The Intellectual Asset Health Check

Measuring Workplace Productivity in Services Firms

Abstract

In this article, we discuss strategies available to public and private sector managers for how to improve workplace productivity. We draw on results from a study commissioned by the Australian Commonwealth Government in which 77 services organisations benchmarked their intellectual asset performance and financial productivity against industry peers using the Intellectual Asset Health Check. Results show that organisations with high stocks of intellectual assets are more productive than those with low stocks of intellectual assets. We predict that a low performing firm can realise an increase in financial productivity of up to 13.3% if it were to improve its intellectual assets.

Key words: workplace productivity, intellectual assets, service industries.

1. Introduction

This article identifies strategies that managers in public and private sector services organisations can implement to improve workplace productivity. The article is motivated by a decline in productivity in the services sector in developing countries worldwide. As intellectual assets determine much of the economic output of services organisations, improving the intellectual asset performance of these organisations is a strategic issue for lifting the productivity of nation states.

The *Intellectual Asset Health Check* is a comprehensive methodology that assists organisations measure and improve their intellectual assets. The health-check offers multiple benefits. It makes visible an organisation's intellectual assets, most of which are not accounted for on its balance sheet. It reduces potential biases by seeking participation from the *whole* workforce, workers included (not only managerial elites).

As a practical example, organisations (e.g. banks, venture capitalists, fund managers, and public sector managers) can incorporate the *Intellectual Asset Health Check* into their lending, procurement or contacting processes. Borrowers or contractors are asked to complete the health-check to apply and qualify for funding or contracts. As lending or procurement managers gain more insights into the performance of borrowers or contractors the risks inherent to these relationships reduce. Participating organisations simultaneously benefit as they receive a comprehensive benchmark report showing the strengths and weaknesses of their intellectual asset and financial productivity. Benchmark data inevitably prompts interventions by managers seeking to outperform their competitors and lead the pack; there is an old saying, 'what we measure is what we manage' (Ridgway, 1956).

The article is structured as follows. Section 2 defines intellectual assets and their associations with workplace productivity. Section 3 discusses the declining growth in productivity in services sectors in modern economies. Section 4 presents the *Intellectual Capital Health Check*. Section 5 details the empirical results of the study. Section 6 concludes the article by discussing implications for policy and managers.

2. Intellectual Assets and Workplace Productivity

Intellectual assets commonly include an organisation's staff and leaders (human capital), its relationships with customers and other stakeholders (relational capital), and its business systems and processes (structural capital). While intellectual assets do not have the obvious physical value of a factory or equipment, they are critical to firms' long-term success (or failure). Organisations such as Baker & McKenzie, Randstad Group, and Marks & Spencer would not be nearly as successful without the innovative talents of their human capital, strong brand names and valuable customer relationships. The positive effects of intellectual assets on bottom-line profits are critical to these organisations, whose employees apply their intellectual capital to drive global sales year after year.

However, measuring the value of intellectual assets has for long been a challenge to the accounting profession. The International Financial Reporting states that assets must be 'reliably measurable', 'controllable' and 'identifiable' in order for them to be recognised and valued on the company balance sheet. However, as staff goes home at night so does the intellectual wealth that drive profit making. Control is thus a misapprehension in the world of intellectual capital. This article directly addresses this measurement problem by introducing the *Intellectual Asset Health Check.* The health-check measures an organisation's intellectual assets in the following five categories: Innovation: Employee Experiences; Fairness: Leadership; Customer Orientation; and Adaptability.

Internationally, numerous governments have launched initiatives to better measure the intellectual assets and wealth of organisations and nations in search of higher productivity. In 2001, the Danish Government issued the first *Guideline on Intellectual Capital Reporting,* following a project with over 100 Danish firms. In 2007, the *Organisation for Economic Cooperation and Development* (OECD) launched the *World Intellectual Capital Initiative* in partnership with the *European Commission* and others. This was followed by an OECD report entitled *Supporting Investment in Knowledge Capital, Growth and Innovation* in 2013. This report states that business investment in knowledge-based capital is critical to future productivity growth and living standards as it contributes *"20% to 34% of average labour productivity growth"* (p. 17). It also calls for increased reporting of knowledge-based capital and international comparability.

Parallel to the intellectual capital movement, nation states have launched projects focused on human capital. In 2008, the Irish Government funded a study entitled *New Models of High Performing Work Systems in Ireland* (Flood *et al.*, 2008). This study finds that organisations which adopt high performance workplace systems achieve a 14.8% increase in labour productivity (equivalent to over €44,000 per employee or €12 million per median company of 270 employees). In 2013, the *UK Commission for Employment and Skills* issued a report entitled *High Performance Working in the Employer Skills Surveys*. The report identifies three groups of practices that characterise high performance working in the UK: 1) employee involvement, 2) skills acquisition and 3) motivational practices. Much of this work on intellectual and human capital suggests that when work is organised to support high levels of employee involvement firm performance improves. The UK Task Force *Engage for Success* likewise advocates a management approach that places employee engagement at the centre of the productivity debate.

Additional studies include the *World Management Survey* which investigates the technologies and business processes that lead to higher productivity (also known as structural capital). Commissioned by governments in over 20 countries worldwide (see Bloom *et al.*, 2007), this research finds that a single point increase in management practice score is associated with the same increase in output as a 25 % increase in the labour force or a 65 % increase in invested capital. In 2013, the US Census included for the first time measures of management practices in its nationwide manufacturing survey. This growing evidence base consistently shows that intellectual assets determine much of the economic output and productivity of organisations in modern economies.

3. Declining Productivity Growth in the Services Sector

The majority of organisations in developed economies are located in the services sector. Services organisations are highly reliant on intellectual assets for economic production. In 2011, services industries contributed 78 % of industry value added (IVA) to gross domestic product (GDP) in the United Kingdom (UK) (World Bank, 2014). In Australia, the United States, Japan, France and Germany services respectively contributed 68%, 79%, 73%, 79% and 69% of IVA to GDP in 2011 (World Bank, 2014). Service industries are also important because of their scale, potential for export growth and generation of well-paid jobs. In the UK, services are the largest employer at 79.9% of total employment. In Australia, services employ 76.4%, the United States 81.2%, Japan 71.1%, France 75.4% and Germany 73.7%

(OECD, 2013). For these nations, employment in service industries exceeds the share of total employment for any other sector, including manufacturing, mining and agriculture.

However, growth in value added in services industries has not outpaced the increase in employment and, in general, labour productivity growth (gross value added per employee) performance has been poor in recent decades. In the UK, from 2007 till 2012, the annual industry contribution to growth in service sector labour productivity was negative for the wholesale, retail, trade, accommodation, food services, transportation and storage industry sector and for the financial and insurance industry sector (OECD, 2014). The gross value added per hour worked (constant prices) for these two sectors was negative at -1.5 % and -2.3 % respectively from 2007 till 2012 (OECD, 2014). This pattern of negative and slow growth in the productivity of services firms compared to the economy as a whole is a concern that has also been observed in other developed nations, including the USA, Australia, France, Japan and Germany. In Australia, the average annual labour productivity percentage growth rates for the Property and Business Services industry sector was negative in the last 2 out of 3 decades, at -1.6 % (1975-85), -2.0 % (1985-95) and 0.9 % (1995-2005).

It is clear from the above that more needs to be done to improve the productivity performance of services industries. As noted previously, intellectual assets determine much of the economic performance and outputs of organisations. Thus, in this article we put forward the argument that improving organisations' intellectual asset is a critical strategic priority to lift the productivity and progress of nation states.

4. The Intellectual Asset Health Check Framework

Data was collected as part of a study of services firms commissioned by the Australian Commonwealth Government entitled *Leadership, Culture and Management Practices of High Performing Workplaces in Australia*. Whilst the services sector is a large and growing part of the Australian economy, this sector has received less policy attention than other industries, such as a manufacturing (e.g. Green *et al.,* 2009). In Australia, the largest proportion of service firms is concentrated in the Property and Business Services industry division. The majority of participating firms in this study are from this industry division. The industry groupings of the 77 firms that participated in our study are shown in Table 1.

Table 1: Sample firms: Industry Sub-sectors

Industry (n = 77)	***Frequency***
Employment, Education and Social Assistance Services	18
Computer System Design and Related Services and Software Publishing	14
Advertising	10
Membership and Advisory Services	8
Management Consulting and Market Research	6
Legal and Accounting Services	6
Architects and Engineering Services	6
Tourism	3
Construction services	2
Other	4

The *Intellectual Asset Health Check* measures the value of organisations' intellectual assets and tangible assets, including capital stocks. The latter is obtained from the organisations' Chief Financial Officers (CFOs) or Financial Controllers, either via statutory financial statements or survey questionnaires. Information about the organisations' intellectual capital was obtained from staff at different levels of authority and in different functional areas. Floors staff, front line managers, middle managers and executives were surveyed. Such multi-source data distinguishes this approach from previous studies (such as the abovementioned *World Management Survey*) and provides a clear benefit in that it reduces the risk of self-report survey bias. Employee response rates averaged at 50.5% per firm. 55% of these were from floor staff.

Firm Productivity

The measure of firm level productivity developed in this study is Total Factor Productivity. It is calculated using a Cobb-Douglas approximation based on cost shares in an equivalent way to the Australian Productivity Commission's official calculations of national industry level productivity. Firm level productivity measures how efficiently inputs are converted into output by a firm. The quantity of output a firm produces depends on the quantities of

the tangible inputs its uses (labour, capital equipment and intermediate inputs) plus the technology, intellectual assets and knowhow of the firm in combining and transforming these inputs into services and goods for which customers are willing to pay a premium. Thus, an equivalent way of viewing productivity is as a residual measuring how output varies in firms beyond that due to observable inputs.

The Cobb-Douglas approximation involves taking the ratio of output to a weighted product of inputs, with the weights corresponding to the share of total cost for each input. Output was measured using revenue and inputs were measure using cost data. For services firms, labour tends to be the main input and the study was designed to capture this item in addition to the cost/input measures from standard financial reports[i]. For comparison purposes, firm productivity was normalised by industry sub-sector so as to compare 'like with like'.

TFP for a firm is the ratio of its output *Y* to a composite index of its inputs, as follows:

$$TFP = \frac{Y}{I}$$

The index of input *I* is calculated as the weighted geometric mean of a firm's labour input *L* and its other inputs *M*. Capital inputs are accounted for in M and not treated as a separate input[ii]:

$$I = L^a M^b$$

where *a* is the share of a firm's total costs spent on labour and *b* is the share of total costs spent on all other inputs. Thus, if the cost of labour is *X* and cost of all other inputs is *Y* then:

$$a = \frac{X}{X+Y} \quad and \quad b = \frac{Y}{X+Y}.$$

Variables used to measure Firms' Intellectual Assets

19 survey constructs were used to measure the intellectual assets of the participating firms. These were all well-established constructs from across the disciplines in the academic

literature. All questions used a 7 point Likert scale. The 19 constructs were grouped into six categories, which make up the *Intellectual Capital Health Check*, as follows:

Innovation (I):

1. CFO perception of the organisation's innovation outcomes (OECD Oslo Manual, 2005: Australian Bureau of Statistics, 2008);
2. CFO perception of the organisation's support for innovation (adapted from the OECD Oslo Manual, 2005);
3. Employee perception of the organisation's innovation outcome (Wongtada & Rice, 2008).

Employee Experience (E):

4. Employee perceptions of their level of commitment to the organisation (Mowday & Steers 1979);
5. Employee's experience of their positive and negative emotions at work (adapted from Watson, Clark & Tellegen, 1988);
6. Employee job satisfaction (Felstead, Gallie, Green & Zhou, 2007);
7. Employee turnover intention; and
8. Employee general well-being (Robins, Hendin & Trzesniewski, 2001; Household, Income and Labour Dynamics in Australia survey, Version 9).

Fairness (F):

9. Employee perceptions of distributive fairness (Brashaer, Brooks & Boles 2004);
10. Employee perceptions procedural fairness (Brashaer *et al.*, 2004).

Leadership (L):

Employee perceptions of their immediate supervisor's leadership skills in three areas (adapted from Carless, 2000):

11. Developmental orientation;
12. Authentic leadership; and
13. People management.

Adaptability (A):

14. Employee perceptions of their firm's responsiveness to change (Barringer & Bluedorn, 1999; Bhattacharya, Gibson & Doty, 2005);
15. Employee on the job learning (Hafsteinsson, Donovan & Breland, 2007);

16. Employee behavioural flexibility (Beltran-Martin, Roca-Puig, Escrig-Tena & Bou-Llusar, 2008);
17. Employee skills flexibility (Beltran-Martin *et al*., 2008).

Customer Orientation (C):

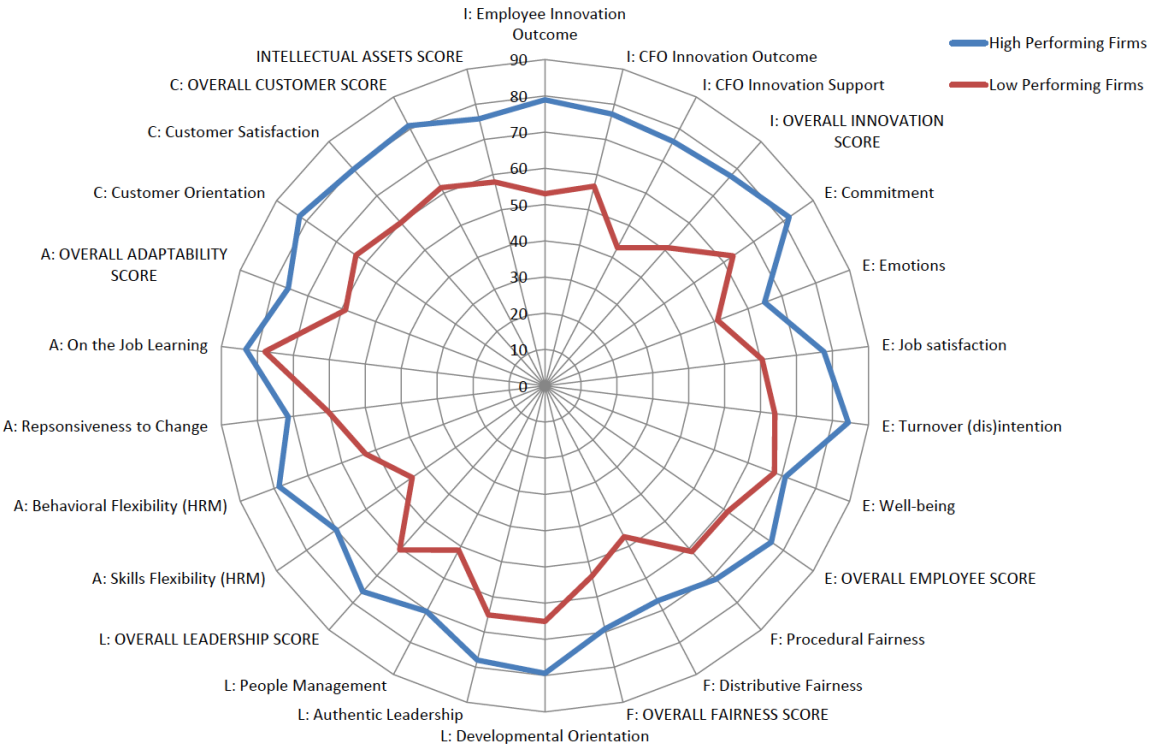
18. Employee perceptions of the firm's customer orientation (Dev, Zhou, Brown & Agarwal, 2009; Narver & Slater, 1990):
19. Employee perceptions of the firm achieving its customer satisfaction goals (adapted from Widener, 2007).

5. Results from Applying the Intellectual Asset Health Check Framework to 77 Organisations

In order to demonstrate how the *Intellectual Capital Health Check* would work in practice, it was applied to 77 Australian services organisations. An index was generated in which the participated organisations' intellectual asset score was calculated[iii]. On the basis of this score, the participating organisations were classified into three broad categories: high, mid or low performing. Organisations that were more than one standard deviation above the mean were considered to be 'high performing workplaces' (HPWs). In a similar fashion, organisations that were more than one standard deviation below the mean were considered to be 'low performing workplaces' (LPWs) [iv]. This resulted in 19.48% of the sample falling into the high performing group and 16.88% into the low performing group.

By grouping the participating organisations in high and low performing groups, the performance differences and gaps between the organisations became clear. Figure 1 charts the results of this analysis. The blue line shows the average performance of the HPWs on their intellectual assets on each of the 19 performance measures. The red line shows the average performance of the LPWs. The Figure shows that there are significant performance differences between HPWs and LPWs.

Figure 1: Intellectual Assets of High and Low Performing Firms



The differences in intellectual asset performance between high and low performing organisations are associated with significant differences in firm level productivity, as discussed below.

Workplace Productivity

The relationship between stocks of intellectual assets and firm level productivity was analysed by regressing total factor productivity on intellectual asset stocks plus a number of controls for possible confounding influences on productivity. The regression analysis shows that stocks of intellectual assets is a significant determinant of workplace productivity at .015 (p=0.05) (see Table 2). The strength of the relationship, as measured by the regression coefficient of .015, is both statistically significant and economically important.

Table 2: Regression Model: Intellectual Assets and Firm Productivity (Dependent Variable is Industry Adjusted Total Factor Productivity)

	Regression Coefficients	*Standard Errors*	*p-value*
Intellectual Assets Stock	0.015*	(0.006)	0.016
Firm Demographics			
Age	0.004**	(0.001)	0.007
No. of Employees (FTE)	-0.000	(0.000)	0.159
No. of Workplaces	-0.009	(0.013)	0.508
Private Company	0.046	(0.109)	0.676
Ownership Structure			
Partnership/Sole Trader	0.208	(0.217)	0.343
Charity/Mutual	-0.058	(0.117)	0.623
Government Owned Firm	0.218	(0.138)	0.119
Family Business	-0.174	(0.100)	0.086
% Domestic Ownership	0.001	(0.001)	0.227
External Environment			
No. of Competitors	0.001	(0.003)	0.723
% of Output Exported	0.004*	(0.002)	0.013
Constant	-1.184*	(0.474)	0.015
N (No. of Observations)	77		
R^2	0.241		

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

For managers, the economic importance of this result is best expressed as a percentage difference in productivity between high and low performing workplaces. Table 3 shows that on average if a LPW was to increase its intellectual asset stocks to be on par with that of a HPW, the organisation would realise a predicted 13.3% increase in total factor productivity. This change in productivity is significantly larger than the average annual percentage growth rates in productivity for the services sectors, previously discussed in section 2.

Table 3: Predicted Productivity Gains to Low Performing Firms from Increasing Intellectual Asset Stocks (Based on regressions in Table 2)

Average Productivity for Low Performing Firms	Average Intellectual Asset Stocks for Low Performing Firms	Average Intellectual Asset Stocks for High Performing Firms	Predicted % Change in Productivity
2.028	57.912	75.866	13.278

The controls included in the regression of productivity include: SIZE (number of employees and number of workplaces), AGE of the organisation, OWNERSHIP structure of the organisation, the INDUSTRY environment and SECTOR. Most of these controls are insignificant as determinants of workplace productivity. Size and the number of workplaces are not significant. Age is significant at 0.004 ($p = 0.01$). Ownership structure is not significant for any of the five types of ownership; neither is competition. The percentage of output exported is however significant at 0.004 ($p= 0.05$).[v]

A further regression analysis to test SECTOR differences shows that there are no differences in the impact of intellectual assets on productivity to organisations across the eight industry sub-sectors[vi]. In other words, organisations in different industry sectors (be it architects, accounting firms, recruitment companies, or other) all benefit financially on average from having high stocks of intellectual asset. Hence the 6 categories of intellectual assets measured in this study are important to the productivity performance of organisations in all of the services sectors represented here.

Performance Gaps between High and Low Performing Workplaces on Intellectual Assets

The analyses presented in Figure 1 shows that there are significant gaps and differences between high and low performing organisations in their intellectual asset performance. To realise the predicted increase in workplace productivity of 13.3% (as discussed above), managers in low performing workplaces would need to implement a series of intervention strategies. These strategies are discussed in the following.

Innovation

The largest performance gap between HPWs and LPWs is in the area of innovation. It is clear from Figure 1 that HPWs produce more new services and/or products (31% higher than LPFs). In HPWs, innovation processes are organised from idea generation all the way through to prototyping and trialling new products and service and taking these to market. Areas where LPW tend to perform poorly and hence need to implement strategies to improve include:

1. Production of more new ideas (HPWs produce 36.4% more new ideas than LPWs);
2. Capturing ideas from employees. LPWs need to put into place mechanisms for capturing ideas from employees' (e.g. town hall meetings, innovation zones) (this is 57.4% higher for HPWs than LPWs);
3. Implement formal processes for systematically assessing and responding to ideas from employees' (HPWs are 58.3% higher than LPWs);
4. Invest to transform ideas into concrete outputs. LPWs need to dedicate more resources to new strategic initiatives (HPWs are 64.9% higher than LPWs).

Employee Experiences

Employees' turnover intentions are much smaller in HPWs than in LPWs (31.9% lower). High staff turnover has significant financial consequences for LPWs, both due to the cost associated with hiring new staff and also due to the loss of productivity (knowledge and expertise) that occurs when employees leave the firm. Thus, retention strategies must be put into place to secure knowledge and reduce the risk of leakage of intellectual capital. To improve employee experiences and reduce employee turnover, LPWs need to:

- Increase staff satisfaction and employee commitment. One strategy to achieve this is to increase employee participation in decision making processes. When employees feel that they are involved in decisions, their commitment and satisfaction is likely to increase as they develop a sense of belonging to the organisation and ownership of their work. Committed employees exert discretionary effort and consistently go beyond their formal job description to satisfy customers and solve problems. (HPWs score 29.8% higher than LPWs on employee commitment).

- Build a company culture where employees feel valued and proud. Specifically, LPWs must implement culture change strategies to reduce employees' negative emotions and increase employees' positive emotions. Positive emotions (such as feeling cheerful, loved and optimistic) are much more prevalent amongst employees in HPWs, whilst negative emotions (such as feeling anxious, inadequate, worried, depressed and fearful) are more prevalent amongst employees in LPWs. One in every four respondents (25%) in LPWs reports feeling 'depressed', whereas in HPWs it is one in every seven respondents (14%). Feeling 'anxious' is the most prevalent emotion in LPWs with 56% of respondents experiencing this emotion. This is followed by being 'worried', which ranks second highest at 41%. 70% of respondents in HPWs feel 'proud' about their workplace and 65% feel 'valued', versus 40% and 47% respectively in LPWs.

Fairness

HPWs are concerned with fairness for employees. Figure 1 shows that the greatest difference between HPWs and LPWs is distributed fairness. To improve fairness, LPWs need to:

- Implement reward systems that ensure that employees are fairly rewarded and recognised for their efforts, responsibilities and contributions (distributive fairness). Compared to employees in HPWs, employees in LPWs perceive that they are less fairly rewarded for their work efforts and contributions (HPWs score 42.3% higher than LPWs).

- Implement company policies on procedural fairness and train managers in how to implement these (procedural fairness). Employees in LPWs perceive their managers and supervisors to implement procedures and processes in a manner that is less fair and equitable than employees in HPWs (HPWs score 16.6% higher than LPWs).

Leadership

HPWs enjoy high quality leadership. Leadership is a process whereby one person exerts influence over another in an attempt to guide, influence and facilitate activities and relationships towards shared goals and objectives. To improve the effectiveness of leadership, LPWs need to implement leadership programs and train and mentor leaders to:

- Spend more time and effort managing their staff (HPWs are 28% higher);
- Encourage employee development and learning (HPWs are 20.8% higher);
- Welcome criticism and feedback as learning opportunities (18.9% higher);
- Foster involvement and cooperation amongst employees (18.4% higher);
- Encourage employees to think about problems in new ways (17.8% higher);
- Give increased recognition and acknowledgement to employees (16.1% higher);
- Have a clear vision and goals for the future (15.5% higher);
- Give employees opportunities to lead work assignments and activities (14.5% higher);
- Have clear values and 'practice what they preach' (14.2% higher).

Adaptability

HPWs are agile organisations that respond well to change in the environment, including cyclical and competitive changes. Figure 1 shows that HPWs are more adaptable than LPWs. Employees in HPWs have higher levels of behavioural and skills flexibility and are curious to learn new things. These skills are important for firms to navigate through industry peaks and throughs and survive structural changes. To improve adaptability, LPWs need to:

- Skill up staff to allow them to switch to higher level jobs within a short time and who routinely perform more than one job (57.2% higher for HPWs).
- Train staff to become competent at dealing with problems and/or uncertainty when it emerges (48.2% higher for HPWs).
- Respond promptly to changes and shifts in customer needs and preferences, technology, regulatory changes, economic conditions, market opportunities / threats (18.9% higher than LPWs for HPWs).
- Employ staff who enjoy learning new things and take on challenging and difficult job tasks (6.8% higher for HPWs).

Customer Experiences

Customer orientation involves taking the customer seriously and concerns efforts made by the organisation to shape its offerings and activities around the customers' needs and interests. Figure 1 shows that HPWs systematically outperform LPWs on customer orientation. It is clear that HPWs spend significant amounts of time and resources to

understand the needs of customers. They encourage customer feedback and employ staff who actively listens to the customers. They seek dialogue and are curious to learn from others. To improve customer experience, LPWs need to:

- Exert more effort to achieve their customer satisfaction goals (32.7% higher for HPWs)
- Act on suggestions / feedback from customers (24.4% higher for HPWs);
- Train their staff to do whatever it takes to create value for customers (24.2% higher for HPWs);
- Exert more effort in trying to understand customer needs (22.5% higher for HPWs).

6. Conclusion and Policy Considerations

There has been much debate amongst scholars and managers as to whether higher stocks of intellectual assets are associated with superior financial performance (see; Crass & Peters, 2014; Flood *et al*., 2008; Huselid, 1995; Lev & Daum, 2004; Youndt, Subramaniam & Snell, 2004). It is clear from the selection of service organisations surveyed in this study that organisations with higher stocks of intellectual assets have significantly higher levels of productivity, even after controlling for size, ownership structure, industry sector, and the external business environment. In fact, organisations with lower stocks of intelletual asset could increase their productivity by up to 13.3% if they were to improve their stock of intellectual assets to be on par with that of the high performing group. This is equivalent to more than a decade of productivity growth in the service sectors in many countries.

The prevailing assumption of traditional economic policy frameworks is that firms utilise their resources and economic inputs with maximum efficiency (they operate *on* the production frontier). We see in this study that this is not always the case. A proportion of firms (those with low stocks of intellectual assets), operate *below* the production frontier, meaning they do not maximise the effectiveness of resource utilisation. Our study suggests that there are significant economic benefits available to nation states by lifting the performance of organisations below the frontier to become high performing.

At the policy level, one immediate opportunity is to address potential knowledge gaps amongst executives and managers. Three types of knowledge gaps are likely to exist. First, managers may not be aware that intellectual assets can drive productivity performance.

Second, managers may not know how they perform on their intellectual assets; a lack of measurement standards leaves this gap wide open. Third, even if managers know their position, they may not know how to improve their intellectual asset performance.

The *Intellectual Assets Health Check* can help close these knowledge gaps in the following ways. By using the health-check, managers can acquire new knowledge that is likely to lead to intervention strategies and improved performance. Standardised measurement and benchmarks tools (such as the health-check) can assist organisations detect areas of relative strength and weakness. Such new knowledge, in turn will prompt investments by managers seeking to be on par with their competitors, or to lead the pack. For example, if leadership is identified as an area of weakness in the health-check, a leadership program can assist to improve the effectiveness of the organisation's leaders.

Due to their reach and social networks, public sector managers are in a unique position to lead economy wide change in workplace productivity. One way to do this is to introduce standardised measurement and benchmarking tools, such as the *Intellectual Assets Health Check,* into their sub-contracting and procurement relationships. This will reduce risks in public procurement processes and disseminate new knowledge.

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Footnotes

[i] As a robustness check, TFP was also calculated using a regression method. The results were highly correlated with the Cobb-Douglas method reported here.

[ii] Regression analysis showed that capital inputs are not significant as a separate category.

[iii] The 19 items in the 6 categories of intellectual assets are scored out of 100. The items are weighted equally. An overall score is calculated by averaging the scores for the 6 categories to an overall score for each firm. The six categories are weighted equally to produce an Index of the firms' scores. The resulting Index is converted to a z-score (a mean of zero and a standard deviation of 1).

[iv] Participating firms received approximately 100 pages of benchmarking information. This included an Executive Summary which showed their scores on the six intellectual asset categories and their overall position on the Index relative to peers.

[v] Capital assets are not included in the regression since they were included in the calculation of total factor productivity.

[vi] The hypothesis test that the regression coefficient for intellectual assets is constant across industries shows a p-value of 22.6%, providing strong evidence that there are no differences across industries.