Managing Knowledge and Innovation for Performance

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Abstract

This research examined the extent to which knowledge and innovation management practices contribute to innovation performance. A model of Systematic Innovation Capability consisting of various building blocks of innovation and linked to innovation performance and business success framed the study. A quantitative survey of 1,579 Australian managers was conducted to determine the extent to which various practices relating to systematic and sustained innovation were prevalent in the respondent organizations. The analysis of the data revealed the major predictors of innovation performance. The relationship between innovation performance and business performance across the respondent organizations was also examined.

1. Introduction

Speculation abounds concerning why certain companies outperform others. However, in knowledge-based environments, the key to unlocking competitive advantage resides in acquiring, using and re-using knowledge assets in effective ways [1]. Human, relational, structural and social capital all contribute to knowledge-based capital and this contribution in turn supports the innovation capability of organizations [2]. However, harnessing knowledge resources is a complex endeavor because although intangible assets drive growth, they are difficult to imitate [3]. Understanding how competitive advantage derives from these intangible assets is important because an organization's human or intellectual capital might be its only source of competitive advantage.

In knowledge intensive organizations [KIOs], the capacity for innovation is linked increasingly to intangible assets. However, despite the extensive literature on innovation, it is difficult to determine which particular innovation activities and processes might explain the differences across organizations concerning innovation performance [IP] and business success. The ways in which intangible assets are managed, therefore, become a strategic concern when seeking factors for innovation success. Within this focus, the literature indicates that knowledge management [KM] plays a significant role in the process of achieving innovation capability that leads to IP.

Following Du Plessis [4], innovation is highly dependent on managing knowledge in ways that align knowledge to the innovation process. Furthermore, the increasing amount of knowledge now available to organizations increases the speed of innovation processes. Prahalad and Krishnan [5], for example, highlight the "dynamic reconfiguration of resources" in IT and its significant impact on contemporary business models. Rapid changes in the application of technologies and the interconnectedness of the global business environment work to increase the complexity of innovation create shorter product lifecycles and produce higher rates of new product development.

Knowledge and innovation are inextricably linked because innovation involves the mobilization of knowledge [6]. Therefore, sustainable innovation has human, social and management dimensions and the imperative for KIOs is to manage knowledge effectively in order to harness knowledge as a catalyst for innovation [7] [5].

The study is significant because it articulates the close relationship between knowledge and innovation and the ways in which the management of knowledge and innovation within organizations leads to IP and business success. The results of this study also shed light on innovation activities and processes and the implications of these elements for managers seeking to achieve greater levels of systematic and sustainable IP within their organizations.

2. Literature Review

As competition in business and industry continues to grow, the demand for effective KM to support innovation in knowledge-intensive industries also increases. In this context, the strong links between forms of knowledge and modes of innovation motivate organizations to manage their knowledge

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assets proactively to achieve innovation capability and IP [8]. To this end, the manner in which organizations approach KM influences IP.

At a conceptual level, KM includes definitions of knowledge and descriptions of the underlying principles, practices and frameworks used in organizational contexts. At the level of process, critical concerns include understanding the blueprints for KM and the role of an organization's information technology [IT] infrastructure. Organizational perspectives in KM include organizational culture, structure, strategy, core competencies and strategic capabilities. At the management level, one could examine various management practices such as staffing, employee development, compensation, rewards, leadership styles and motivation. Implementation factors might include KM strategy and approaches, success factors and evaluation issues.

Model of Systematic Innovation Capability

A model of Systematic Innovation Capability developed from previous research frames this research [9] [10] is presented in Figure 1. These elements of systematic innovation formed the basis for the questionnaire items in this study.

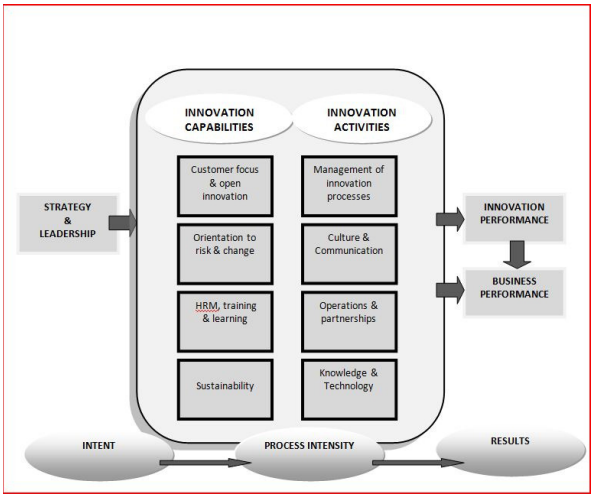

Figure 1. Systematic Innovation Capability Model

A substantial body of literature speaks to the ways in which the effective management of knowledge enhances and supports activities and processes within each of the building blocks of innovation depicted in the Systematic Innovation Capability model. In supporting innovation strategy, knowledge is crucial to developing and adapting innovation strategies to changing circumstances to foster growth and create value [11]. KM also supports creative leadership that develops social and human capital to stimulate innovation within organizations [12]. Paulsen *et al.* [13] found that KM supports change management and mediates the relationship between transformational leadership and team innovation.

Effective KM also facilitates collaboration and customer engagement, thus supporting open innovation and a strong customer focus [14]. Mahr and Lievens [15] highlight the role of virtual lead user communities as drivers of knowledge creation for innovation. Other research identifies KM systems as a major factor supporting open innovation [16]. Spithoven *et al.* point to an organization's absorptive capacity, or the ability to absorb external knowledge as a significant precondition of successful open innovation [17].

In reducing risk and facilitating change, KM assists managers in identifying specific organizational, technological or market-based risk factors that might influence new product development [18]. Knowledge-based risk management frameworks also increase the success of innovative IT projects [19]. Osborne and Brown [20] also discuss the role of KM in managing and supporting innovation in public services through effective risk management.

KM also serves as a mediator between HRM practices and increased innovation activity [21]. Chen and Huang [22] found that KM capacity plays a mediating role between strategic HRM practices and IP. Organizational learning also depends on effective KM linked to technical innovation [18]. Based on a framework of knowledge, organizational learning positively influences both innovation and business performance [23]. Foss *et al.* [24] found that organizations improve their innovativeness through rewarding employees for acquiring and sharing knowledge. KM also plays a significant role in developing employee capabilities to support innovation [25].

KM also contributes to innovation and sustainability operations through a focus on knowledge and learning [26]. Quist and Tukker's [27] study found that knowledge collaboration and learning provides considerable support for sustainability and innovation across niche, incremental and systemic forms of innovation. KM also supports information systems innovation that enables and transforms sustainable practices and processes in organizations [28].

Effective management of innovation processes is dependent on the systematic gathering, sharing and dissemination of knowledge in addition to the coordination of knowledge activities [29]. KM is also

crucial for managing inputs to the decision making process [30]. For McAdam [7], the construction, embodiment, dissemination and use of knowledge supports innovation process management.

A study by Donate and Guadamilla [31] found that a knowledge-based organizational culture strongly supports a firm's technological performance. A robust organizational culture focused on knowledge [32] and supported by intensive vertical and lateral communication channels [24] also enhances IP. Moreover, an organizational culture characterized by strong quality management practices with a focus on continuous improvement contributes to innovation [33].

The pivotal role of KM in capturing knowledge for innovation is well documented. Dougherty's [34] work in the service sector focuses on the benefits of capturing practice-based knowledge to grow innovation. KM can also assist in environmental scanning to support breakthrough innovation [35]. Knowledge also forms the backbone of customer relationship management that contributes to the development of enhanced innovation capability [36].

Concerning links between knowledge and technology, KM assists with the broadening of knowledge sources to increase innovation capacity [37], in facilitating inter-organizational knowledge flows [38] and managing technology strategies to support innovation [39].

Table 1 below encapsulates the contributions of KM within each of the building blocks of innovation.

STRATEGY & LEADERSHIP	**CUSTOMER FOCUS/OPEN INNOVATION**	**ORIENTATION TO RISK & CHANGE**
* Supporting strategy focused on innovation * Knowledge development to support creative CEO leadership * Guiding transformational leadership	* Facilitating collaboration and customer engagement * Engaging lead users * Knowledge to manage open innovation * Knowledge to enhance absorptive capacity	*KM to support risk mgmt strategies * Providing a knowledge based framework for IT risk strategy * Knowledge to manage and support innovation through risk management

HRM, TRAINING & LEARNING	**SUSTAINABILITY FOCUS**	**MANAGE INNOVATION PROCESSES**
* Collaboration between HRM & innovation activities * KM to enhance strategic HRM capacity * Organizational learning to support innovation * Develop employee capabilities and rewards for innovation and knowledge work	* Knowledge collaboration to support sustainable innovation * Knowledge to support learning for sustainable innovation * Knowledge to support innovation for environmental sustainability	* Systematic gathering, sharing & dissemination of knowledge * Providing coordination & managing inputs to the decision making process * Construction, embodiment, dissemination and use of knowledge to support innovation process management

COMMUNICATION & CULTURE	**OPERATIONS & PARTNERSHIPS**	**KNOWLEDGE & TECHNOLOGY**
* Knowledge centered org culture facilitates innovation * Strong culture can support technical innovation * Intensive vertical and lateral communication *quality & improvement focus	* Capturing practice based knowledge for innovation * Knowledge for environmental scanning to support breakthrough innovations * Supporting technology-based CRM	* Broadening of knowledge sources * Facilitating inter-organizational knowledge flows * Managing technology strategy to support innovation

Table 1. Contributions of KM across the Building Blocks of Innovation – summary of literature

Little consensus exists in the literature concerning the definition and nature of IP. For Ryan [40], IP has two main parameters - the quantity and quality of ideas feeding innovation and the efficiency and effectiveness of the implementation of these ideas circumscribe the innovation process. While the two parameters exist independently within organizations, this research employs "innovation performance" as a surrogate term to capture the benefits that accrues from the management and deployment of organizational resources, including systems, processes, human capital and knowledge capital. Ryan's two parameters, interpreted here as two independent constructs, only deliver benefits to an organization when combined with strategic intent and continuous improvement activities. In effect, IP becomes a significant measure of the value created by an organization.

Measuring innovation takes many forms and can involve assessing diverse areas such as innovation strategy, capability development, processes, people and culture. A major aim of this survey was to determine the nature and extent of strategic innovation capability that leads to IP and ultimately to business performance. Consequently, a range of measures to assess IP was adopted, as well as a separate set of measures designed to evaluate business performance. These measures are displayed in Table 2 below.

Innovation Performance Indicators
• Return on innovation spending • New product/services success ratio • Responsiveness to the market • Number of new products and/or services • Enhancing existing products and/or services • Revenue arising specifically from new products and/or services • Level of employee engagement • Cost reductions • Number of patents secured.
Business Performance Indicators
• Revenue growth • Cash flow • Differentiation of products and/or services • Profitability • Long-term competitive advantage • Productivity • Customer satisfaction • Cost advantages.

Table 2. Innovation performance and Bbsiness performance indicators

These indicators are based on generally recognized and accepted measures found in the business and innovation literature that have been validated through previous case studies and surveys [41] [42] [40] [10][43]. While business performance is heavily dominated by profit drivers such as revenue growth, cash flow and profitability, IP measures have a broader focus and include such dimensions as product and/or service development, employee engagement and responsiveness to or leadership of the market.

3. Methodology

The following research questions [RQs] frame the research study:

RQ1. To what extent do knowledge and innovation management practices contribute to innovation performance?

RQ2. Which particular knowledge and innovation management practices are significant predictors of innovation performance?

R**Q3**. To what extent are innovation performance and business performance linked?

The study focused on the close links between knowledge and innovation and the ways in which both knowledge management [KM] and innovation management [IM] practices contribute to IP.

The methodology consisted of a literature review and the development of a model of systematic innovation capability, followed by a quantitative component. From the literature, a number of processes and relationships used by successful organizations to deliver IP and business value were identified. The contribution of these building blocks of innovation-to-innovation performance were then tested through a survey of 1,579 managers.

Several hypotheses concerning the relationship between knowledge and innovation management practices and IP were then developed. A survey approach was employed to test the hypotheses derived from the literature and the research model. Following generally accepted survey design principles [46], the questionnaire was developed based on the domain of the constructs; it was also pretested, and piloted prior to conducting the large-scale study.

The questionnaire was directed to members of the Australian Institute of Management, the largest professional management body in Australia, through an invitation to participate in an anonymous online survey on innovation. The comprehensive questionnaire consisted of 20 demographic items and 82 multiple-choice items exploring the extent to which various elements of knowledge and innovation capability, activities and performance were evident in the respondent organizations. The online survey was attempted by 2,499 and fully completed by 1,579 respondents. Respondents included managers from a wide range of organizational types and sizes, with the majority of respondents representing professionals, middle level management or top-level management. It was assumed that as all respondents had managerial responsibilities, they would have a better than average knowledge of innovation practices within their respective organizations.

It should be noted that while email sampling techniques pose the same issues as paper-based sampling concerns, they cannot claim to be representative of all organizations or indeed all managers [47] [48]. However, non-response bias was evaluated using a chi-square test of goodness of fit of various demographic variables, which indicated that there were no significant differences between various demographic variables such as industry, organization type, size, sector, operating scope and respondents' position.

The hypotheses below were developed from the literature as well as from the application of the theoretical framework (the Systematic Innovation Capability model) which was based on previous qualitative research [9] [43] [44]:

H1. A strategic focus on innovation and leadership support are significant and positive predictors of innovation performance.

H2. Creating value through open innovation and collaboration with customers leads to innovation performance.

H3. A focus on change and a willingness to take calculated risks results in innovation performance.

H4. A focus on people, capability development, investment in training and rewards for innovation contributions are significant and positive predictors of innovation performance.

H5. Monitoring and improving environmental, social and community impact for sustainability enhances innovation performance.

H6. Robust management of innovation processes leads to innovation performance.

H7. Effective communication, common understandings and embedding of innovation in daily work life are significant and positive predictors of innovation performance.

H8. Investment in technology, effective knowledge capture, alignment between business strategy and technology are significant and positive predictors of innovation performance.

H9. Capturing knowledge effectively, building external relationships and responding to technological change are significant and positive predictors of innovation performance.

The above hypotheses were derived not only from the literature but also from the application of the theoretical framework to articulate the role of knowledge and innovation management practices across the nine building blocks of innovation. It was postulated that certain knowledge and innovation management practices are better predictors of IP than others are.

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H1 to H9 were tested using the data collected through the responses (n=1,579) to the survey. In testing the hypotheses through regression analysis, the purpose was to establish empirically whether particular management practices relating to KM are better predictors of IP than others are.

4. Major Findings

The literature review indicated that knowledge and innovation are inextricably linked, and that effective KM practices can make a significant impact to achieving IP and business success. Using a theoretical framework derived from the literature on innovation as well as previous exploratory research, various building blocks of innovation were identified. Within each building block a number of knowledge an innovation management practices were identified and these were included in a comprehensive survey undertaken by a large cohort of Australian managers.

The statistical analysis identified specific predictors of IP. The responses of the participants suggest that certain knowledge and innovation management practices are significant and positive predictors of IP. While the R square values may not be as high as might be desired, they are still considered to be of statistical significance in business and social science research. VIF and tolerance checks were made to ensure that multicollinearity was not an issue, that Durbin-Watson values were also within acceptable limits, and the normality assumption was tested and met. Residual plots displayed normal patterns. The results of the multiple regression analysis are displayed below:

Table 3. Multiple regression results

H1

Strategy and Leadership					
Multiple R		.409			
R square		.167			
Adjusted R square		.165			
Standard error		.913			
ANOVA	DF	Sum of Square		Mean Square	
Regression	4	263.418		65.854	
Residual	1574	1314.582		.835	
F=78.850				Sig F=.000	
Variables		B	Beta	T	Sig
Innovation prioritized in strategy		.132	.235	7.724	.000
Leaders are role models for innovation		.052	.094	2.473	.014
Managers get involved in innov projects		.047	.080	2.167	.030
Decision making decentralized		.042	.084	3.157	.002
Senior leadership support for innovation		.019	.043	1.526	.127

H2

Customer Focus/Open Innovation					
Multiple R		.422			
R square		.178			
Adjusted R square		.176			
Standard error		.907			
ANOVA	DF	Sum of Square		Mean Square	
Regression	4	281.470		70.368	
Residual	1574	1296.530		.824	
F=85.427				Sig F=.000	
Variables		B	Beta	T	Sig
Creating new value a priority		.079	.121	3.949	.000
Cust feedback actively sought		.063	.099	3.161	.002
Collaborate w outside partners		.073	.125	4.012	.000
Ideas come from external sources such as lead users		.103	.189	6.453	.000

H3

Orientation to Risk and Change					
Multiple R		.430			
R square		.185			
Adjusted R square		.182			
Standard error		.904			
ANOVA	DF	Sum of Square		Mean Square	
Regression	5	291.737		58.347	
Residual	1573	1285.914		.818	
F=71.354				Sig F=.000	
Variables		B	Beta	T	Sig
Top mgmt focuses on org change		.042	.069	2.325	.020
We implement changes effectively		.060	.105	3.371	.001
Org has strategy for managing risk		.033	.055	1.884	.060
Org willing to take calculated risks		.077	.129	4.117	.000
We project manage innovation		.103	.185	6.207	.000
Our organization embraces change		.014	.024	.654	.513

H4

HRM, Training and Learning					
Multiple R		.469			

R square		.220			
Adjusted R square		.216			
Standard error		.885			
ANOVA	DF	Sum of Square		Mean Square	
Regression	7	346.432		49.490	
Residual	1571	1231.342		.784	
F=63.130				Sig F=.000	
Variables			B	Beta	T	Sig
T&D focused on innovation			.048	.087	2.535	.010
Recruitment focus on innovation			.056	.106	2.838	.005
Employee capabilities re: innovation			.096	.182	4.815	.000
Financial rewards for innovation			.022	.046	1.566	.147
Personal recognition for innovation			-.010	-.018	-.538	.513
Employees learn from mistakes			.026	.046	1.451	.147
Teamwork is emphasized			.057	.020	2.889	.004
Employee satisfaction measured			.017	.032	1.128	.260

H5

Sustainability					
Multiple R		.330			
R square		.109			
Adjusted R square		.107			
Standard error		.945			
ANOVA	DF	Sum of Square		Mean Square	
Regression	4	172.190		43.047	
Residual	1574	1405.810		.893	
F=48.198				Sig F=.000	
Variables			B	Beta	T	Sig
We measure our environmental impact			.051	.102	1.972	.049
We work to improve our envir impact			.037	.069	1.320	.187
We measure social/comm impact			.036	.066	1.273	.203
We work proactively to improve our social & community impact			.075	.132	2.631	.009

H6

Management of Innovation					
Multiple R		.595			
R square		.354			
Adjusted R square		.352			
Standard error		.805			
ANOVA	DF	Sum of Square		Mean Square	
Regression	6	558.948		93.158	
Residual	1572	1019.052		.648	
F=143.706				Sig F=.000	
Variables			B	Beta	T	Sig
Assessing risk v potential value			.050	.086	2.685	.007
Idea generation			.072	.123	3.214	.001
Prioritizing innovation ideas			.033	.058	1.390	.165
Killing off underperforming projects			.070	.156	4.201	.000
Balancing portfolio pipeline of innov			.078	.156	4.201	.000
Capturing value from innov projects			.072	.135	3.498	.000
Opportunity identification			-.017	.022	-.029	.434
Developing & implem innov projects			.011	.019	.495	.621

H7

Culture and Communication					
Multiple R		.463			
R square		.215			
Adjusted R square		.213			
Standard error		.887			
ANOVA	DF	Sum of Square		Mean Square	
Regression	4	338.609		84.652	
Residual	1574	1239.391		.787	
F=107.507				Sig F=.000	
Variables			B	Beta	T	Sig
Employees strive to improve org processes			.061	.091	3.091	.002
Common understandings re innovation			.098	.175	4.767	.000
Innovation embedded part of daily work			.112	.205	5.574	.000
Employees are highly skilled			.057	.080	3.076	.002
Opportunity for informal conversations			.019	.043	1.526	.127

H8

Operations and Partnerships					
Multiple R		.517			
R square		.267			
Adjusted R square		.266			
Standard error		.857			
ANOVA	DF	Sum of Square		Mean Square	
Regression	4	422.057		105.514	
Residual	1574	1155.943		.734	
F=143.674				Sig F=.000	
Variables			B	Beta	T	Sig
Org knowledge is captured			.046	.077	3.277	.001
Sufficient investment in technology			.051	.094	3.110	.002
We benchmark competitors			.126	.256	10.164	.000
Business strategy & tech aligned			.125	.228	7.189	.000
Processes are well defined, sequenced			.012	.019	.677	.499

H9

Knowledge and Relationships					
Multiple R		.550			
R square		.302			
Adjusted R square		.300			
Standard error		.836			
ANOVA	DF	Sum of Square		Mean Square	
Regression	4	476.790		119.197	
Residual	1574	1101.210		.700	
F=170.373				Sig F=.000	
Variables			B	Beta	T	Sig
Tech knowledge comes from suppliers			.085	.152	5.709	.000
Tech knowledge comes from customers			.049	.094	2.629	.000
Customer knowledge enhances understand			.119	.238	6.565	.000
We rapidly respond to tech changes in our industry			.099	.190	7.649	.082

5. Discussion

The analysis of the data identified a number of significant predictors of IP across each of the nine 'building blocks' of innovation. The most significant predictors of innovation are listed in Table 3.

Table 4. Predictors of innovation performance

Strategy & Leadership
Innovation is prioritized in the business strategy
Decision making is decentralized
Leaders are role models for innovative behavior
Customer Focus/Open Innovation
Ideas come from external sources such as lead users
We collaborate with outside partners
Developing and creating new value is a priority
Orientation to Risk and Change
We project manage our innovation activities
The organization is willing to take calculated risks
We implement changes effectively
HRM, Training & Learning
Clearly articulated employee capabilities relate to innovation
Teamwork is emphasized
Recruitment & selection focuses on innovation
Sustainability
We work proactively to improve our social and community impact
We measure our environmental impact
Innovation Process Management
Balancing a portfolio pipeline of innovations
Killing off underperforming projects
Capturing value from innovation projects
Idea generation
Culture & Communications
Innovation is an embedded part of daily work
There is a common language and understanding re: innovation

Employees strive to improve org processes
Employees are highly skilled
Operations and Partnerships
Business strategy and technology are aligned
We benchmark competitors
Organizational knowledge is captured
Sufficient investment in technology
Knowledge and Technology
Customer knowledge enhances understanding
Technological knowledge comes from suppliers
Technological knowledge comes from customers

Concerning strategy and leadership, the prioritization of innovation in the business strategy and a decentralized decision making process were the most significant predictors of IP. This points to the importance of identifying innovation as a strategic priority, by ensuring that innovation is a significant driver of business plans. A decentralized decision making process likely allows for a range of inputs and knowledge sharing across the organization to support innovation. Still significant, but to a lesser degree, were leaders whom act as role models for innovation and encourage managers to get involved in innovation projects. Paradoxically, senior leadership support for innovation was not linked to IP; this might indicate that hands-on leadership and management support makes the difference in driving innovation projects forward.

A strong customer focus where customer feedback is actively sought and where ideas come from external sources such as lead users is strongly linked to IP. Collaboration with outside partners was also strongly associated with IP, while a focus on creating new value for customers was the most significant predictor. This highlights the pivotal role of the customer in all business enterprises.

A willingness to take calculated risks and a record of accomplishment of implementing change effectively were significant precursors of IP. This is not surprising, as innovation is clearly about change. Less significant was a top management focus on organizational change and a strategy for managing risk. This may indicate that an appetite for risk and a proactive approach to change management are more important than embedding risk management in strategy and at the top level of management.

Taking an active project management approach to innovation activities was also linked to IP, perhaps because such an approach allows risk to be assessed across several stages of a project. Curiously, whether or not the organization embraced change did not appear to have any impact on IP. The effective implementation of change, however, is significant for achieving IP.

In terms of HRM, the development of employee capabilities related to innovation was the most significant predictor of IP, followed by a culture of teamwork and a recruitment focus on innovation. The articulation of desirable employee capabilities linked to innovation will guide the recruitment and selection process to identify candidates with the best 'fit' for an innovative organization.. Training and development for innovation also contributes to IP performance. Financial rewards and personal recognition for innovation contributions were not shown to be related to IP, although financial rewards had more of an influence than personal recognition. This indicates that performance management systems should be scrutinized carefully to ensure alignment across the entire HRM function. The least significant predictor of IP in this area involved the measurement of employee satisfaction, an area that warrants further investigation.

Measurement of innovation processes involves moving projects from idea generation through to commercialization stage, with the ultimate aim of capturing value. IP was strongly linked to the processes of idea generation, balancing an ongoing portfolio pipeline of projects, and 'killing off' underperforming projects, thereby capturing value from innovation. The development and implementation of innovation projects alone did not contribute to IP; this indicates that the proactive management of innovation processes is essential for achieving IP.

In the context of organizational culture and communication, a common understanding of innovation and the embedding of innovation into daily work processes were found to be strongly linked to IP, followed by a high level of employee skills and an employee focus on continuous improvement. The opportunity for informal conversations among employees did not have a significant impact on IP, which may indicate that decentralization of decision-making structures and a team atmosphere are more crucial for achieving IP, as both of these processes would enhance the opportunities for knowledge sharing through informal conversations.

From an operations perspective, a number of processes and activities contributed to IP. These include a strong alignment between the business strategy and technology, investment in technology, effective knowledge capture and the benchmarking of competitors. This points to the importance of proactive management of innovation that results in business performance. The definition and sequencing of processes did contribute significantly to IP; it may be that rigid structuring of organizational processes may inhibit creativity and lateral thinking that often results in innovative outcomes.

The provision of technological knowledge from both customers and suppliers was found to be critical to levels of IP. Rapid responses to technological change in the industry were less significant. This may indicate that the relationships with customers and suppliers are the essence of value creation in the innovation process, as opposed to staying one-step ahead of competitors.

The results also indicated a high level of correlation between the individual constructs or building blocks of innovation. This would indicate that if systematic and sustainable IP is desired, it is important to consider all aspects of the building blocks of innovation. It would appear that IP leading to BP requires a holistic approach across a range of innovation activities in order to maximize IP, from strategy and leadership through to HRM, attitudes to risk and change, knowledge and partnerships as well as operations and process management.

Innovation Performance and its Impact on Business Performance

Following the multiple regression analysis, the relationship between IP and BP was investigated across the respondents' organizations. Respondents were asked to rate their organizations across a range of IP and BP indicators (see Table 2) The average score across the range of IP and BP indicators was then calculated for each respondent organization to achieve and Innovation Performance Score and a Business Performance Score.

The top quartile (top 25%) of innovation performers were compared to the bottom quartile (bottom 25%) of innovation performers were compared across the eight indicators of business performance. The results are displayed in Figure 2.

Clearly, there are stark differences between innovation performers and non-performers across all of the measures of BP. The top 25% outperformed the bottom 25% across all areas, particularly in terms of productivity, differentiation, achieving cost advantage and competitive. It is interesting to note that top and bottom quartile performers scored closest on the measure of customer satisfaction, which indicates that this measure is the most significant for all organizations wishing to achieving success in innovation.

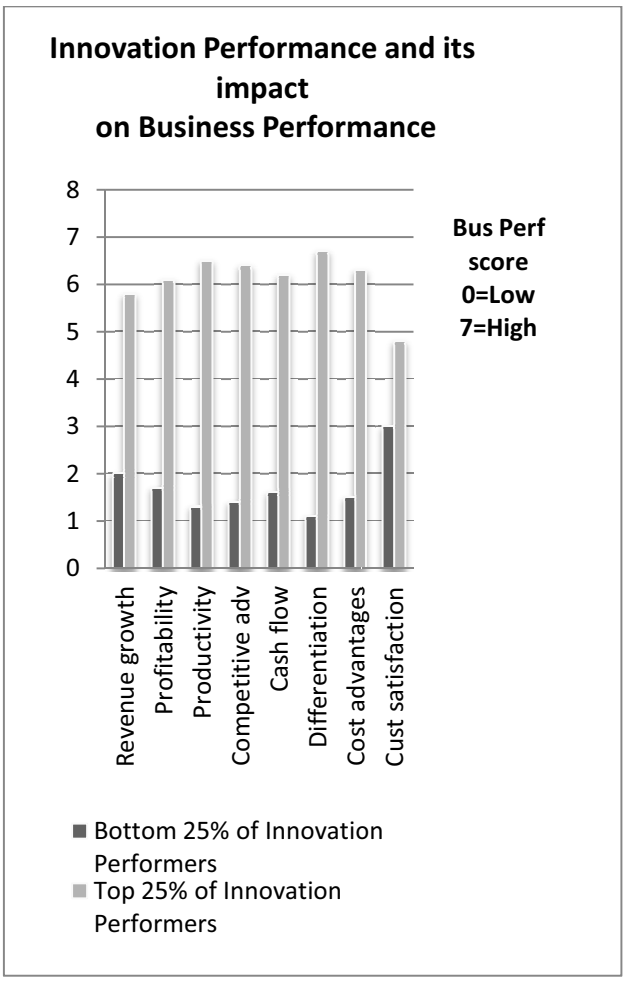

Figure 2. Innovation performance and its impact on business performance

6. Conclusion

Knowledge and innovation are closely intertwined, and this study has shown that the effective management of knowledge and innovation can contribute to the development of systematic and sustainable innovation within organizations. The research framework identified certain knowledge and innovation practices across the various 'building blocks' of innovation and established the extent to which these practices contributed to IP. The survey revealed specific innovation practices that are significant predictors of IP, and demonstrated that IP is strongly linked to business performance. Systematic and sustained innovation requires a holistic approach across a range of innovation activities in order to maximize IP, from strategy and leadership, through to HRM, organizational culture, operations and process management. Since this study was conducted with Australian managers, it would be

prudent to replicate the survey in other countries in order to compare and contrast results in different innovation environments. Future research should also examine further the links between various innovation practices, as well as the relationship between IP and business performance.

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