

Demystifying The 4Ps In Singapore SMEs: Does The Government Hold The Key To Open Innovation?

Abstract

Open Innovation (OI) should be the saviour of Singapore's Small to Medium Enterprises (SME). Relative to other South East Asian nations over the last decade, they have suffered from declining productivity levels that have prompted the Singaporean Government to intervene with a plethora of rectifying initiatives. The Singapore Government through its policy levers offers generous financial incentives in the hope to foster a culture of innovation amongst SMEs to boost productivity, create value and contribute to economic growth. However, this assumption is predicated on certain firm—level attributes being exhibited. Consequently, in this paper two key research questions for Singapore SMEs are studied reflecting on firm level attributes - people, platforms, power, processes (4Ps) - and understanding how SMEs respond to government policies within the OI ecosystem. To answer these questions, a benchmarking study of a representative sample of SMEs from the manufacturing sector in Singapore is carried out. Firm level practices relating to technology adoption, innovation culture and firms responses to government policies are extracted and analysed.

Introduction

Open Innovation (OI)¹ should be the saviour of Singapore's Small to Medium Enterprises (SME). Relative to other South East Asian nations over the last decade, they have suffered from declining productivity levels that have prompted the Singaporean Government to intervene with a plethora of rectifying initiatives.

Unlike large scale Schumpeterian "Mark II" firms (Malerba & Orsenigo, 1995) with their own integrated R&D capabilities, many of these SMEs rely on indigenous, tacit and decaying managerial knowledge with intermittent forays into the market and community for its refurbishment. Such a downward spiral can be reversed by transferring knowledge from external resources without the need for the extensive innovative resource set of larger firms (Teece, 1986). Dispensing with the need to co-locate R&D resources through the building of alliances or the sharing of platforms, Singaporean SMEs should be major beneficiaries of OI (Chesbrough, 2006).

The Singapore Government through its policy levers offers generous grants and financial incentives in the hope to foster a culture of innovation amongst SMEs to boost productivity, create value and ultimately contribute to economic growth. The essential premise is that SMEs (which account for 9 out of 10 businesses in Singapore) hold the key to improving productivity, creating jobs, and contributing to economic growth. However, this assumption is predicated on certain firm—level attributes being exhibited. Consequently, in this paper we pose two key research questions for Singapore SMEs:

1. What firm level attributes – people, platforms, power, processes (4Ps) - impact knowledge and information flow within and external to the firm (*a defining characteristic of OI*)
2. How do SMEs respond to the role of the Singapore Government in the OI ecosystem?

To answer these questions, a benchmarking study of a representative sample of SMEs from the manufacturing sector in Singapore is carried out. Extracting insights of firm level practices relating to practices around technology adoption, organizational culture in relation to innovation and how firms respond to government policies and incentives this paper argues the 3Ps on platforms, processes and power. The data collected from expert interviews also sheds light on the influence of national and ethnic culture in SMEs, especially in the Singapore context, and consequently adds a new thread to OI discussion vis-à-vis the people factor of the 4Ps.

This research study makes three distinct contributions to the field of OI by contributing to the scant knowledge base of OI in SMEs; understanding the role of government within the OI ecosystem; and, in doing so, we add depth to the literature of OI practices emerging from the Asian continent, particularly Singapore, in contrast to usually covered ground of Western developed economies.

¹ The authors wish to thank Prof. Dr. Kathrin Moslein for her expert advice on OI.

Literature Review

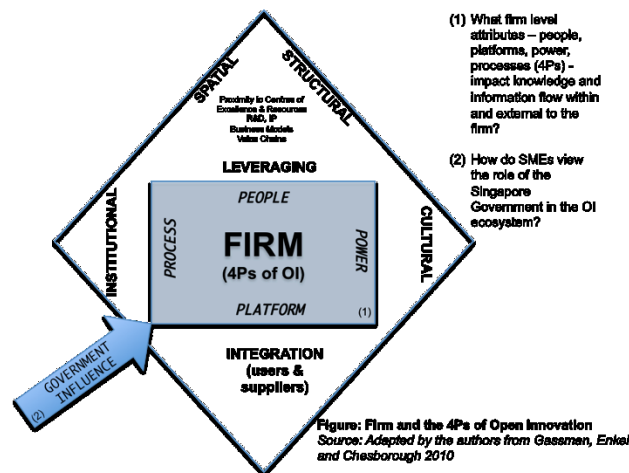
The flow of knowledge, within and external to the firm, to speed up the innovation process creating new markets for use of these products and services is the defining cornerstone for open innovation (Chesbrough, West and Vanhaverbake 2006). Research over the years has discussed various OI perspectives – *spatial* (proximity to centres of excellence and resources) and *structural* (alliances and value chains) which can lead to the *leveraging* (business model innovation, capitalising of R&D, IP) perspective, the use of *tools* for *user* and *supplier* integration into the innovation *process*, and, the *institutional* and the *cultural* mindset of a firm that lends itself to open innovation (Gassman, Enkel and Chesbrough 2010). However, most of this research has emerged from studying large firms with a focus on exogenous or macro factors.

In the case of SMEs - where the literature continues to evolve - attributes such as process, platforms, people and power are individually and interactively important for linking SMEs with OI. **Process** is seen as a dynamic and generic one, consisting of: Sourcing Innovations – Integrating Innovations – Commercialising Innovations (West & Bogers 2014), with learning facilitated and networks built through appropriate feedback loops between the stages. Extant research has focused mainly on the primary stage of Sourcing, with limited research on Integration and even less on Commercialisation (West & Bogers, 2014). In sourcing, firms search passively or actively for needed innovation knowledge through sector stakeholders (e.g., suppliers, customers, competitors), as well as from Universities (Fabrizio, 2009). Contextually, for Singaporean SMEs, their close geographic markets, a dense concentration of international “Mark II” firms, the existence of strong industry bodies, technologically excellent Universities, high speed digital infrastructure, mature financial markets and the spur and the speed of Government interventions ought to provide a bountiful crop of innovation sources. However, search costs- both explicit and implicit (communication and control), especially for SMEs, are not zero for the broad scoping required to maximize the chances of identifying a good fit between knowledge needed and the problem encountered (Jeppesen & Lakhani, 2010). Moreover, benefits to productivity and profits may rise to a peak and enter diminishing returns at an earlier stage for SMEs than other organisations, given the structure of their cost base (Belderbos et al., 2010).

Shared **platforms** that bring together actors to facilitate OI can be relatively closed – as a sector specific, agency- driven technological network (Chesbrough & Bogers, 2014) or relatively open - as a community driven by the crowd (Afui & Tucci, 2012). The former network of knowledge garners creative solutions to an organisation’s innovative issues and does this with or without a core organisation (Radziwon et al., 2016). Despite the success of these platform ecosystems (Bogers et al., 2016) and their rapid colonization through digitization- that has lowered ‘barriers to joining’ (Gawer & Cusumano, 2014),

they raise serious questions as to the openness of ‘governance’ e.g., transparency of policy and control of intellectual property (Belian, 2015). SMEs that are part of focused sector activity like industry clusters, whose members can depend on these platforms for both technology and strategy, should find this analogous binding relatively safe and productive. In addition and pertinent to the Singapore case, research suggests that regional performance can benefit from formal platform collaboration (Belussi et al., 2010).

Alternatively, those SMEs that trade in an individual capacity should find open platforms—that outsource innovation to the crowd or an existing community, provide “more efficient solutions to a local problem” (Bogers et al, op cit., p. 15) by extracting knowledge from more pluralistic sources. Again, this is not a costless solution to innovative activity, with problematic issues in decision-making, ethics and governance, motivation and the design of appropriate reward mechanisms (Alexy et al., 2012; Piezunka & Dahlander, 2015). But, as von Hippel (2007) has argued, existing communities are bound by group loyalty, membership and identity- attributes that characterise the many Singaporean SMEs.



With relatively lower hierarchies and implied trust within family firms, SMEs in Singapore tend to be *people* focused. First, people in an open firm culture may be well suited to the importation of external ideas and knowledge and those in a closed one may stifle importation and adoption due to the ‘not invented here’ prescription (West & Gallagher, 2006). Each SME will be different in this regard. But, whereas larger firms may have the capacity to absorb external, idea-donor firms in take-overs, SMEs rarely have. Second, an SME’s ability to take externally generated ideas and use them (the concept of absorptive capacity - Cohen & Levinthal, 1990), may be more limiting than larger firms, that may have a higher turnover of external managers and better training schemes than SMEs, with a managerial make up of long serving family employees. Internal processes and systems that have sedimented over the years and become aligned to goals and business models of yesteryear may further restrict the absorptive capacity of SMEs.

Finally, owner managers or generational family members run many Singaporean SMEs. Internally, their *power* base is well founded and guarded securely. Externally, the sharing of sensitive material with eco platforms will be a challenge to their power base. This sensitivity is magnified by the influential role played by government-linked enterprise in the Singaporean economy and the capacity of such firms to dominate SMEs. Sensemaking in any core relationship between a strong, cohesive platform which the SME perceives to be authoritative, may be akin to an act of power that acts to harness the consent of the SME executive (Clegg, 1989). In turn, that threat might limit an SME's ability to join the game.

Though the literature on OI and SMEs has grown recently (see, for instance Lee et al., 2010; Barge-Gil, 2010, Gruber et al., 2013; Zobel et al., 2016), it is still in a developing phase. In addition, there is little OI research that focuses on the role, relations and policy interventions of governments, beyond the analysis of OI and stakeholder interests. An exception is found in research on 'six smart cities' and Government in the US (Almirall et al., 2014; Mergel, 2015). This research speaks to both these cases by using primary research in its laboratory of Singapore.

Research Design

This research focussed on productivity and innovation among SMEs in the Singapore manufacturing sector. The study collected primary data from a representative sample of 215 Singaporean SMEs in identified subsectors on their productivity and innovation practices. The research adopted a three-pronged approach that led to the design of a main survey instrument. First, the academic literature on the determinants of productivity (including firm-level determinants) and the determinants of productivity in the Singapore context was critically reviewed. Second, a Delphi study where views of global and local experts and thought leaders (including academics, government officials, and policymakers) on the drivers of productivity and innovation in SMEs were sought. This was followed by interviews with 20 SME leaders across the Singaporean manufacturing subsectors identified to appreciate the policy context and understand the challenges they face.

This triangulated approach brought to the fore 6 thematic determinants of productivity in SMES: technology & capital utilisation; pay & performance management; training, development & formal learning; innovation culture; government policy, markets and regulation; and leadership and management quality. Reflecting on the aforementioned approach, a survey instrument containing 41 multiple-choice questions across these six determinants was subsequently designed. A stratified random sample based on the share of economic output to the manufacturing sector was drawn from the Accounting and Corporate Regulatory Authority of Singapore, which maintains information on

businesses, by Singapore Standard Industrial Classification (SSIC) classification codes. These subsectors account for more than 80 percent of manufacturing output in Singapore.

The main survey data was collected through a face-to-face interview with the person ‘most familiar with productivity and innovation issues’ in the firm – usually the CEO or other senior manager. Data was captured on a tablet computer and uploaded to a cloud-based survey administrator in real time. To improve the response rate, we complemented this approach with a ‘snow-balling’ approach inviting SME respondents that completed the survey to introduce us to other SMEs within their network.

Findings and Discussion

In order to respond to the two key questions posed at the outset of this paper, the discussion mainly focusses on three of the productivity determinants for SMEs – Technology and Capital Utilization; Innovation Culture and Government Policy, Markets and Regulation. This approach is adopted in order to hone in on the 4Ps – people, platform, process and platform – which is the core of this paper.

Innovation Culture

The findings suggest that SMEs tend to be problem-oriented and riddled with poor internal communication mechanisms (Figure 1); and, yet, have made limited investments in effort that are R&D oriented or encourage collaboration (Figure 2). Less than 20% of the SME leaders interviewed suggested that they adopt practices wherein they worked with R&D institutions such as universities or even invested in their own internal research activities. The affinity to engage with external consultants or crowdsourcing of ideas was even much poorer at SMEs. When contrast with internal firm level communication, the data shows that in-person meetings between managers and employees was standard practice while organisational level communication through the use of internal channels such as newsletters and intranet was quite poor. This suggests to a large extent that SME behaviour is inconsistent with open innovation. Further, it can be surmised that the poor internal level communication is also replicated in firm-level behaviour with external stakeholders. The firm-level focus, thus, tends to be problem oriented which is short-term solution-oriented as opposed to being innovation oriented. Whether the presence of platforms for communication and collaboration are present and underutilised or they are simply absent is uncertain. These themes are further unpacked in the following sections.

Figure 1 Firm Level Communication

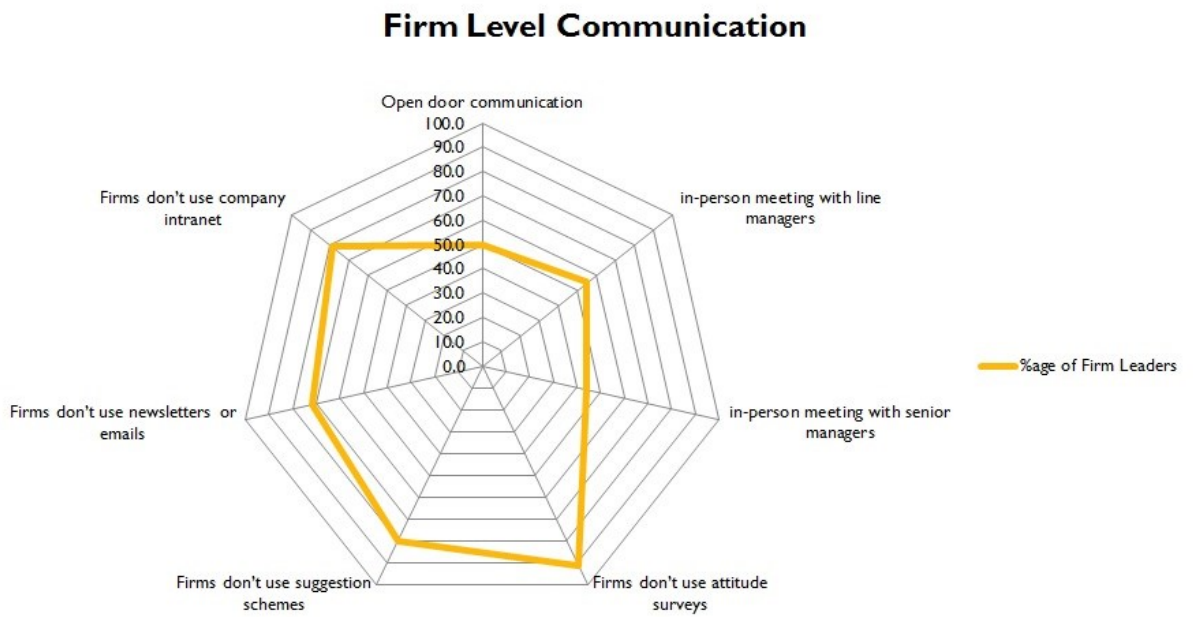
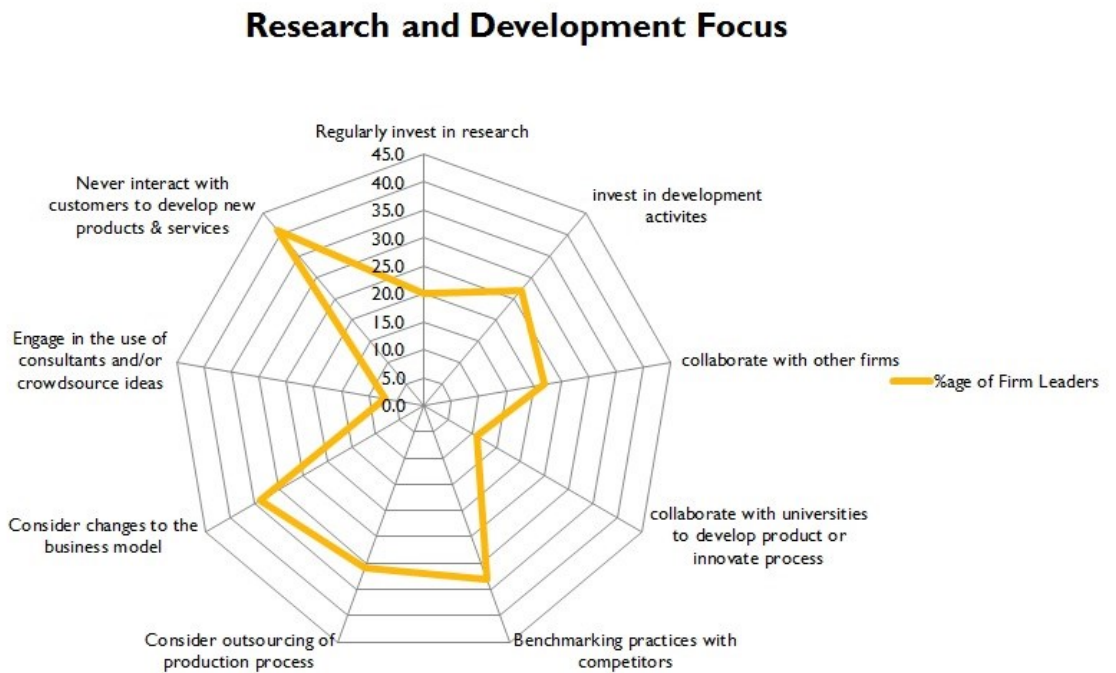


Figure 2 Research and Development Focus

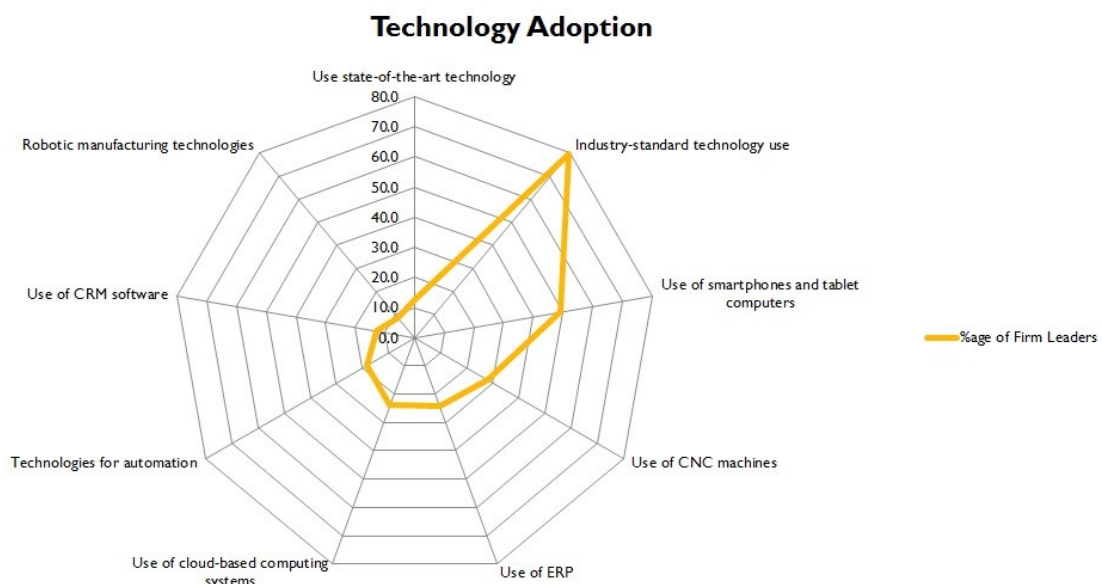


Technology and Capital Utilisation

Driving efficiency and innovation through the adoption of leading-edge technology solutions is of fundamental importance to manufacturers. For SMEs the ability to absorb new technologies offers an opportunity to move down the cost curve while also improving product differentiation and quality. In recent decades, the digitization of manufacturing processes and the application of robotics technologies have revolutionized production processes. Proven technologies such as cloud-based computing platforms and tablet computers can help monitor data and vital information in real-time and remotely if need be, providing firms with oversight of the entire production process and enabling improvements in efficiency.

It was therefore somewhat surprising that the data revealed that Singaporean SMEs did not use advanced production technologies and that only 13% them reported that the level of technology in their firm's operations was 'state of the art'. An overwhelming share (80%) reported that their technology was 'industry standard' (Figure 3). The limited use of advanced production technologies is striking, given the relatively large contribution of 'machinery and equipment', 'metal products', and 'manufacturing engineering' to the manufacturing sector in Singapore. It is also somewhat contrary to the prediction of the 'supplier perspective' in the open innovation literature (Gassman et al, 2010) – the notion that embeddedness within a tight supply chain can have a strong impact on innovation. SMEs in Singapore are often tightly co-located within MNC supply chains and yet in the majority of cases this does not seem to have led to the adoption of 'state of the art' technology.

Figure 3 Technology Adoption

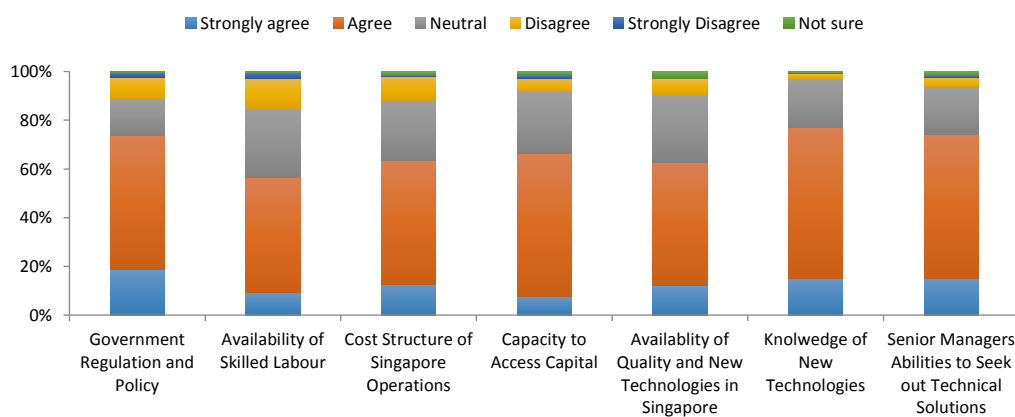


The data reveals that there is a limited use of advanced technologies, such as robotic manufacturing, as well as enterprise solutions, such as enterprise resource systems and customer relationship management software. It is likely that the relatively bountiful supply of inexpensive, low skilled foreign labour may have acted as a powerful disincentive for these

labour-saving technologies to be adopted in spite of government encouragement and subsidies. It however remains the Singapore Government’s wish for SMEs to transition to these technologies to reduce their reliance on manpower and move towards more capital-intensive solutions for survival.

The absorption rate of Singapore SME’s new technologies remains relatively low in the manufacturing sector, however a large share of firms (75%) reported that three broad factors drive investment in new technologies within the firm: *government policy and regulation; knowledge of new technologies; and the ability of senior managers to seek out technical solutions* (Figure 4). This finding reiterates the strong role of the Singapore government in encouraging SMEs to adopt new technologies. Increased awareness amongst SME Leaders and senior managers on the latest technical solutions for their subsector may also increase investment in technology, improving efficiency and driving productivity. Other factors that influenced new investments in technology included the ‘*cost structure of Singapore operation and the availability of skilled labour*’.

Figure 4: Determinant’s of Investments in New Technologies within a Firm.



While adoption of advanced technical solutions is not common amongst the SMEs surveyed, nearly 50% of respondents reported that they assessed new technological solutions that could improve productivity within the firm at least once every six months (Table 1), with 33% doing so annually. This suggests that, while SMEs are aware of technical solutions, their adoption of these solutions may be constrained by other factors. SMEs surveyed did not utilise the expertise of external consultants to advise on technical solutions with more than 40% never having appointed such consultants.

Table 1: How Frequently Does Your Firm Do The Following?

	At least Once in 6 months	Annually	Less than once a year	Never	Not sure
Assess new technological solutions to	46.0%	34.0%	8.8%	7.9%	3.3%

improve productivity					
Benchmark with firms using state of the art technology	30.2%	22.8%	9.3%	28.4%	9.3%
Appoint consultants to advise on technology solutions to improve productivity and innovation	14.0%	23.3%	14.0%	44.2%	4.7%

These data points indicate that SMEs lack the requisite platforms and processes to further their growth agenda. While it is clear that SMEs are aware of the need to invest in state-of-the-art technologies and pursue the need to undertake benchmarking activities on a regular basis, for which government provides generous support through various programs, as we will discuss further in this paper, SMEs are reluctant to engage in these activities.

The interview data with SME leaders also suggested that the links between Singapore's first class educational institutions and SMEs were not as strong as they might be expected. Many SME leaders and some respondents to the Delphi study reported only limited engagement between SMEs and higher education and research institutes. This is surprising in the context of the open innovation literature since the spatial perspective of that literature indicates that proximity to vibrant and world-class universities in Singapore and the extremely well regarded A*STAR (Agency for Science, Technology and Research) should result important in-flows and out-flows of knowledge within the SME sector (Gassman, Enkel and Chesbrough 2010).

Prima facie, Singapore would appear to have all the indigenous elements present to facilitate open innovation and yet we found little evidence of open innovation contributing to the deployment of advanced technologies. The explanation of these rather counter-intuitive results on technology utilization is necessarily multi-faceted. Some clues can be found from the OI literature already surveyed. It is true that the sourcing of innovation knowledge is not without cost. In the case of SMEs, the costs of sourcing are likely to be higher given tight manpower and leadership constraints, especially relative to assumed pay-offs. Second there is the influence of family ownership of SMEs in Singapore and the power and control of the firm by elders (usually older males). This may impact open innovation if those in control of the firm are not trained in OI concepts and in the general willingness to share knowledge if this is considered to be central to their power and authority within the firm.

A further and related consideration is the impact of culture on open innovation. As Gassman et al (2010) argue “opening up the innovation process starts with a mindset”. This mindset they claim is influenced “by the values of the company...and by concrete artefacts” (p214). However, their review misses perhaps the most influential contributor to culture which is national and ethnic cultures. Singapore SMEs, largely owned as ethnic Chinese are influenced by interpersonal trust with defined networks - known in mandarin as ‘guanxi’. Reciprocity and external trust is limited to SME leaders’ guanxi network. This contrasts sharply within the underlying principles of open innovation and may help to explain the limited evidence of OI. As Witt and Redding (2010) have suggested, there is a need to link culture to the strategic choices of firms and we would suggest this is particularly so in efforts to explain the uneven adoption of open innovation even where other elements appear to be abundantly present.

Further, historically many Singapore-based businesses derived their primary economic value from trade, and were primarily trading businesses. SMEs did not necessarily need to create value, which would have required them to emphasize innovation and an appetite for risk-taking, to derive their cost competitiveness. Instead, these businesses were able to leverage lower labour costs and access to markets to survive – policy areas where the Singapore government actively manages.

Government Policy, Markets and Regulation

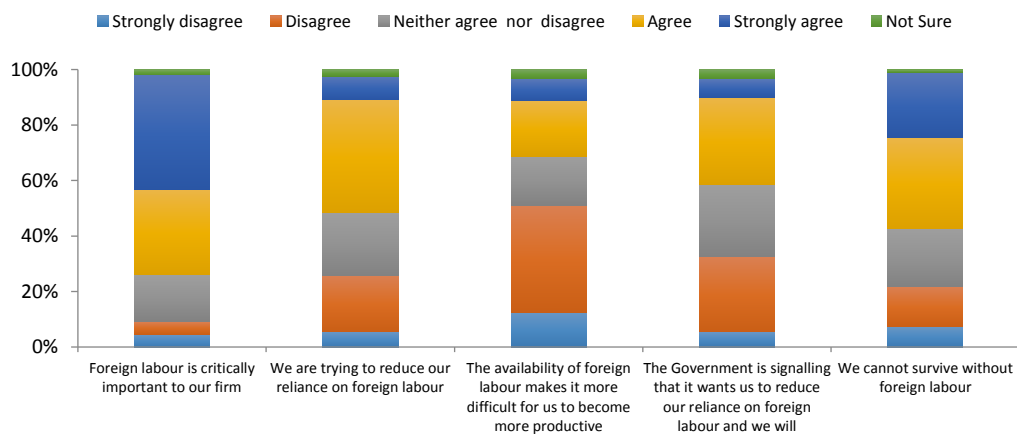
That the Singapore government intervenes deeply and actively manages all aspects of the economy has been well documented in the literature (Asher et al 2015; Lim 2015; Huff 1997). Singapore’s economic success has partly been attributed to the government following a ‘growth strategy’ which ensured that the city-state remained an attractive business location and conduit for wealth in the region and globally. This growth strategy is aided by a complex policy regime of unfettered financial and capital markets, reliance on foreign labour at both ends of the skill-spectrum, an environment of low taxes and low public spending, and ensuring that the share of wages remains lower than that of capital in national income (Asher et al, 2015).

Singapore’s economic success notwithstanding, it has also been characterized by declining or low productivity growth, especially over the past two decades. The average labour productivity growth has trended downwards since 1975, despite an upward trend during 1985-96 (Vu, 2014: 10); and productivity growth has been lowest in sectors with a high dependence on low-skilled foreign labour (Shanmugaratnam, 2013). Policymakers have been long aware of the perils of relying on foreign labour and their long-term implications on productivity². Fuelled by robust economic growth and sustained political stability, the government did little in policy terms to stem its dependence on foreign labour and consequently improve productivity. Singapore’s reliance on foreign labour solidified over time, and its porous labour markets have come to be one of the defining characteristics of Singapore’s growth strategy and its economy.

² For instance, The Prime Minister of Singapore in 1982 remarked ‘...the manufacturers must further mechanize, automate, computerize, and improve management to cut down on workers: or they will have to relocate their factories’ (cited in Fong and Lim, 1982: 552).

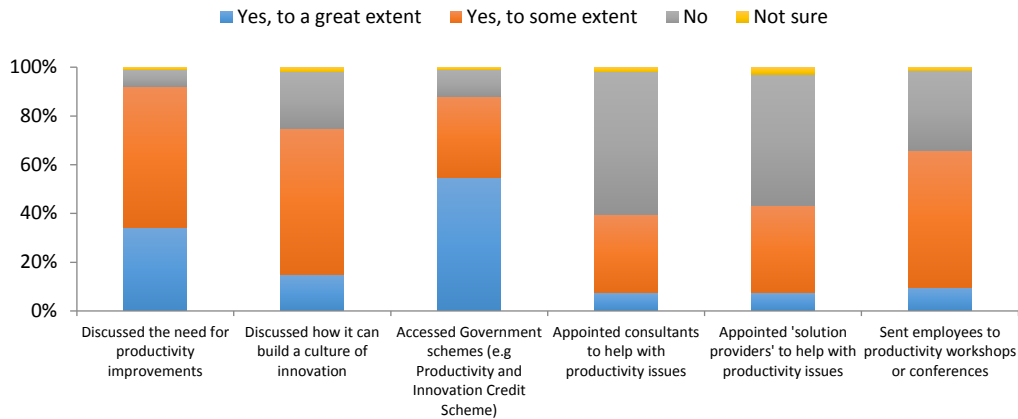
Since 2011, the Singapore government has introduced a range of measures to tighten the flow of foreign workers, reduce the historic dependence Singaporean businesses have on foreign workers, and encourage these firms to automate, mechanize, and ultimately improve productivity. However, this historic dependency is challenging to overcome and businesses are struggling to significantly re-tool their business models and adapt to this new regulatory paradigm. For instance, 70 percent of all SMEs interviewed reported a ‘high’ to ‘moderate’ reliance on foreign workers. While there was evidence that SMEs are trying to reduce this dependence, many also reported that their current business model would not survive without foreign workers. The ‘weaning-off’ foreign labour which is critical in raising productivity and innovation levels has proven challenging in the context of a long history and culture of using such labour regardless of productivity outcomes.

Figure 5 Reliance of Foreign Labour



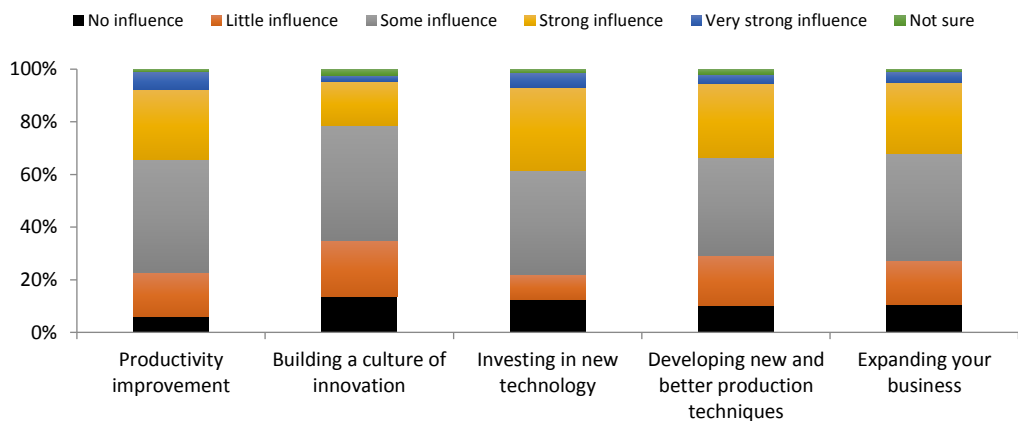
For SMEs to reduce their dependence on foreign workers would necessarily require a greater share of the domestic labour force to join the manufacturing sector and/or parts of the production process to be automated and mechanized. Neither of which are easy to do and efforts on both accounts would have trade-offs and a significant gestation period before their effects are visible. Some SME leaders indicated that their relatively small size was an impediment to automating the production process.

Figure 6: Firm’s Engagement with Government’s Productivity Agenda



These SMEs are however acutely aware of the governments agenda to foster productivity and innovation and an overwhelming share have accessed government schemes – over 90 percent had discussed the need to improve productivity & over 85 percent had accessed financial schemes – over the past year (Figure 6). Despite these generous schemes (largely subsidies for capital expenditure and offsets for spending on training and development programs) many firms (50%) had not appointed consultants or solution providers to advise on productivity related issues. This suggests that most of the funds accessed under these schemes would largely serve as operating subsidies to offset the increased cost of doing business in a tightening labour market – instead of a fillip to SMEs to re-tool their business models.

Figure 7: Impact of Government's Financial Schemes



A third of the firms surveyed suggested that these schemes had limited or no influence on building a culture of innovation and only less than a fifth reported that the incentives had a strong influence on fostering a culture of innovation (Figure 7). Some SME leaders and Delphi experts reflected on the legacy of Singapore's entrepot economy as contributing to the absence of a culture of innovation. Singapore is well integrated with global capital and financial markets, and is part of the global supply chain. Its Free Trade Agreements (FTAs) and minimal business regulations have contributed to it being a successful hub for trade and commerce.

However it could be that the profits from the entrepot economy have reduced the impetus to develop firm level innovation cultures. In other words, it has been too easy for SMEs to profit from trade rather than through product and service innovation. The political economic history of Singapore with its emphasis on the development of large government linked corporations may have also acted to stymie an innovation culture in SMES through their dominance of market sectors in what is a relatively small economy.

Notwithstanding the inability of these businesses to shake-off their dependence on foreign labour, there also appears to be a diminishing political appetite for further tightening the flow of foreign labour. Since 2011, average Singaporeans have had to contend with the ‘personal inconveniences’ of the tightening labour market including the closure of certain restaurants unable to secure sufficient labour or the difficulty of finding skilled tradespeople. In 2015 the government through a series of short videos released on YouTube relied on policy metaphors and symbols to shape the narrative as a trade-off between the conveniences that the society currently enjoys and the inconvenience they would have to contend with in the absence of foreign workers³.

Moreover, the government is acutely aware that if they allowed too few ‘foreign workers, or freeze their numbers, some businesses [would not] survive, especially SMES, and many Singaporean jobs will also disappear’⁴. The government recently announced that the increase in levies to hire foreign workers that were introduced to lower dependence of businesses would be deferred for two industrial sub-sectors (marine and process) due to tough business conditions (Straits Times, 2016).

These findings: poor firm-level communication (internal and external), reduced uptake of technology, and low incentives to improve productivity and innovate (stemming from sustained use of cheap labour) suggest that the enabling conditions for OI do not manifest themselves in Singapore SMEs. Further, expert respondents identified apathetic leadership, poor management styles, lack of strategic awareness; complacency, culture of fear, inability to manage failure and consistently reduced tolerance of risk-taking; insulation from competition, limited market access, and lack of policy support from the government to improve innovation; limited human and financial capital manifested in low skilled labour, limited education infrastructure, and limited resources to take financial risks were factors that restrict innovation within an SME.

Conclusion

³ See for instance

<https://www.youtube.com/watch?v=4TAH8SmEyKE&feature=youtu.be&list=PLH2CR4s1lqyirWMsGjwSrZWYUCIkKhmMQ> (Accessed March 2016)

⁴ Speech by the Prime Minister Lee Hsien Loong on October 7th 2014. Available online at <http://www.pmo.gov.sg/mediacentre/transcript-prime-minister-lee-hsien-loong%E2%80%99s-speech-opening-national-productivity-month-7>

OI should be the saviour of SMEs in order to access new markets, create new products and services and ultimately grow. However, our research, in the case of Singapore, reveals that OI practices are not embraced by SMEs. This is further made complex by the influence of national and ethnic cultures, family run SMEs, poor internal communication processes and collaboration platforms. With the help of the data collected, this paper discussed the role of government as an enabler and how SMEs in Singapore have responded to government policies and incentives. The scope, structure and dependence on foreign labour are also examined in support of the discussion on the 4Ps.

Our findings suggest that the enabling conditions for OI do not manifest itself fully in firm-level behavior of SMEs in Singapore's manufacturing sector. Despite showing signs of embracing facets of the structural and leveraging perspectives of OI by virtue of looking for new markets and assessing business model innovations more needs to be done within the firm. Without a heightened level of OI practices within the firm (endogenous), the efforts to tackle exogenous externalities will be limited. Consequently, there is limited efficacy of increased government spending in trying to foster OI. Despite government investment and policy action over the years to create an ecosystem of excellence and resource abundance in Singapore (spatial perspective), SMEs struggle to embrace OI as a business practice. This research further contributes to the literature in its analysis of how SMEs respond to government policies and incentives, and, in doing so comprehends how OI can be facilitated in SMEs.

These perspectives, while, unique to Singapore sheds light and contributes to the discourse on OI in SMEs, which is scant, by studying firm level attributes particularly the 4Ps.

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