td>
<td>0.13*</td>
<td>0.26**</td>
<td>0.83</td>
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<tr>
<td>Firm size (FS – No. of employees)</td>
<td>8.32</td>
<td>12.25</td>
<td>0.05</td>
<td>0.06</td>
<td>0.09</td>
<td>0.11*</td>
<td>0.12</td>
<td>n/a</td>
<td></td>
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<tr>
<td>Firm age (FA – No. of years)</td>
<td>12.18</td>
<td>10.50</td>
<td>0.11</td>
<td>0.07</td>
<td>0.05</td>
<td>0.08*</td>
<td>0.15</td>
<td>0.15**</td>
<td>n/a</td>
<td></td>
</tr>
<tr>
<td>Educational qualifications (EDU)</td>
<td>4.19</td>
<td>1.26</td>
<td>0.09</td>
<td>0.08</td>
<td>0.10</td>
<td>0.11</td>
<td>0.09</td>
<td>0.08</td>
<td>0.07</td>
<td>n/a</td>
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*P<0.05; **P<0.01.
n/a – not applicable/not a construct.

The model suggests that practice-based learning has the strongest impact on innovation, followed by distal learning and proximal learning, respectively. Innovation, on the other hand, has positive and significant impacts on firm performance. The three types of learning (along with the four control variables) explain approximately 26% of the variation in the firms’ innovation activities,
whereas the latter explains approximately 13% of the variation in firm performance. Using Cohen’s (1992) recommended approach to measure effect size, the equivalent Cohen’s $r^2$ values for the learning-innovation relationships and innovation–firm performance relationships are 0.35 (large effect size) and 0.15 (medium effect size), respectively, which suggest that the significant path coefficients are substantially meaningful, from which implications can be validly drawn. Finally, the average r-square and average path coefficient values are all significant at $P < 0.01$, and the average variance inflation factor (AVIF) is much lower than the acceptable maximum threshold of 5. These goodness-of-fit parameters suggest that the structural model fits the data well.

However, a graphic analysis of the significant path coefficients using the ‘warping’ function of WarpPLS (Kock, 2011) shows the curvilinear relationships between the variables. As shown in Figure 3, firm performance drastically increases as the levels of innovation increase, but the latter’s effects on firm performance tend to flatten and then slightly curve downward after it reaches a certain point (i.e., the point of inflection). This slightly inverted u-curve suggests that while innovation has positive effects on firm performance, its effects tend to attain an optimal level at some point and then diminish over time, indicative of the finite positive effects of innovation on the firm’s overall performance outcomes.

The same implications can be drawn from the diminishing positive effects of the three types of learning activities on innovation. The results suggest that engagement in learning activities can only have positive effects on innovation, and the latter can only have positive effects on firm performance, up to a certain extent, after which other confounding variables, which were unaccounted for by the current structural model, may explain effectively the variations in the firm’s level of innovation and firm performance. Finally, the firm size tends to show a positive and linear relationship with innovation, whereas firm age tends to show a positive but curvilinear relationship with innovation.

**Discussion**

The current study aims to gather empirical evidence about the relationships between KA, KE, and firm performance in the context of small firms. The study measured a facet of KA by describing the engagement of owner-managers in three types of learning activities, namely, practice-based, proximal, and distal learning.
It then measured a facet of KE by describing the innovation activities of the sample firms. Firm performance was measured by describing the firm’s current turnover, productivity, and profitability, as perceived by the owner-managers relative to the previous year. The findings show that the owner-managers’ engagement in the three types of learning is significantly associated with higher levels of innovation among the sample firms. Practice-based learning has been shown to have the greatest impact on innovation, followed by distal and proximal learning, respectively. These findings highlight three important considerations.

First, these findings support the view discussed earlier that the role of knowledge generation and absorption at the individual level is key to KM in the context of small firms. The KBV underscores the importance of knowledge for the value-creating activities of firms such as innovation. The upper echelons theory underscores the important role of the owner-manager, as the firm’s key strategic decision-maker, in the KM processes within a small firm. The findings offer strong evidence on the role of individual and managerial-level learning activities as a precursor to the innovative undertakings of a small firm. Through managerial learning, a small firm absorbs knowledge that has been shown to have strong positive effects on innovation. Innovation, on the other hand, describes the extent to which a firm is able to exploit its knowledge-based resources to create value for the firm, as manifested by better performance outcomes.

Second, the novelty of the findings rests on the empirical evidence linking a micro-level variable, that is, the owner-manager’s engagement in learning activities, and a firm- or meso-level variable, that is, the innovation of the sample firms. The KBV and upper echelons theory provide a solid theoretical foundation explaining the unique KM processes that are likely to occur within small firms. The results of the study generally support the view that the KA-related activities undertaken by the owner-managers of the sample firms have a strong influence on the overall KE undertakings of the firm, which, in this case, are manifested by innovation at the firm level. More specifically, however, the study provides evidence of the effect of different types of knowledge acquisition strategies on innovation. Knowledge can generally be acquired both internally and externally (Cohen and Levinthal, 1990). Results show that knowledge acquired within the firm through the learning potential that is inherent in the goal-directed activities of everyday management practice has the strongest impact on innovation in the small-firm context. This type of knowledge acquisition has tended to be neglected in previous studies. Instead, previous research has focused predominantly on knowledge acquisition from outside the firm, such as from customers, suppliers, or business peers, as that is considered to increase the absorptive capacity of firms (Cohen and Levinthal, 1990). Although we did find some effects of distal and proximal learning (i.e., external knowledge acquisition), the effects were weaker compared with practice-based learning (i.e., internal knowledge acquisition).

Third, the findings showing the positive impact of innovation on firm performance lend further credence to the main argument advanced in this study that KA and KE can potentially endow firms with competitive advantage that enables the firms to reap positive rates of return from their business operations. The findings suggest that through learning, owner-managers can channel and deploy knowledge into the firm which fuels innovation, which, in turn, generates positive outcomes in terms of the overall performance of the firm.

The findings about curvilinear relationships are indicative of the finite and beneficial effects of engagement in learning activities on innovation, and of innovation on firm performance. Therefore, the notion of ‘the more, the better’ does not apply in relation to the effect of managerial learning on innovation and, in turn, firm performance. Instead, managerial learning positively impacts on innovation but only to a certain extent, after which the effects diminish. It can be argued that particularly in small firms, the managerial capability of the business owner provides the foundation for innovation. The influence of the owner-manager, however, decreases once the firm has reached a certain innovation level. Beyond this point, factors, such as technological capability, access to external funding or skilled staff might become more important. Similarly, it can be argued that innovation is not the only practice that contributes to firm performance. Firm performance is driven by a complex bundle of variables that consists of individual, firm, and macro-economic variables that are likely to change over time, that is, it is multi-dimensional and dynamic. As indicated in the literature review, recent research tends to agree that innovation has at least some impact on firm performance. However, the lack of longitudinal research and a wide variation of definitions and measurements of innovation and firm performance mean the multi-dimensional and dynamic aspects of the relationship between the two variables are still not well understood.

In summary, it can be concluded that other potential confounding variables, unaccounted for by the current study, may explain as effectively the innovation and performance of the sample firms in particular, and KA and KE in a small-firm context in general. Second, learning and innovation as facets of KA and KE, respectively, are resource-hungry endeavours and their organisational benefits can only be adequately measured longitudinally. The design of the current research may have only captured a snapshot of the benefits of learning on innovation, and of the latter on firm performance.

Because of the inconsistent findings on the relationship of firm size and age on innovation in previous studies, it was considered important to include both as control variables. In relation to firm size, our findings are supportive of the RBV (Barney et al, 2001) of the firm. Larger firms were able to call upon greater levels of resources compared with micro firms. In relation to
firm age, our findings contradict a recent meta-analysis undertaken by Rosenbusch et al. (2011), who argue new ventures benefit more from innovation compared with mature firms because of their inherent flexibility. Instead, our findings partly support the view that the specialisation of resources, as firms mature, is more important.

Conclusion and implications for future studies

KM does happen in small firms too, relative to their inherent uniqueness, structural simplicity, and resources. That KM is highly relevant and important in the survival and management of the sample small firms, is a highlight of the current study. In small firms, the role of the owner-manager cannot be over-emphasised. When they engage in learning activities, they (un)knowingly engage in KA-related endeavours that are essential to a critical KE-related activity of the firm, that is, innovation. The more the owner-managers of the sample firms learn and absorb knowledge, the more their firms become innovative. Innovation, in turn, sustains the positive performance outcomes of the sample firms. The positive effects of organisational learning on innovation, and of innovation on firm performance, are hardly surprising or novel in the extant literature focusing on large and corporate firms. However, the current study's findings about the impact of managerial learning as a form of KA on innovation as a facet of KE in small firms underscore the relevance and importance of KM, even in a small-firm context.

However, the authors of the current study recognise a number of limitations. First, the current study's use of managerial learning and firm innovation capability as proxies for KA and KE suggests that there are other mechanisms through which firms can engage in KA and KE in particular and KM in general. Second, the study did not take into account the nature, type, volume, or magnitude of tacit or codified knowledge that owner-managers absorb when they engage in various learning activities. Third, the focus on the direct relationship between KA and KE precludes other important KM processes, such as those suggested by Cohen and Levinthal (1990) in their concept of absorptive capacity, which enables the firm to undertake innovative undertakings. Fourth, the measurement of innovation in the current study does not take into account the various facets and types of innovation, as suggested by other studies such as radical, incremental, disruptive, ground-breaking, or cutting-edge types of innovation (Damanpour, 1991; Hult et al., 2004). Fifth, the cross-sectional nature of the current study is limited in its ability to capture the incremental and long-term impacts of learning. Sixth, only engagement in learning activities in the last 12 months has been considered. Although it can be argued that these activities are indicative of an attitude towards learning, learning activities often require a longer period to produce innovation. This limitation could potentially bias the results, particularly the effect of distal and proximal learning on innovation. Nonetheless, these limitations can be addressed in future studies dealing with KM in the context of small firms.

Finally, the findings of the current study have important managerial and policy implications. From a managerial point of view, KM in general, and learning in particular, does not necessarily have to be an expensive and formal academic exercise. The findings suggest that learning-by-doing is an effective KA mechanism if it becomes a conscious and continuous learning process instituted within a small firm. Building on social and inter-organisational networks is another important managerial channel for learning that is readily accessible to an owner-manager of a small firm. At the policy front, government policies and business support programs can be designed to encourage learning that is relevant to the shopfloor. Such programs will make learning and management development more relevant and responsive to the KM needs of owner-managers of small firms.

References


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