Intellectual property as a key driver of business performance: the case of Singapore and its implications for innovation in a knowledge-based economy

Mariza Tsakalerou
School of Engineering,
Nazarbayev University,
Astana, Republic of Kazakhstan
Email: mariza.tsakalerou@nu.edu.kz

Abstract: While the importance of intellectual capital (IC) for organisational value varies across the enterprise continuum, it is commonly accepted that IC has a generally positive effect on firm performance. It has been observed in the literature that certain variables such as the industry sector and the level of economic development play an important mediating role on the effects of IC on firm performance. It is thus accepted that conditions of the environment in which a firm operates may have a tempering effect on the significance of IC for its performance. One of the most important external factors for organisational value is the level of intellectual property (IP) rights protection granted to patents, copyright, trademarks, etc., in its operating environment. The case of Singapore is a specific example of a country where the emergence of a strong IP rights protection environment coincided with the tremendous development of the country. But since Singapore was already one of the top locations in the world for ease of doing business, the question remains whether its innovation ecosystem evolved because of the IP rights protection advance. The objective of this paper is thus to examine the degree to which an IP rights protection system fosters an environment in which IC can be of significance for firm performance. Preliminary second-level analysis of the aggregate results of a meta-study of the relevant bibliography (2003–2013) demonstrates that the significance of IC is severely undermined for manufacturing firms that operate in environments with weak IP rights protection.

Keywords: innovation ecosystem; intellectual capital; intellectual property rights; Singapore.


Biographical note: Dr Tsakalerou is an Assistant Professor of Engineering Management, in a graduate program jointly run by the School of Engineering and the Graduate School of Business at Nazarbayev University. Her research interests are in the areas of knowledge management, business clusters and innovation networks. She also serves as a board member of a software start up. In the past, she has served as a senior ministerial advisor to the Ministry of Administrative Reform and e-Governance in Greece, as a fellow with the KMIRC of Hong Kong Polytechnic University and as a visiting scholar at George Washington University and at the National University of Singapore.
1 Introduction

According to the World Intellectual Property Organization, intellectual property (IP) refers to creations of the mind and is divided into two categories: industrial property (patents for inventions, trademarks, industrial designs and geographical indications) and copyright (literary works, films, music, artistic works and architectural design). IP rights are like any other property right: they allow creators, or owners, of industrial patents, trademarks, or copyrighted works to benefit from their own work or investment in a creation (WIPO, 2004).

Intellectual property is a major component of the intangible assets of a company. Intangible asset, that is, the intellectual capital (IC) of the enterprise, is increasingly recognised as a key driver of business performance and economic growth in the knowledge-based economy. IP is thus considered a significant contributor to the value of companies as evidenced by the rapid growth in demand for IP rights worldwide (4.5% in patent and 6% in trademark filings, respectively in 2014) and the significant increase in global royalty and licensing revenue (WIPO, 2015).

While there is a rise in patent and trademark filings worldwide, Asia is emerging as a new hotbed for IP activities. Based on 2010 data from the Patent Cooperation Treaty (the framework used for the filing of patents in multiple international jurisdictions), “filings from Asia overtook those from Europe, so that Asia became the region from which the highest number of international applications under the Patent Cooperation Treaty (PCT) was filed” (WIPO, 2011). China - more than ever - has been driving that growth with patent applications increasing by 12.5% and trademark applications rising by 18.2% on the strength of resident applications (WIPO, 2015).

Beyond China, and within Asia, there are fast-growing, emerging markets for IP that seek to capitalise locally and internationally by moving towards an innovation-based economy. In the Association of Southeast Asian Nations (ASEAN) region, a most diverse one in the world in terms of level of economic development, innovation and IP creation grows in parallel with the evolution of a strong IP regime. Indonesia (7.7%), Thailand (7.1%) and Singapore (6.1%) topped the growth list on the strength of non-resident applications (WIPO, 2015).

This is noteworthy, considering that developing countries often perceive the misappropriation of IP rights as acceptable on social, economic and development grounds. Many developing countries perceive IP rights as an obstacle to the acquisition of advanced technology, put forward by developed countries to prevent them from catching up in the early stages of their development. Yet for many ASEAN countries, stronger protection for IP is justified on the basis that innovators should be allowed to recoup their investment in R&D. While there is no indication that countries such as Laos and Myanmar devote much attention to IP, others such as Indonesia, Malaysia, Thailand, Vietnam and the Philippines are on a steady path of building a strong IP regime. For these countries, the example of Singapore where the development of an IP rights framework mirrored, if not preceded, its economic development is a strong motivator and a path to follow.

It is interesting that Singapore, once described as the IP “piracy capital of the world” (Peters, 1986), is consistently recognised today as having one of the best IP rights regimes in the world (IPRI, 2015). Thirty years ago, Singapore’s perception of the relative costs and benefits of a strong IP regime was no different from that of many present-day developing countries. Singapore embarked, however, on a conscious path to
build up its patent, trademark and copyright protection policies. As the country developed, it implemented the necessary legal framework and set up the supporting institutions required for a strong and enforceable IP rights scheme.

The development of Singapore’s IP rights regime occurred during a period characterised by rapid economic growth and restructuring. With a strategic goal to move to a knowledge-intensive economy and the increasing importance of IP in such an economy, Singapore consciously used the IP rights protection system as a tool to achieve its economic goals. Singapore recognised that a strong IP protection framework does not just support resident innovation, but also provides spillover effects in the economy by attracting development capital and encouraging firms to locate in Singapore (Gill et al., 2014). Stronger IP protection attracts foreign direct investment and creates demand for a skilled workforce in R&D intensive sectors.

Singapore identified a window of opportunity to develop the country as a global IP hub in Asia, with a vibrant IP industry sector that will help to grow the economy further. The high-level IP Steering Committee formulated a 10-year Master Plan which sets out the vision “to become a conducive and progressive environment for IP activities, to strengthen international acclaim of Singapore as a vibrant IP hub and establish Singapore as a thought leader in IP” (IPSC, 2013).

Singapore has thus clearly benefited from its strong IP protection framework and built a globally visible and reputed innovation ecosystem that contributes significantly towards its economic development as a knowledge-based society. The case of Singapore, however, may or may not have implications for innovation in other emerging economies. Some argue that the emergence of Singapore did not have much to do with the strengthening of its IP protection regime. Strong IP protection is just one of the many factors that influence investment inflows, and it is well known that Singapore has always had a good business environment and has welcomed foreign investment.

Indeed, Singapore is already one of the top locations in the world for ease of doing business by virtue of its world-class legal and financial infrastructure, its high-quality workforce and its strategic geographical location. The research question thus remains whether a strong IP protection rights framework does indeed impact business performance.

The objective of this paper is thus to shed some light in this direction by examining the degree to which an IP rights protection system fosters an environment in which IC can be of significance for firm performance. Based on a database of the aggregate results of a meta-study of the relevant bibliography (2003–2013), a preliminary analysis is performed to assess how the significance of IC on firm performance is affected by the level of IP rights protection afforded in its operating environment.

To account for other influences, such as the level of economic development in the operating environment or the industry sector involved, the study examines these control variables as well. GE/McKinsey matrices are employed as the analysis tool of choice to allow for only major trends to emerge (Tsakalerou, 2015a, Tsakalerou, 2015b, Tsakalerou, 2015c).

2 Literature review

For IP to be an effective development tool, it needs to be managed effectively to keep competitors at bay or to confer competitive advantage (Zhuhadar et al., 2017). The key
for every business is to be aware of IP rights and their potential and to exercise due diligence in identifying whether an innovation should be afforded protection and in developing an effective protection. The impact of IP rights protection on firm performance has never been studied in isolation. As IP is a major component of the intangible assets of a company, the so-called IC of the enterprise, its effect on business performance and economic growth can be indirectly observed through studies of IC.

Intellectual capital has been identified in the literature as a critical business success factor (Ordóñez de Pablos, 2002, Bounfour and Edvinsson, 2005, Lee, 2008). The importance of IC is based upon the conjecture that it has a positive effect on a firm’s performance (Bueno et al., 2004, Cabrita and Vaz, 2006; Diez et al., 2010; Nassari and Nasab, 2014). The relationship between IC and organisational value has been the subject of significant academic research with often-inconclusive results (Chahal and Bakshi, 2014). A recent meta-study of the relevant research literature of the period 2000–2013 has demonstrated that IC as a whole has a strong positive effect on firm performance (Tsakalerou, 2015a) while its constituents are significantly lagging in this respect (Tsakalerou, 2015b).

Over the years, it has been observed that certain variables such as the industry sector (Sirilli and Evangelista 1998, Metcalfe and Miles, 2000, Wall and Van de Knaap 2011) and the level of economic development of the operating environment (Saxenian 1994, May et al., 2001, Nassimbeni, 2003) independently play an important mediating role on the effects of IC on firm performance. For instance, while service and manufacturing organisations share many characteristics, their sectoral specialisation affects information flows and impacts IC utilisation (Wall and Van de Knaap 2011). Similarly, firms in high-income economies have better access to resources and participate effectively in knowledge networks with customers, partners and communities of practice (Zhang et al., 2016). Firms operating in low- or medium-income economies are resource constrained, and thus have a knack for exploiting external sources of knowledge; given the asymmetry of resources and long-term objectives, such firms are at a disadvantage in terms of knowledge management.

Firms do not operate in a vacuum; they are affected by the type of economy in which they are operating, primarily because of human resource, capital, regulatory and policy issues (Zhang et al., 2015). In this context, the research question of this paper is to examine the degree to which an external factor such as the level of IP rights protection moderates the significance of IC for firm performance.

In this context, this paper examines a 3D model of IC to assess its effect on firm performance while calibrating for the influence of the mediating variables of industry sector, type of economy and level of IP rights protection. The key concept of this article is that IC may have distinctly different characteristics for service or manufacturing firms, for firms operating in advanced or developing economies and for firms operating in environments with varying degrees of protection for IP rights.

3 Research methodology

The proposed approach is based on an exhaustive second-level analysis of a dataset collected in an objective and unbiased fashion from published results in Scopus-indexed journals from 2004 to 2013 (Tsakalerou, 2015a,b). In all, 44 such evidence-based studies,
reporting on 8222 firms were used to investigate the relationship between IC and financial performance.

The majority of these individual studies did not explicitly differentiate between industry sector, type of economy and level of IP rights protection. The second-level analysis of the studies in the dataset was needed to further classify the firms in the sample with respect to the mediating variables of industry sector [Sector], type of the economy [Income] and level of IP rights protection [IP rights]. Each of the three variables was limited to three possible values, in order to smooth the results and to allow only major trends to emerge.

The firms in the dataset covered the spectrum from service to manufacturing. The Global Industry Classification Standard (MSCI, 2014) was employed to characterise companies on the service [SERV] to manufacturing [MFG] axis. When it was impossible to extract the relevant company information from the sampled paper, the term general [GEN] was used to reflect the lack of information.

The firms in the dataset operate in more than 34 countries with varied levels of economic development. Every country was classified as low and lower-middle income [LOWER], upper-middle income [UPPER] or high income [HIGH] based on its Gross National Income per capita (World Bank, 2013).

In addition, the International Property Rights Index score (IPRI, 2015) was used to classify each country’s level of IP rights protection as high [STRONG], baseline acceptable [BASIC] or needing serious improvement [WEAK].

In order to check for a possibly skewed distribution of the data, both the 44 cases and the 8222 firms were classified across the variable pairs of (i) IP rights protection vs. industry sector; (ii) type of economy vs. industry sector and (iii) type of economy vs. level of IP rights protection. (From the analysis point of view, the approach is akin to the three orthographic projections in a Cartesian coordinate system.)

The importance of constructing both mappings is due to the fact that each case in the dataset is unique from the others in the sense that it reflects the methodological approach, the analytical tools and even the personal biases of the researchers involved. On the other hand, each case carries a different weight based upon the total number of firms in its empirical sample.

It is difficult to establish a priori whether the number of cases or the number of firms is more important. It is thus necessary to maintain the duality in the approach and to assess the distribution of the data along both modalities. Evidently, results that will emerge from both mappings will have increased validity in the interpretation of the findings.

Table 1 illustrates that all the firms in the dataset that operate in low- to lower-middle-income economies are neatly classified as service or manufacturing. In addition, strong IP rights protection is an exclusive characteristic of high-income economies. Closer scrutiny of the data in Table 1 reveals in addition the following.

- The dataset is biased towards companies from more developed economies, with only 14% of the cases (and 5% of the firms) from low- and lower-medium-income countries. This is anticipated, as knowledge management and IC issues are more the purview of advanced economies.

- The group of the 8222 firms is somewhat biased (2:1) towards manufacturing companies although the 44 cases are evenly balanced with respect to the service vs. manufacturing variable.
The 8222 firms are distributed in a 9:3:1 ratio in terms of operating in countries with strong, basic, and weak IP rights protection, respectively. The 44 cases are distributed likewise in a 2:2:1 ratio, reflecting the real-world situation.

Table 1  Distribution: Cases (44) vs. Firms (8222)

<table>
<thead>
<tr>
<th>IP Rights</th>
<th>14</th>
<th>17</th>
<th>13</th>
<th>44</th>
<th>IP Rights</th>
<th>707</th>
<th>6013</th>
<th>1502</th>
<th>8222</th>
</tr>
</thead>
<tbody>
<tr>
<td>WEAK</td>
<td>2</td>
<td>2</td>
<td>6</td>
<td>10</td>
<td>WEAK</td>
<td>46</td>
<td>83</td>
<td>505</td>
<td>634</td>
</tr>
<tr>
<td>BASIC</td>
<td>9</td>
<td>6</td>
<td>2</td>
<td>17</td>
<td>BASIC</td>
<td>540</td>
<td>1305</td>
<td>114</td>
<td>1959</td>
</tr>
<tr>
<td>STRONG</td>
<td>3</td>
<td>9</td>
<td>5</td>
<td>17</td>
<td>STRONG</td>
<td>121</td>
<td>4625</td>
<td>883</td>
<td>5629</td>
</tr>
<tr>
<td>Sector:</td>
<td>SERV</td>
<td>GEN</td>
<td>MFG</td>
<td></td>
<td>Sector:</td>
<td>SERV</td>
<td>GEN</td>
<td>MFG</td>
<td></td>
</tr>
<tr>
<td>Income</td>
<td>14</td>
<td>17</td>
<td>13</td>
<td>44</td>
<td>Income</td>
<td>707</td>
<td>6013</td>
<td>1502</td>
<td>8222</td>
</tr>
<tr>
<td>HIGH</td>
<td>5</td>
<td>12</td>
<td>6</td>
<td>23</td>
<td>HIGH</td>
<td>383</td>
<td>5023</td>
<td>954</td>
<td>6360</td>
</tr>
<tr>
<td>UPPER</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>15</td>
<td>UPPER</td>
<td>100</td>
<td>990</td>
<td>379</td>
<td>1469</td>
</tr>
<tr>
<td>LOWER</td>
<td>4</td>
<td>2</td>
<td>6</td>
<td>4</td>
<td>LOWER</td>
<td>224</td>
<td>169</td>
<td>393</td>
<td></td>
</tr>
<tr>
<td>Sector:</td>
<td>SERV</td>
<td>GEN</td>
<td>MFG</td>
<td></td>
<td>Sector:</td>
<td>SERV</td>
<td>GEN</td>
<td>MFG</td>
<td></td>
</tr>
<tr>
<td>Income</td>
<td>17</td>
<td>17</td>
<td>10</td>
<td>34</td>
<td>Income</td>
<td>5629</td>
<td>1959</td>
<td>634</td>
<td>8222</td>
</tr>
<tr>
<td>HIGH</td>
<td>17</td>
<td>5</td>
<td>1</td>
<td>23</td>
<td>HIGH</td>
<td>5629</td>
<td>660</td>
<td>71</td>
<td>6360</td>
</tr>
<tr>
<td>UPPER</td>
<td>7</td>
<td>8</td>
<td>15</td>
<td>15</td>
<td>UPPER</td>
<td>1050</td>
<td>419</td>
<td>1469</td>
<td></td>
</tr>
<tr>
<td>LOWER</td>
<td>5</td>
<td>1</td>
<td>2</td>
<td>5</td>
<td>LOWER</td>
<td>249</td>
<td>144</td>
<td>393</td>
<td></td>
</tr>
</tbody>
</table>

The scoring scale of IC effect on firm performance introduced in (Tsakalerou, 2015a) includes three possibilities: negative effect (Score \(-1\)) and positive effect (Score \(+1\)). Grouping the effect on performance in just three classes enables the use of appropriately modified GE/McKinsey matrices to integrate the diverse information and to allow for only major trends to emerge.

The nine-cell (3X3) matrices, GE/McKinsey matrices, have been traditionally used to perform business portfolio analysis in the strategic planning process of an enterprise (Coyne, 2008). The concept of employing GE/McKinsey matrices to assess variable performance in multivariable modelling problems such as IC praxis has been covered extensively in Tsakalerou (2015a), Tsakalerou (2015b), Tsakalerou (2015c). The results of the scoring with the GE/McKinsey matrices are detailed in the following section.

4  Analysing the results

Table 2 presents the detailed form of the 3X3 GE/McKinsey matrices used to assess the effect of IC on firm performance with the format structure of Table 1. An average score was computed for the cases and firms in the dataset and the result was constrained to the first decimal digit to allow for only major trends to emerge. The GE/McKinsey matrices
are augmented around their outside perimeter with cells that indicate the average score for each of the categories represented by the rows and columns of the matrices.

**Table 2** IC effect on performance: Cases (44) vs. Firms (8222)

<table>
<thead>
<tr>
<th>IP Rights</th>
<th>1.0</th>
<th>0.9</th>
<th>0.8</th>
<th>0.9</th>
<th>IP Rights</th>
<th>1.0</th>
<th>0.9</th>
<th>0.8</th>
<th>0.9</th>
</tr>
</thead>
<tbody>
<tr>
<td>WEAK</td>
<td>1.0</td>
<td>1.0</td>
<td>0.5</td>
<td>0.8</td>
<td>WEAK</td>
<td>1.0</td>
<td>1.0</td>
<td>0.4</td>
<td>0.8</td>
</tr>
<tr>
<td>BASIC</td>
<td>1.0</td>
<td>0.8</td>
<td>1.0</td>
<td>0.9</td>
<td>BASIC</td>
<td>1.0</td>
<td>0.9</td>
<td>1.0</td>
<td>1.0</td>
</tr>
<tr>
<td>STRONG</td>
<td>1.0</td>
<td>1.0</td>
<td>1.0</td>
<td>STRONG</td>
<td>1.0</td>
<td>1.0</td>
<td>1.0</td>
<td>1.0</td>
<td></td>
</tr>
</tbody>
</table>

**Sector:** SERV, GEN, MFG  
**Income:** HIGH, UPPER, LOWER

<table>
<thead>
<tr>
<th>IP Rights</th>
<th>1.0</th>
<th>0.9</th>
<th>0.8</th>
<th>0.9</th>
<th>IP Rights</th>
<th>1.0</th>
<th>0.9</th>
<th>0.8</th>
<th>0.9</th>
</tr>
</thead>
<tbody>
<tr>
<td>WEAK</td>
<td>1.0</td>
<td>1.0</td>
<td>0.5</td>
<td>0.8</td>
<td>WEAK</td>
<td>1.0</td>
<td>1.0</td>
<td>0.4</td>
<td>0.8</td>
</tr>
<tr>
<td>BASIC</td>
<td>1.0</td>
<td>0.8</td>
<td>1.0</td>
<td>0.9</td>
<td>BASIC</td>
<td>1.0</td>
<td>0.9</td>
<td>1.0</td>
<td>1.0</td>
</tr>
<tr>
<td>STRONG</td>
<td>1.0</td>
<td>1.0</td>
<td>1.0</td>
<td>STRONG</td>
<td>1.0</td>
<td>1.0</td>
<td>1.0</td>
<td>1.0</td>
<td></td>
</tr>
</tbody>
</table>

**Sector:** SERV, GEN, MFG  
**Income:** HIGH, UPPER, LOWER

Only results that emerge from both mappings are presented and both scores (cases/firms) are reported simultaneously. As identified already in the original study (Tsakalerou, 2015a), the overall picture for IC is profoundly positive (with a mean score of 0.9/0.9). The GE/McKinsey matrices in Table 2, however, reveal the following important observations:

- for service firms, the strong IC effect on firm performance (1.0/1.0) is not mitigated by the GNI or the IP rights protection scheme of the country they are operating in
- for manufacturing firms, the effect is still strong (0.8/0.8) except for firms operating in a country with a weak IP rights protection scheme (0.5/0.4) or with an upper-middle-income economy (0.4/0.2) where it becomes much less pronounced
- for firms operating in an upper-middle-income economy with a weak IP rights protection scheme, the effect of IC is significantly reduced (0.6/0.3).

It is interesting that these observations emerge clearly both from the point-of-view of the 44 cases and from the point-of-view of the 8222 firms despite the continuous averaging of the calculations.

A secondary observation is that while the effect of IC on performance in upper-middle-income economies is overall strongly positive (0.8/0.8), it is weakly positive or
non-existent (0.4/0.2) for manufacturing firms. This is interesting because the same observation is not valid for high- or low-income economies.

5 Conclusion and discussion

The overwhelmingly positive impact of IC on performance for service firms is not mitigated significantly by factors such as industry sector (services vs. manufacturing), type of economy (high-income vs. upper-middle or low income).

For service firms, the strong IC effect on firm performance is not mitigated by the GNI or the IP rights protection scheme of the country they are operating in. It can be hypothesised that service firms rely less on IP rights (such as patents) than manufacturing ones, but this is certainly a point for future research.

The situation is more complicated for manufacturing firms. In manufacturing, the overwhelmingly positive impact of IC on performance is sustained for firms operating in countries with at least a basic level of IP rights protection. This can be explained by the fact that manufacturing is much more dependent on IP rights. Interestingly enough, the positive impact of IC on manufacturing performance is sustained when a firm operates in a high or low GNI country but not in one with an upper-middle GNI. A plausible explanation for this is that in a high GNI country strong IP protection mechanisms are in place while in a low GNI country the sophistication needed to violate IP rights is probable absent. Nevertheless, this is a presumption that needs further investigation and validation.

Within this general context, all the deviations from the norm should be examined in detail. It is expected that the results of this paper will motivate a slew of new research studies that will focus on manufacturing firms, in order to further illuminate the degree to which an IP rights protection system fosters an environment in which IC can be of significance for firm performance.

Acknowledgements

This paper was supported in part through a Social Policy Research grant of Nazarbayev University.

The author was officially invited by the National University of Singapore and spent the period from June 1st to July 10th, 2016 as an Academic Visitor with its Division of Engineering & Technology Management (ETM).

References


Intellectual property as a key driver of business performance


Lee, W.B. (2008) ‘On the relationship between innovation, intellectual capital and organizational unlearning’, Essays in Honor of Professor Karl-Erik Sveiby on His 60th Birthday, Swedish School of Economics and Business Administration (Hanken), Helsinki, p.120.


