

# Business Performance and Skills Survey (BPSS)

## Final Report

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# Executive summary

## 1.1 About the Business Performance and Skills Survey

The Business Performance and Skills Survey (BPSS) is a study of skills utilisation from the perspective of the commercial establishment. The analyses and findings from this study will provide relevant and timely data on skills demand and skills utilisation at the establishment level for tracking and diagnostic purposes as well as to inform skills policies at the sectoral level.

## 1.2 Key findings and policy implications

The study provides critical insights into the drivers of skills utilisation, including:

- **Value add strategy.** The survey findings revealed that skills utilisation is closely associated with the pursuit of a high value add strategy. To make business strategy and high skills work together, *policies should encourage high value add production, with a focus on how businesses use workers and their skills to drive productivity and sustainability in the long run. In addition, greater co-operation and co-ordination between agencies and initiatives addressing skills policy and those addressing business strategy would be most beneficial.*
- **Technological change.** The survey findings revealed that technological changes in work processes are associated with higher skills utilisation. *This would suggest that innovation and technology adoption are more likely to occur in a high skills environment, and that technological changes should be accompanied by a close evaluation of associated changes in skills demand and needs. The impact of technology on skills should therefore be closely monitored and is the subject of another Centre for Skills, Performance and Productivity study.<sup>1</sup>*
- **High-performance workplace practices.** The survey findings revealed that skills utilisation was positively associated with the use of work practices that encouraged employee participation, involvement, and commitment. *Policies and related initiatives, including management training, should therefore encourage the use of these practices.*
- **Skills gaps can affect performance, but are not a major concern currently.** While the survey findings revealed that skills gaps (defined as the reported percentage of existing staff who are unable to cope with their existing duties) were negatively associated with skills utilisation, they also showed that most workplaces in Singapore were not greatly affected by skills gaps. On average, slightly fewer than 1 in 10 existing staff in each establishment showed skills gaps. *Nonetheless, monitoring of skills gaps would be vital to inform supply-side policies.*
- **The employment of comprehensive employee development plans are positively associated with skills utilisation.** The survey findings revealed no significant relationship between the proportion of staff that attended classroom-based training and employees' discretionary effort; however, establishments with formalised employee development plans demonstrated significantly better employee performance. *Organisations should be encouraged to put in place formalised employee development plans. As well as addressing training, workforce development initiatives should facilitate the creation and improvement of employee development plans, with particular focus on organisations with fewer resources.*

From the BPSS data, we have developed a multi-index barometer to gauge skills utilisation over time, specifically two workplace skills indicators relating to effective skills utilisation that will provide a baseline for tracking skills utilisation at establishment level in the long term:

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<sup>1</sup> See *The future of jobs and skills: the impact of automation in Singapore* – final report due to be released in June 2019.

1. the Establishment Skills Index (ESI), which relates to the demand for high quality and high level job skills through the measurement of skills demand;
2. the Discretionary Effort Index (DEI), which relates to employees' performance and how effectively their skills are being applied in their jobs.



# 1 Introduction

## 1.1 A demand side approach to skills policy

It is generally acknowledged that a highly skilled workforce is the key to a competitive economy in this increasingly knowledge-based global age (OECD, 2012). Hence, it is essential that Singapore's skills policies are geared towards raising the level of skills to enable the workforce to perform higher-level work functions and drive economic productivity and growth. Recent initiatives include the SkillsFuture movement, aimed at "developing an integrated system of education and training to provide all Singaporeans with the enhanced opportunities to acquire greater skills proficiency, knowledge, and expertise" (MOM Singapore, 2016).

However, this supply-side approach to skills, while necessary, is inadequate, because "skills do not automatically convert into jobs and growth" (OECD, 2012). Investments in education and training without first understanding employers' demand for skills do not guarantee that the skills will be utilised effectively. It thus follows that it is necessary to consider not only skills acquisition and development but also skills utilisation (Sung & Ashton, 2014).

This shift in focus towards skills utilisation warrants the examination of skills from the perspective of a business, for this is where the demand for skills is derived. This acknowledges the crucial role of employers as main actors in creating "the environment in which individuals will deploy their abilities and skills" in terms of "what those workers need to do, what skills they will need to possess in order to be able to perform their task adequately, and so ultimately their output and contribution to the enterprise" (CIPD, 2015).

Accordingly, the Business Performance Skills Survey (BPSS) is a study of the demand for skills from the perspective of the commercial establishment. In relation to a system of workplace indicators relating to "effective skills utilisation", it looks within the establishment's productive system to understand the business decisions and other institutional factors that interplay with and drive skills demand. The analyses and findings from this study will provide relevant and timely data on skills demand and skills utilisation at the establishment level for tracking and diagnostic purposes, as well as to inform skills policies at the sectoral level.

### 1.1.1 How we define effective skills utilisation

In examining the demand side of skills, of central importance is the notion of *effective* skills utilisation, that is, to achieve "the most effective *application* of skills in the workplace to maximise performance" (Scottish Government, 2008) so that the potential of skills may be harnessed to fulfil business needs. Beyond skills development, this emphasises the application and outcomes of investments in skills. In a commentary, Warhurst and Findlay (2012) conceptualised the problem of effective skills utilisation as a two-fold concern about "making use of better skills" and "making better use of skills".

### 1.1.2 Making use of better skills: job skills demand

In making use of better skills we are concerned with raising the quality and level of the skills required to perform the job adequately, which in turn relates to the demand for job skills in the establishments. Reviews (Spenner, 1990; Gallie, Felstead, & Green, 2003) have suggested that skills demand is the key concept behind the demand for skills. Skills demand has been defined as the "level, scope, and integration of mental, manipulative, and interpersonal tasks of the job" (Spenner, 1990).

### 1.1.3 Making better use of skills: employees' discretionary effort

In making better use of skills we are concerned with maximising the untapped potential of employees' skills so that both employers and employees are able to fully benefit from the

investments in and application of these skills. In the study, we adopted discretionary effort as an indicator of how gainfully employees in the establishments are applying their skills in their jobs. Employees' discretionary effort may be described as the voluntary effort that employees contribute to the organisation above and beyond what is required to keep the job and remain functional (Lloyd, 2008).

#### 1.1.4 *Positive relationship between discretionary effort and job skills demand*

The BPSS found a positive and significant relationship between job skills demand and discretionary effort. This finding affirmed that employees' technical and cognitive competences were important prerequisites for them to know what should be done and how it should be done to execute their job roles efficiently and effectively, and for encouraging their exertion of discretionary effort above and beyond the baseline requirements (Lloyd, 2008).

#### 1.1.5 *Market competitive conditions and value add strategies*

Value add strategies define the ways that businesses position their products or services to compete in their chosen market and to gain an advantage over their competitors (Porter, 1980; UCKES, 2016). Through carefully chosen strategies, businesses are able to influence market competition and affect the overall attractiveness and profitability of the industry (Porter, 1980).

The survey findings showed a positive and significant relationship between the extent to which value add strategies are pursued and the demand for job skills and discretionary effort. This was expected as greater employee skills are required to produce more complex and differentiated products or services.

Inversely, the survey findings showed a negative relationship between the extent to which value add strategies were adopted and the competitiveness of the market. There was also a negative relationship between skills utilisation and the competitiveness of the market. This suggested that in pursuing a high value add strategy and adopting a "high-road" approach towards skills, businesses were more likely to find themselves in a "niche" position that was less subject to external competitive pressures and more sustainable in the long run.

#### 1.1.6 *Technological changes in work processes*

Technological changes introduced into work processes also play a central role in driving skills utilisation and therefore workforce needs. Of the establishments surveyed, 27.4 percent indicated that they had introduced significant technology-related changes in their work processes in the last 12 months. Of those, 19 percent indicated that the technological changes resulted in considerable reduction in the number of workers required.

In terms of the association between technological changes and the *quality* of jobs, there was a positive and significant relationship between the introduction of technological changes in work processes and skills utilisation. This suggested that technology-related changes had a positive impact on the technical skill requirements (or skills demand) of job roles and functions and also the discretionary effort exhibited by employees.

#### 1.1.7 *Skills strategies*

Skills strategies, or high-performance workplace practices (HPWPs), are human resource management practices designed to stimulate more effective employee involvement and commitment (UCKES, 2016) in ways that motivate and create opportunities for employees to expend their acquired skills in suitable and effective ways that will contribute to overall business goals (Huselid, 1995; Warhurst & Findlay, 2012). Beyond skills development, skills strategies underscore the importance of effective skills utilisation in the workplace.

The survey findings showed a positive and significant relationship between the extent of use of skills strategies and skills utilisation. This suggested a promising link between the use of skill strategies and the use of better skills in the workplace.

#### 1.1.8 *Existing skills gaps*

The survey findings suggested that the large majority of the Singapore workforce had sufficient skills for their job and were not considerably affected by existing skills gaps. Across the establishments surveyed, the mean percentage of staff (unweighted) with existing skills gaps (defined as staff who were unable to cope with their existing duties) was 9.4 percent.

Interestingly, the survey findings indicated no discernible patterns in the extent of existing skills gaps across industry sectors, establishment sizes, or other establishment characteristics such as whether the establishment was family-owned or part of a multi-national entity.

As would be expected, there was a negative and significant relationship between the extent of existing skills gaps and the extent of discretionary effort exerted by employees. This suggested that employees' inability to cope with their existing duties has an impact on their performance (Lloyd, 2008).

Examining the *types* of skills where gaps are experienced, the skills areas found to be most commonly lacking by the establishments were leadership (19.7 percent), selling (19.7 percent), specialised numeracy (20.2 percent), and information and communications technology (20.5 percent).

#### 1.1.9 *Workplace training and development*

Across the establishments surveyed, the mean percentage of staff (unweighted) that attended classroom-based training was 29.5 percent.

By industry sectors, compared with the overall mean, establishments in the construction sector (37.7 percent) and education, human health, and social work sector (40.6 percent) were likely to have a higher percentage of staff attending classroom-based training, whereas establishments in the manufacturing, mining and quarrying, and other industrial sector (22.9 percent) and wholesale and retail trade, transportation and storage, accommodation and food service sector (24.8 percent) were likely to have a lower percentage of staff attending classroom-based training.

Furthermore, the findings also indicated that large(r) and multi-national establishments were more likely to have a higher percentage of staff attending classroom-based training in the last 12 months. The higher average participation rate for classroom-based training in these establishments was probably due to the greater access to the relevant resources (in both monetary and non-monetary terms) that these establishments had, which enabled them to support classroom-based training for their employees.

There was a small, positive and significant relationship between the percentage of employees who attended classroom-based training and skills demand. However, there was no significant relationship between the percentage of employees who attended classroom-based training and discretionary effort exerted. This showed the limitations of classroom-based training in encouraging more effective skills utilisation within the workplace. Apart from the extent of participation in such training, other important considerations such as the scope and purpose of the training should also be taken into account.

In terms of formalised development plans, 39 percent of the establishments surveyed indicated that they had a formalised employee development (or training) budget in place.

By industry sectors, the financial and insurance activities (56 percent), information and communication activities (51 percent), education, human health, and social work activities (48

percent) and professional, scientific, technical, administrative, and support service activities (43 percent) sectors had higher than average prevalence a formalised development budget in place.

The findings also indicated that large(r), non-family-owned, and multi-national establishments had a higher than average incidence of having a formalised development budget, probably due to the greater access to the relevant resources (in both monetary and non-monetary terms) that these establishments had, which enabled such activities for their employees.

There was a positive and significant relationship between the incidence of formalised development (or training) budgets and the demand for job skills. There was also a positive and significant relationship between the incidence of formalised development (or training) budgets and the extent of discretionary effort exerted by employees. The presence of a formalised development budget signalled an establishment's commitment to employee development, probably beyond that of current establishment demands, while at the same time encompassing a more holistic approach.

## 1.2 Methodological overview

### 1.2.1 Survey questionnaire

The questionnaire was developed in accordance with the conceptual framework outlined in section 1.1.1. The initial draft underwent expert review and the final draft was pre-tested with 10 establishment managers. Following this, final revisions were made prior to an initial pilot phase with 200 establishments. After further revisions, the final survey was administered to 3800 establishments to provide the final sample reported on here. The data collected in the survey is outlined in sections 1.3 and 1.4.

### 1.2.2 Sampling and data collection

The results presented in this report were collected from January 2016 to December 2016. The survey was conducted through face-to-face interviews. The unit of analysis in the study was individual commercial establishments, and the survey respondents were either the owner of the business or a senior manager who had a minimum of 1 year's tenure with the establishment.

### 1.2.3 The sample

A total of 3801 establishments across different industry sectors were surveyed. Table 1 shows the sample profile broken down by industry sector, establishment size, and establishment type (whether the establishment was a part of a multi-national entity or family-owned).

**Table 1. The sample profile**

Category	Sub-group	%	N	Total
Industry sector	Agriculture, forestry and fishing*	0.1	3	3795
	Manufacturing, mining and quarrying and other industrial	9.3	351	
	Construction	11.7	443	
	Wholesale and retail trade, transportation and storage, accommodation and food service	38.5	1461	
	Information and communication	5.9	222	
	Financial and insurance activities	2.5	95	

	Real estate activities*	1.3	49	
	Professional, scientific, technical, administrative and support service activities	21.0	796	
	Education, human health, and social work activities	4.5	170	
	Other service	5.4	205	
Establishment size	Very small (fewer than 20 employees)	61.1	2321	3801
	Small (between 20 and 49 employees)	24.3	924	
	Medium (between 50 and 199 employees)	12.3	466	
	Large (200 or more employees)	2.4	90	
Family-owned entity	Yes	31.1	1179	3789
	No	68.9	2610	
Multi-national entity	Yes	32.9	1250	3797
	No	67.1	2547	

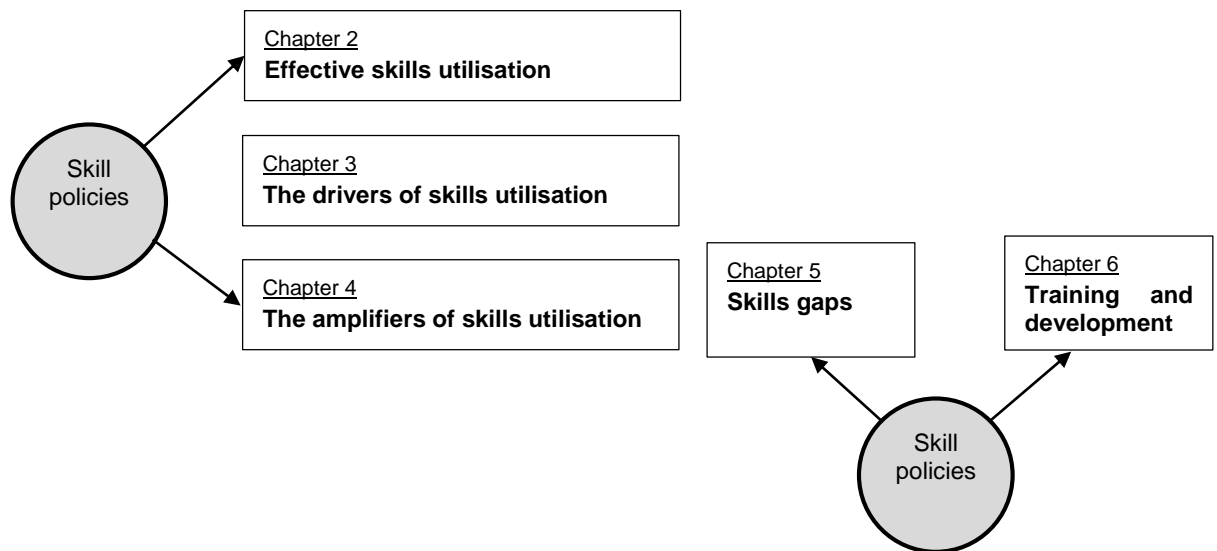
\*Due to small sample size (less than 30), the results for agriculture, forestry, and fishing activities and real estate activities are not reported.

### 1.3 Data collected and the structure of the report

As the first iteration of a proposed multi-wave study of skills utilisation at establishment level, this report focuses on developing and establishing a system of workplace indicators relating to effective skills utilisation for diagnostic, policy and practical purposes. Each of these indicators may be understood in isolation as well as in relation to each other. They will provide a baseline for subsequent tracking of skills utilisation at establishment level in the long term. In addition, this report presents key findings on the links between skills demand and the establishment productive system, including the market conditions, value add strategies, and the technical and interpersonal relations in production. This will further our understanding of the decisions and issues related to skills utilisation faced by employers.

Accordingly, this report will follow closely the skills policy approach detailed by Sung and Ashton (2014). Figure 1 shows a summary of the report framework.

**Figure 1. The report framework**



The second, third and fourth chapters look at skills in the context of the establishment productive system. The second chapter, “Effective skills utilisation”, develops two indices to measure effective skills utilisation, namely the Establishment Skills Index (ESI) and the Discretionary Effort Index (DEI), and examines skills utilisation as captured by these two indices against establishment characteristics. Details behind the design and rationale for these indicators are provided in chapter 2.

The third chapter, “The drivers of skills demand”, takes a closer look at the market competitive conditions and value add strategies as drivers of skills utilisation. It examines how the strategic aspects of a business relate to skills utilisation. The measurement of market competitive conditions and value add strategies is discussed in the third chapter.

The fourth chapter, “The amplifiers of skills demand”, looks at technological changes in work processes and skills strategy as amplifiers of skills utilisation. It examines how these technical and interpersonal relations in the workplace relate to skills utilisation and employees’ performance.

The fifth and sixth chapters address the supply side-related issues of skills at the establishment level. The fifth chapter, “Existing skills gaps”, takes a closer look at existing skills gaps in the workplace and identifies the skills areas that were found to be lacking in the establishments. It examines skills gaps against various establishment characteristics, as well as against job skills demand and employees’ performance, in an attempt to identify possible causes and impacts of skills gaps. Skills gaps are measured in a relatively simple manner in this study. A description of the measurement technique is provided in chapters 5 and 6.

The sixth chapter, “Workplace training and development”, looks at classroom-based training and development plans formalised at the organisational and/or establishment level. It examines the relationship between training and development activities and establishment characteristics and the relationship between these training and development activities and skills utilisation.

Finally, the last chapter, “Conclusion and policy implications”, draws out the key findings from the analyses and highlights potential key contributions to skills policies.

## 1.4 Other data

In addition to the data relevant to the indicators discussed above, the BPSS collected data on a range of significant establishment characteristics, including:

1. Firm demographics such as the occupational make-up of the establishment, the percentage of females in the establishment and the percentage of mature workers in the establishment.
2. The industry that the firm is operating in. The sector classification employed in this report follows high-level aggregation (A\*10) as described in the International Standard Industrial Classification of All Economic Activities (ISIC). This classification is obtained from matching relevant information collected at the two-digit level of the Singapore Standard Industrial Classification (SSIC) during the survey.
3. The talent management practices of the establishment, including the existence of a talent management program and the form that this takes.
4. A managerial perspective on leadership quality within the establishment. The instrument used in this instance is not reported on as it failed to validate.

## 2 Effective skills utilisation

### 2.1 Introduction

Inherent in the demand for skills lies the notion of *effective* skills utilisation, which is about making use of better skills and making better use of skills. In making use of better skills we are concerned with raising the quality and level of the skills required by jobs. In making better use of skills we are concerned with maximising the untapped potential of employees' skills. Both relate to employees' performance and how effectively their skills are being applied in their jobs, and whether or not both employers and employees are able to fully benefit from the investments in these skills.

To better understand if there is effective skills utilisation, we constructed two indices: the ESI and the DEI. These indices are evaluated against establishment characteristics, business strategy, and workplace practices.

These indices will form a basis for monitoring and assessing both current and future trends of skills utilisation in commercial establishments, both in and of themselves and in relation to the drivers and amplifiers of skills utilisation, to better inform skills policy.

### 2.2 Making use of better skills: a measure of skills demand

What constitutes "good" job skills, and how can they be measured? Traditional approaches have been inclined to use non-measurable dimensions such as educational qualification, wage, or occupational group to gauge skills. However, the over-reliance on any one of these proxies for skills is problematic and limited **both** in its practical utility (CIPD, 2015; Warhurst and Findley, 2012; Spenner, 1990), as it presents a narrow perspective on what constitutes and contributes to job skills, and, **consequently**, in terms of what it may inform stakeholders about suitable intervention measure.

Reviews (Spenner, 1990; Gallie, Felstead, & Green, 2003) on the conceptual and methodological underpinnings of measuring job skills have suggested that the key dimension of job skills could be broadly understood as "skills demand". Skills demand reflects the "level, scope, and integration of mental, manipulative, and interpersonal tasks of the job" (Spenner, 1990). Further, in examining skills, the reviews have also noted the necessity of distinguishing between the skills possessed by employees and the skills required by the job. In this study of the demand side approach to skills, we will focus on the latter (skills required by the job).

The ESI is used to reflect the complexity of the jobs available in establishments by offering a broad overview of the technical and cognitive skills they require. Adapted from the Broad Skills Index used in previous related studies conducted in the UK and Singapore (Ashton, Davies, Felstead, & Green, 1999; Felstead, Gallie, Green, & Zhou, 2007; Sung et al., 2011), the ESI used the learning inputs required to develop skills and knowledge to indicate skills demand. It recognised the diverse roles of formal qualifications and other, non-formal or informal means of acquiring relevant skills, including work experience, on-the-job training, and frequent learning and development activities, as equally important means of acquiring relevant skills. In doing so, the ESI is expected to provide a more holistic picture of skills demand that reflected the continuous and multi-faceted nature of skills development extending beyond formal education.

#### 2.2.1 Developing the Establishment Skills Index

In the survey, the respondents were asked to indicate the percentage of jobs in the establishment with the following *minimum* requirements for the jobs to be performed adequately:

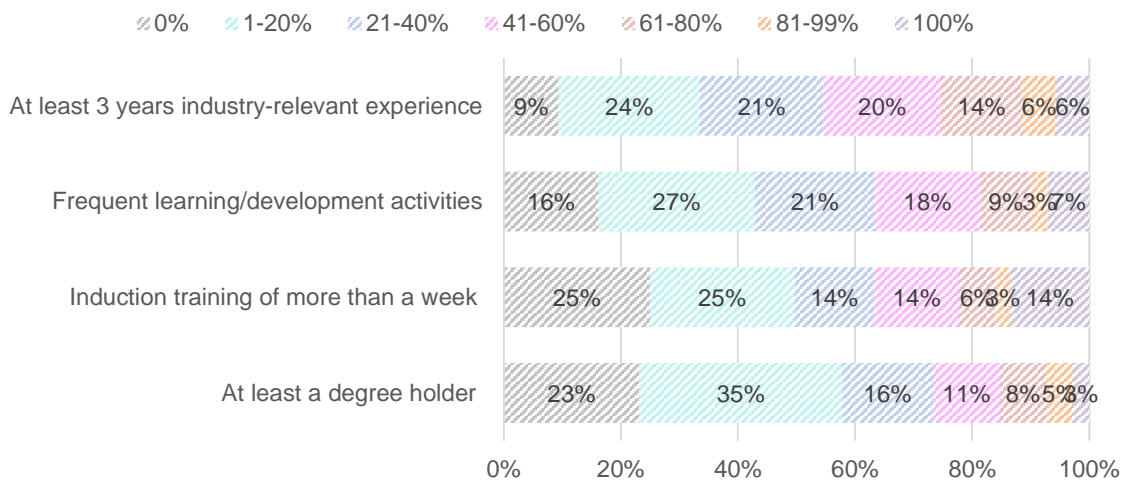


- a degree;
- at least 3 years of industry-relevant experience;
- induction training of more than 1 week;
- frequent learning/development activities.

These four questionnaire items formed the ESI and the response distribution for each of the ESI items is shown in Figure 2.

**Figure 2. Response distribution for the ESI**

The percentage of jobs at the establishment that require:



Base: all respondents ( $n = 3801$ )

Figure 2 shows that, for example, 9 percent of establishments surveyed reported that none of the jobs in the establishment required more than 3 years of industry-relevant experience. This 9 percent would be relatively low-skill establishments, such as in the retail or food and beverage sectors.

The final ESI was obtained by first averaging each of the four questionnaire items, then standardising the scores to obtain a sample mean of 0 and standard deviation of 1.

### 2.3 Making better use of skills: employees' discretionary effort

In examining employees' performance, we adopted discretionary effort as an indicator of how gainfully employees in the establishments are applying their skills in their jobs. Discretionary effort may be described as the voluntary effort that employees contribute to the organisation above and beyond what is required to keep the job and remain functional (Lloyd, 2008). While closely linked to positive behaviours such as motivation and commitment, discretionary effort reflects, beyond merely the intention to act, how these behaviours translate into tangible value for the organisation through accomplished work; it is the value add work or effort by employees that is not and cannot be contractually enforced (Lloyd, 2008). For employees to contribute such effort, it may be expected that employees should possess the relevant technical and cognitive skills to perform their tasks effectively, and should be given sufficient room to exercise their autonomy and decision-making capacities (Lloyd, 2008).

#### 2.3.1 A measure of employees' performance: Discretionary Effort Index

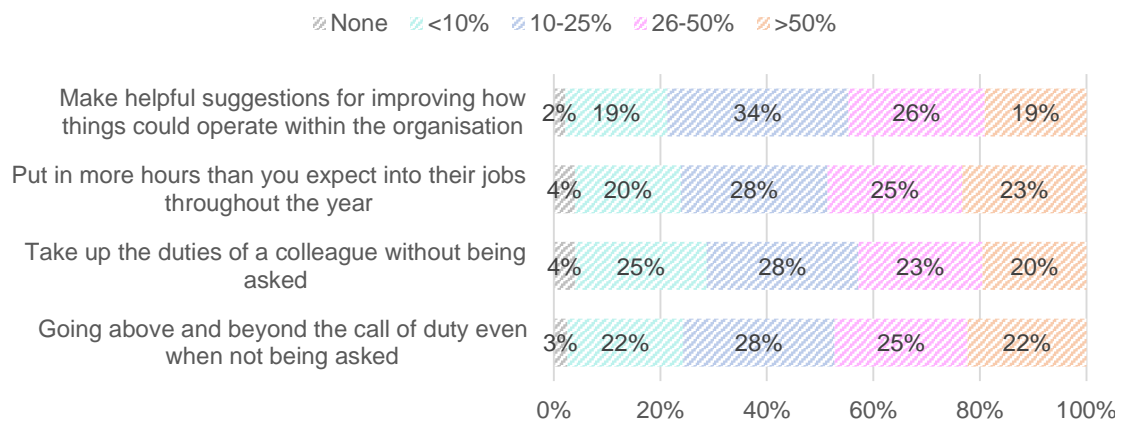
To measure the extent of discretionary effort exerted by employees in the establishment, respondents were asked in the survey to indicate the percentage of staff in their establishments who:

- went above and beyond the call of duty even when not asked;
- took up the duties of a colleague without being asked;
- put in more hours than expected into their jobs throughout the year; and
- made helpful suggestions for improving how things could operate within the organisation.

As a matter of questionnaire design, it may be noted that while discretionary effort *per se* is not an observable trait, the questionnaire items sought to reflect the *actions* that would result from those efforts (Lloyd, 2008). Figure 3 shows the response distribution for the four questionnaire items.

**Figure 3. Response distribution for the DEI**

The percentage of staff in the establishment who:



Base: all respondents ( $n = 3801$ )

As can be seen in the chart, 23 percent of establishments reported that more than 50 percent of their staff put in more hours than expected throughout the year. These establishments would generally be considered to have a high level of discretionary effort.

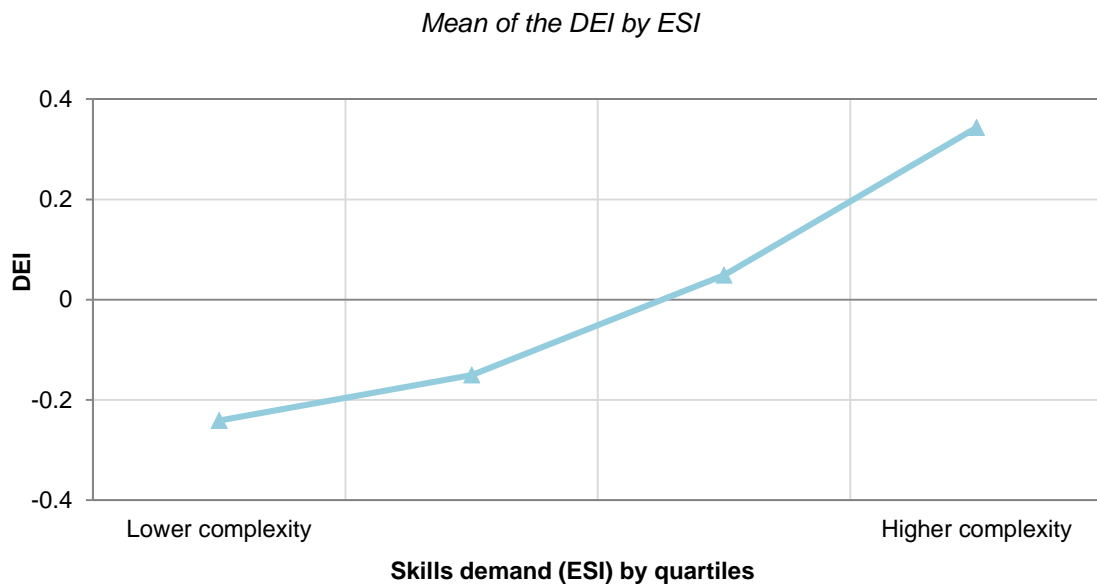
Similar to the ESI, the DEI was obtained by first averaging the scores for the four respective questionnaire items, then standardising the scores to obtain a sample mean of 0 and standard deviation of 1.

## 2.4 Effective skills utilisation: combining skills demand and discretionary effort

### 2.4.1 *The relationship between discretionary effort and job skills demand*

We examined the relationship between skills demand (ESI) and discretionary effort (DEI). Figure 4 shows the mean DEI examined against the mean ESI. Furthermore, as may be observed from the trend line, there was a positive and significant relationship between discretionary effort and skills demand. This suggests that employees who performed more complex jobs were also more likely to exert a greater degree of discretionary effort. It is highly likely that employees' technical and cognitive competencies are important prerequisites for them to know what should be done and how it should be done to execute their job roles efficiently and effectively and for encouraging their exertion of discretionary effort above and beyond the baseline requirements (Lloyd, 2008). Further modelling was conducted to control for establishment characteristics and the relationship remains positive and significant.<sup>2</sup>

**Figure 4. The relationship between discretionary effort and skills demand**



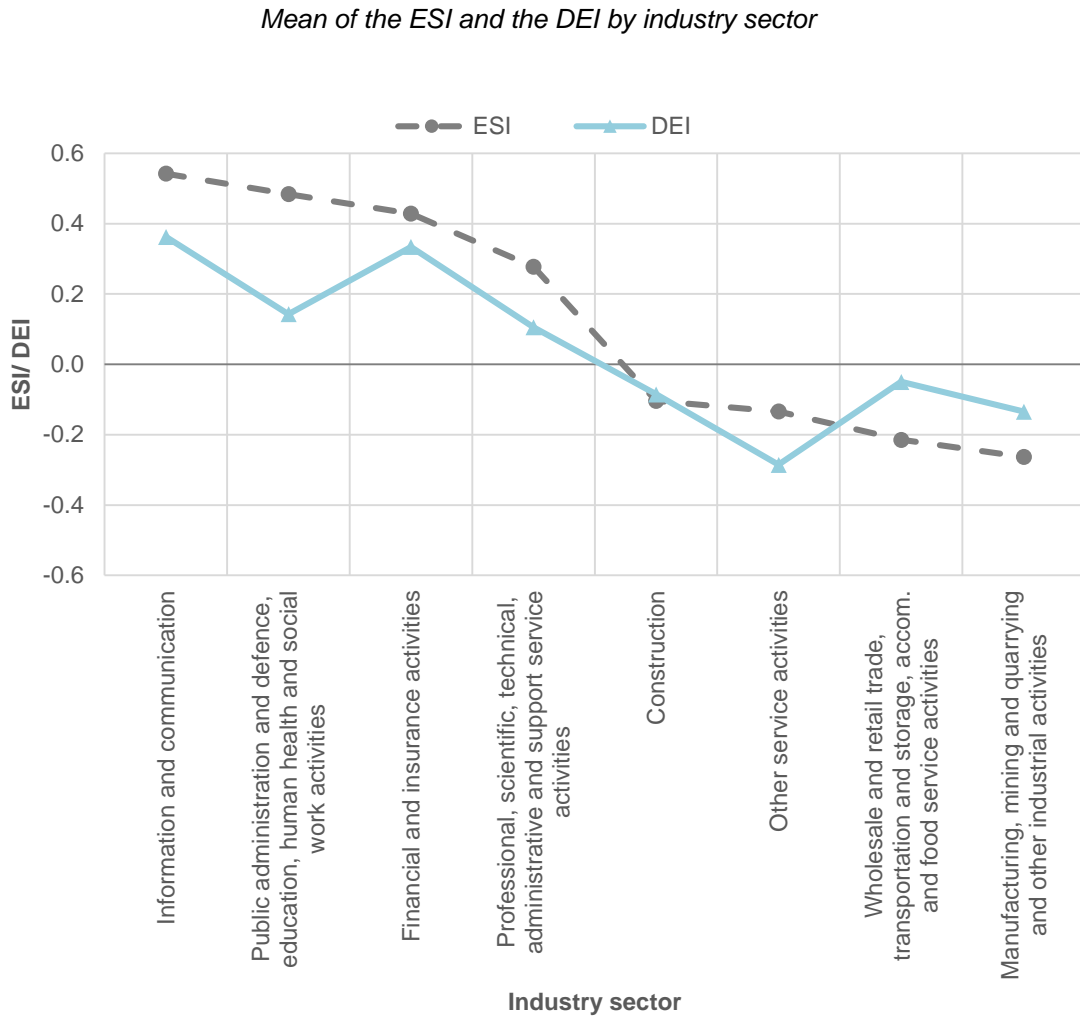
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<sup>2</sup> Please see Appendix 1, Table 6, for more information.

2.4.2 Skills utilisation and establishment characteristics

Figure 5, presented below, shows that the ESI and DEI tend to follow similar patterns across most establishment characteristics. Across industries, the two indices are well correlated and present results that are generally expected. Information and communication, and finance score high for both indices while wholesale, retail, transport, accommodation, food services, and manufacturing score relatively lower.

**Figure 5. Skills utilisation by sector**

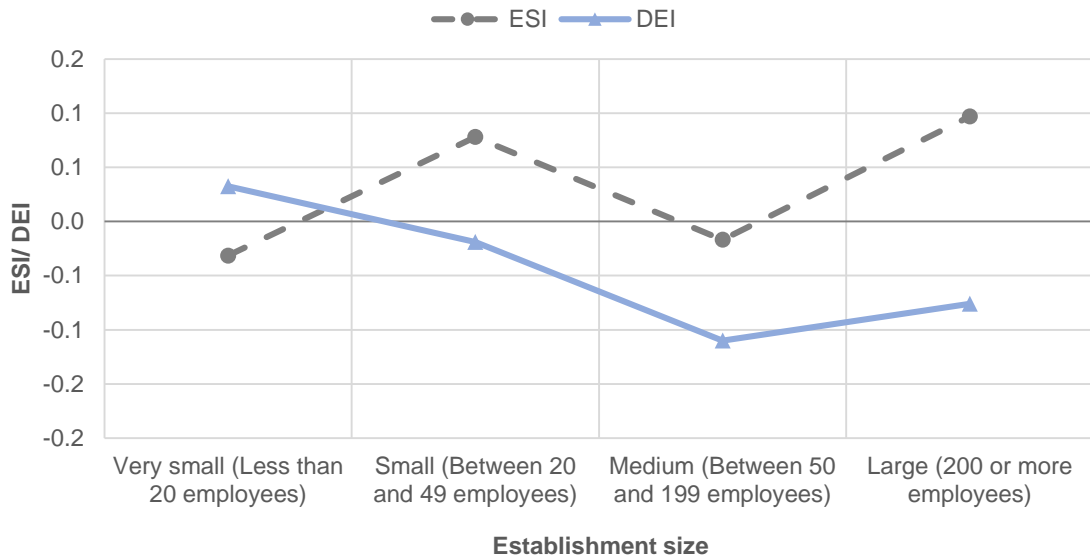


The results for agriculture, forestry, and fishing activities and real estate activities are omitted due to small sample size (less than 50).

The pattern across establishment size shown in Figure 6 is mixed, with no clear indication of direction. It appears that the ESI shows no directional tendency. There is some evidence that DEI may be negatively correlated with establishment size (larger establishments are less likely to have higher DEI).

**Figure 6. Skills utilisation by establishment size**

*Mean of the ESI and the DEI by establishment size*



As may be observed from the trend lines in Figure 7, there was a positive and significant association for both the ESI and DEI with the percentage of managers and professionals in the establishment. The findings suggested that, on the whole, managers and professionals were more likely to perform job roles with high skills demand than rank and file employees. And, as such, a positive and significant relationship between the ESI and both occupational groups is expected.

**Figure 7. Skills utilisation by percentage of managers and professionals**

*Mean of the ESI and the DEI by percentage of managers and professionals*

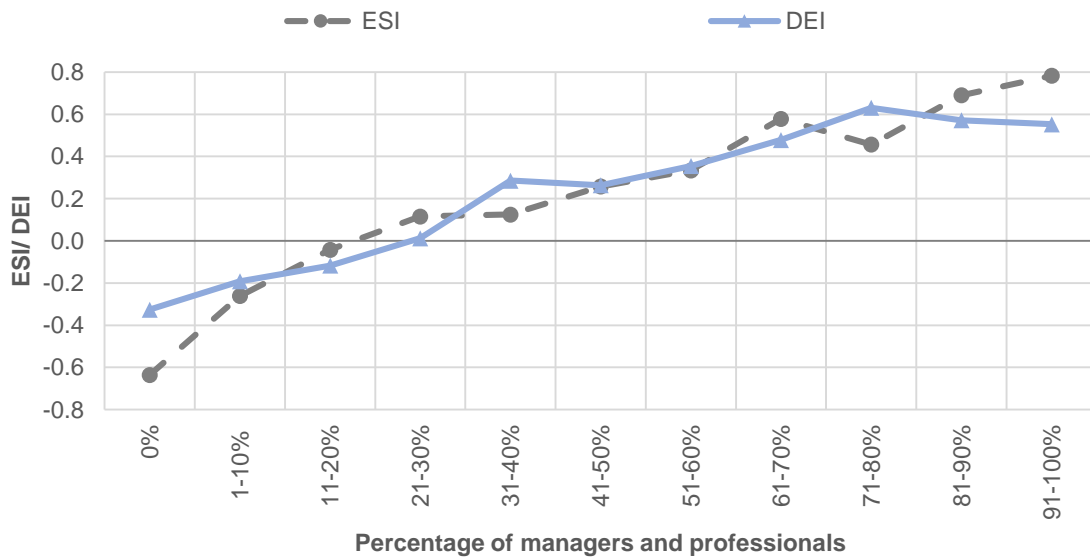


Figure 8 shows that the ESI for family-owned establishments was significantly lower than that for non-family-owned establishments. The relationship between DEI and family-owned establishments was similar to that of ESI and family-owned establishments, but less pronounced.

**Figure 8. Skills utilisation by establishment type (family-owned)**

*Mean of the ESI and the DEI by establishment type (family-owned)*

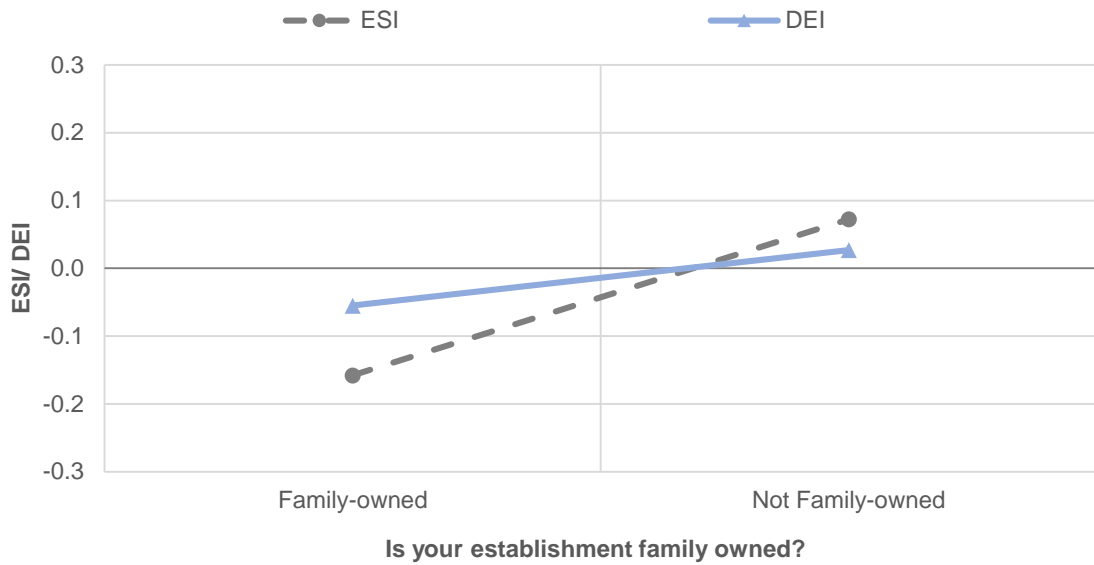
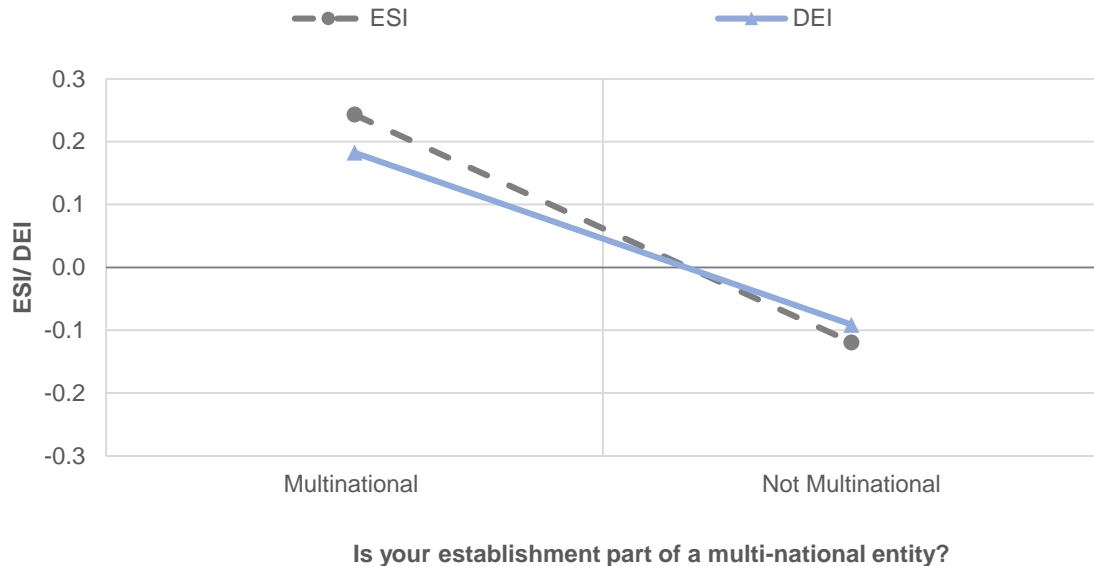


Figure 9 shows that both the ESI and DEI for establishments which were part of multi-national entities were significantly higher than those for establishments which were not part of multi-national entities.

**Figure 9. Job skills demand by establishment type (multi-national entity)**

*Mean of the ESI and the DEI by establishment type (multi-national entity)*

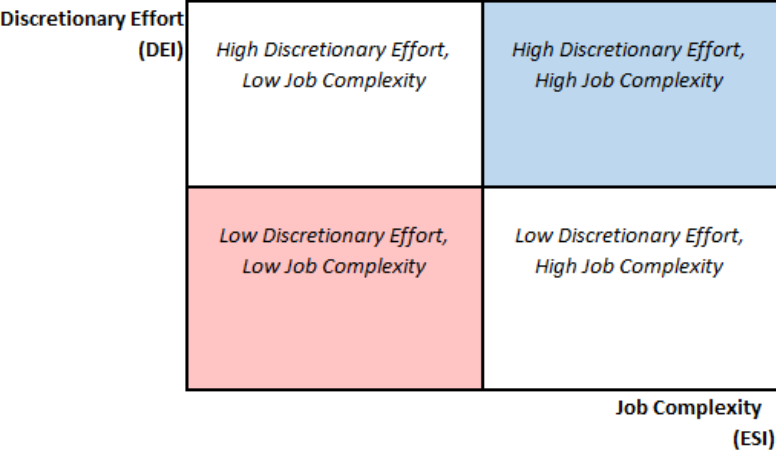


### 2.4.3 Effective skills utilisation: further analyses

Chapters 3 and 4 of this report will focus on the relationship between various drivers and amplifiers of skills utilisation. As skills utilisation has been positioned as the combination of skills demand (ESI) and discretionary effort (DEI), the use of a quadrant, intersecting ESI and DEI, will be used to report the relevant statistics. Figure 10 shows the quadrants to be used. The

implication is that it is the combination of both skills demand and skills utilisation that is likely to be closely related to amplifiers and drivers. In addition to the quadrants, which report raw statistics, we also employ regression analysis to confirm these relationships in the presence of controls for various establishment characteristics.

**Figure 10. Effective skills utilisation quadrant**



# 3 The drivers of skills utilisation

## 3.1 Introduction

Generally speaking, there are two broad ways that businesses may approach skills (Sung & Ashton, 2014). On the one hand, businesses may take the “low-road” approach, making use of low-skilled labour to achieve a competitive advantage based on cost. In this approach, skills in terms of labour/manpower are regarded as a “cost” to be reduced. On the other hand, the high-road approach advocates for skills levels to be raised, as higher skills levels can be harnessed by businesses to pursue a high value add productive system. Unfortunately, there is no automatic relationship between the approach to skills and performance. While higher levels of skills will enable businesses to pursue higher value add productive systems and growth, it could very well be a rational – and even profitable – choice for businesses to choose the low-road approach. Why is this so? How do businesses decide which approach to take to skills?

To answer the above questions, it is imperative to note that businesses are by nature purposive entities, and largely guided by the objective to maximise profits (Sung & Ashton, 2014). Putting this into context, what this means is that how a business approaches skills is influenced by its larger purpose in relation to the external market environment, and driven by its decisions on the type of product to be produced or service to be rendered. These are the conditions that affect its demand for skills from the workforce and which determine whether or not the potential of skills can be realised in terms of productivity and business performance.

In this chapter, we will take a closer look at these drivers of skills demand. We will examine how the drivers of skills utilisation, including the market competitive environment and the value add strategies, relate to skills utilisation as defined by the ESI and the DEI.

Such analyses will better inform us about how business strategic decisions affect demand for and corresponding use of skills in the establishments.

## 3.2 Market competitive conditions and value add strategies

Value add strategies define the ways that businesses position their products or services to compete in their chosen market and to gain an advantage over their competitors (Porter, 1980; UCKES, 2016).

Prior studies have pointed to the chosen value add position of businesses as an important determinant of their corresponding workforce skills level (Mason, 2004). In those studies, a close link was found between the demand for skills and the extent of value added generated by value add strategies. In pursuing a low value add strategy, where the products or services were of basic and standardised quality, these businesses were likely to require a lower level of skills from their employees and accordingly also likely to regard skills as a cost to be reduced. In contrast, in pursuing a high value add strategy producing more complex and differentiated goods and services, these businesses were accordingly likely to require a higher level of skills and thus more willing to invest in them.

By extension, the studies also raised important questions about the *sustainability* of the chosen value add strategies when exposed to external competitive pressures (Mason, 2004). Inasmuch as the low value add strategies and low-road approach towards skills remain viable, and meet the bottom line of the businesses, there would be little incentive for businesses to move towards a high(er) value add strategy and adopt the high-road approach to skills. In developing our



understanding of what drives the demand for skills, it thus warrants a closer look at the relationship between the competitive conditions of the market and the value add strategies.

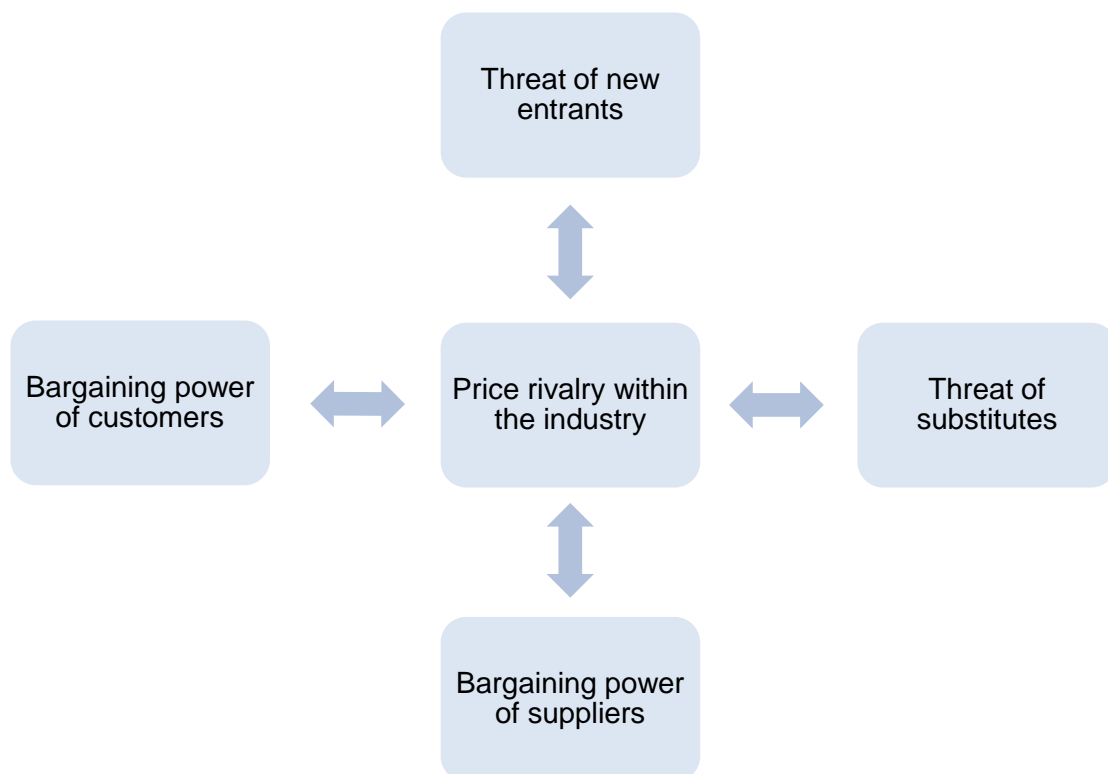
### 3.2.1 *Market competitive conditions*

To describe the market competitive conditions, Porter (1980) developed a “five forces” framework. In it, he identified five competitive conditions (or “forces”) that formed the “rules” of market competition, which in turn would determine the attractiveness of the industry for long-term profitability. An illustration of the five forces is shown in Figure 11.

Accordingly, in the survey, we adopted this five forces framework to describe the extent of market competitiveness. The respondents were asked to rate on a 3-point scale, where 3 means “more competitive” and 1 means “less competitive”:

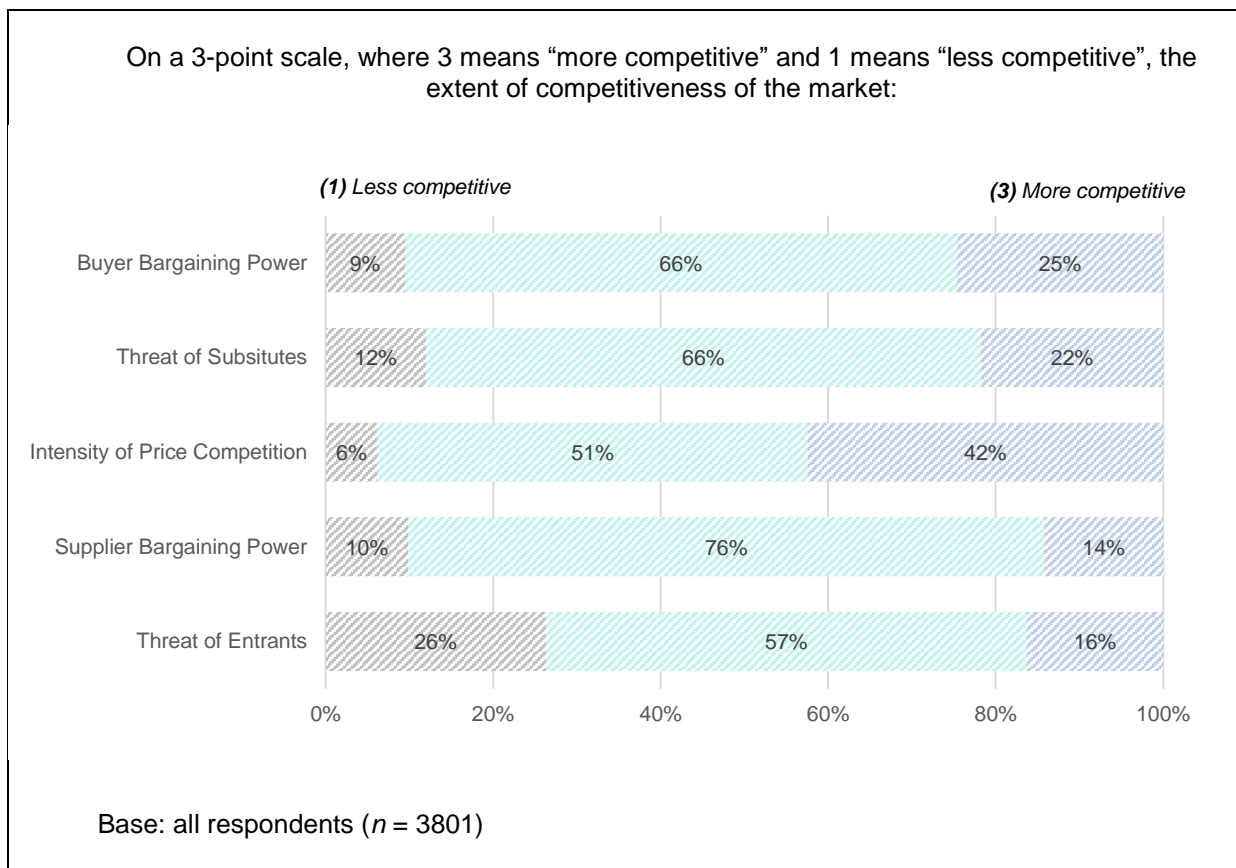
- the extent to which price competition was used in their industry;
- the ease with which new firms can enter and compete in their industry;
- the extent to which their products and services were threatened by substitute products and services;
- the level of bargaining power that the establishment had over their suppliers;
- the extent to which their customers could influence the prices, quality, and design of the products and services.

**Figure 11. Porter’s five forces framework describing market competitive conditions**



These five items corresponded to the five competitive conditions of price rivalry within the industry, threat of new entrants, threat of substitutes, bargaining power of suppliers, and bargaining power of customers respectively. Figure 12 shows the response distribution of the above questionnaire items. The variables have been standardised in the following analyses.

**Figure 12: Response distribution for market competitive conditions**



### 3.2.2 The value add strategies

As an extension to his five forces framework, Porter (1980) identified two basic competitive advantages – differentiation and low cost – that businesses may develop over their competitors. It followed, then, that businesses may choose to pursue the value add strategies of differentiation or cost leadership respectively. In choosing to compete via the differentiation strategy, the business seeks a “unique” (and valued) position for its products and services that may be delivered at a premium price, suggesting a high value add position. In comparison, in choosing to compete via the cost leadership strategy, the business intends to become a low-cost producer in their industry, suggesting a low value add position (Porter, 1980).

Porter (1980) noted that organisations should be clear in deciding which of the two strategies to pursue, rationalising that being “all things to all people” and “stuck in the middle” will lead to below average performance. Later commentators, however, have critiqued this mutually exclusive treatment of the strategies, and argued that organisations are more likely than not to pursue both strategies to different degrees. Rather than conceptualise the two competitive strategies as two ends of a single continuum, the latter perspective viewed them as two separate dimensions. We shall adopt the latter perspective in our analyses.

Adapting the UK’s Employers Skills Survey 2015 (UCKES, 2016) to measure the extent to which the establishment pursued a differentiation strategy, the BPSS survey asked respondents to rate, on a 5-point scale, where 5 means “strongly agree” and 1 means “strongly disagree”, compared with others in their industry:

- the amount of customisation depending on the requirements of customers or users of their establishment’s services;

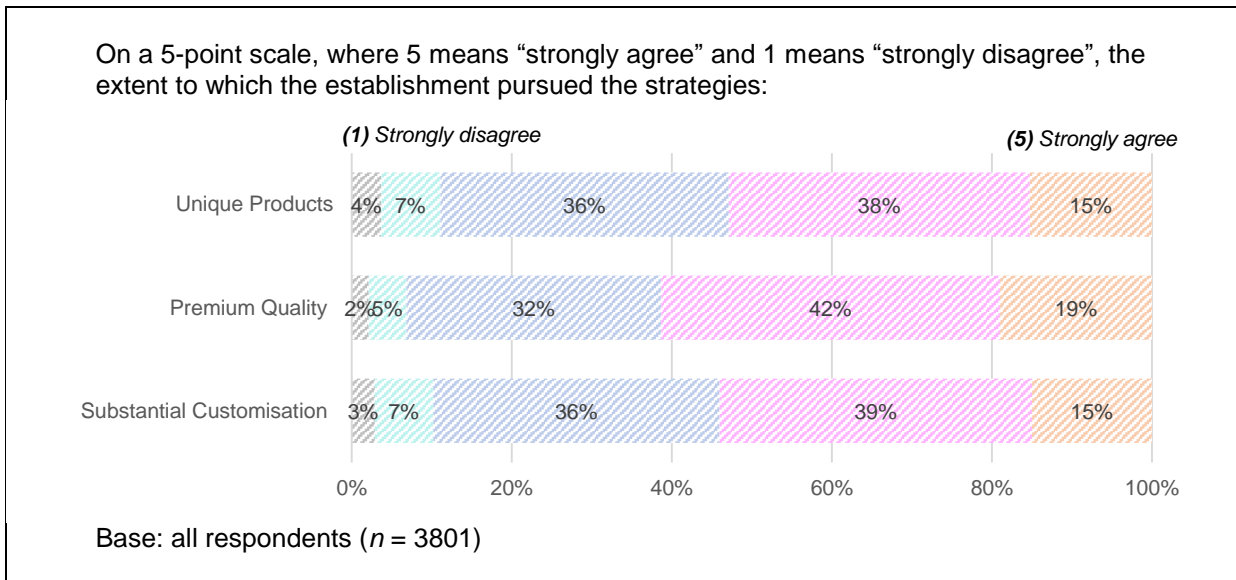
- the degree to which their establishment competed in a market for premium quality products or services;
- the degree to which their establishment relied on development of unique products or services.

Similarly, to measure the extent to which a cost leadership strategy was pursued, the respondents were asked to rate on the same 5-point scale, compared to others in their industry:

- the competitive success of their establishment's products or services was wholly dependent on price.

Figure 13 shows the response distribution of the above questionnaire items. Accordingly, an overall index to measure the extent of differentiation strategy pursued by the establishment was obtained by averaging the responses of the respective three questionnaire items, then standardising the responses. Similarly, an index to measure cost leadership strategy was obtained by standardising the responses of the respective questionnaire items.

**Figure 13: Response distribution for the value add strategies**



### 3.3 The relationship between value add strategies, market competitive conditions, and skills utilisation

#### 3.3.1 Market competitive conditions and value add strategy

We first examined the relationship between the value add strategies and the market competitive environment. Analysis was conducted with value add strategy as the dependent variable and the five competitive forces as independent variables. The analysis also controlled for other establishment characteristics.<sup>3</sup>

There was a negative and significant relationship between the extent to which the value add strategy was pursued and the extent of threat of new entrants and bargaining power of suppliers, and a positive and significant relationship between the value add strategy and the extent of price

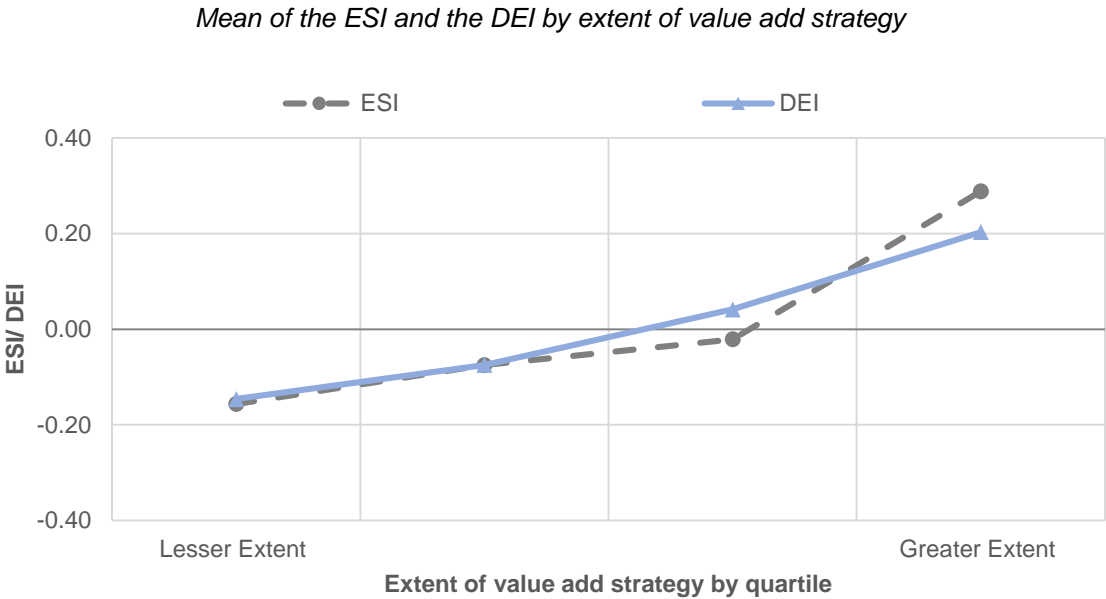
<sup>3</sup> Please see Appendix 2, Table 7, for further information.

rivalry, bargaining power of customers, and bargaining power of buyers. There was no significant relationship between the differentiation strategy and the extent of threat of substitutes.

3.3.2 Value add strategies, market competitive conditions, and skills utilisation

Following the above analysis, we examined the relationship between skills utilisation against the value add strategies and the market competitive conditions. Figure 14 show the ESI and DEI examined against the value add strategies. We also conducted modelling to examine the relationship between skills utilisation, value add strategy and competitive conditions. Generally speaking, we found that value add strategy is positively associated with skills utilisation (for both ESI and DEI) and competitive condition is mildly negatively associated with skills utilisation.<sup>4</sup>

Figure 14. The relationship between value add strategy and skills utilisation



Taken together, the above results provide interesting insights into the relationship between value add strategies, competitive forces, and skills utilisation. The results showed that in pursuing to a greater extent a high value add (differentiation) strategy, the businesses were accordingly more likely to demand a higher level of job skills for the dimension of skills demand, probably so that employees’ skills could be harnessed to produce more complex and differentiated products or services.

In terms of the sustainability of the value add strategies when exposed to external competitive pressures, on the whole the results suggest that the high value add differentiation strategy was associated with less competitive market conditions, while the low value add cost leadership strategy was associated with more competitive market conditions. More significantly, skills utilisation, in terms of both skills demand and discretionary effort, was also negatively associated with the market competitive conditions, suggesting that, in pursuing a high value add strategy and accordingly also adopting the high-road approach to skills, the businesses were more likely to find themselves in a niche position that was less subject to external competitive pressures and more sustainable in the long run.

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<sup>4</sup> Please see Appendix 2, Tables 8 and 9, for further information.

Figure 15 presents the raw statistics of the extent of value add strategy by the skills utilisation quadrant intersecting DEI and ESI. It is clear that the biggest distinction is between the blue quadrant, where both DEI and ESI are high, and the bottom left quadrant, where both DEI and ESI are low. This suggests that it is the combination of ESI and DEI that is associated with value add strategy.<sup>5</sup>

**Figure 15. The relationship between value add strategy and skills utilisation**

*Extent of value add strategy by ESI and DEI*

<b>Discretionary Effort (DEI)</b>	<p><i>High Discretionary Effort, Low Job Complexity</i></p> <p><i>Mean VA = + 0.02</i></p>	<p><i>High Discretionary Effort, High Job Complexity</i></p> <p><i>Mean VA = + 0.29</i></p>
	<p><i>Low Discretionary Effort, Low Job Complexity</i></p> <p><i>Mean VA = - 0.19</i></p>	<p><i>Low Discretionary Effort, High Job Complexity</i></p> <p><i>Mean VA = - 0.11</i></p>
	<b>Job Complexity (ESI)</b>	

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<sup>5</sup> Please see Appendix 3, Table 10, for more information.

# 4 The amplifiers of skills demand

## 4.1 Introduction

The production relations within organisations also shape the way work is designed, and accordingly also influence the demand for and utilisation of skills (Sung & Ashton, 2014). There are the technical relations (TRs) in production, which refer to the relations that people in the organisation enter into by virtue of their functions within the division of labour, and are shaped by the type of technology harnessed in the production process (Sung & Ashton, 2014). There are also the interpersonal relations (IRs) in production, which refer to how people in the organisation relate to others based on their position within the division of labour in terms of how much authority and autonomy they have, and are shaped by how management and work practices are structured (Sung & Ashton, 2014).

Through the TRs and IRs of production, we will take a closer look at the relationship between work design, in terms of the technological changes in the work processes (TRs) and the skills strategy (IRs), and the utilisation of job skills. Accordingly, we will examine:

- the relationship between technological changes in the work processes and the number of workers and skills utilisation of the establishments;
- the relationship between the skills strategy and skills utilisation.

## 4.2 Technological changes in work processes

Prior reviews have identified technological changes as playing a central role in driving the trends in job skills demand (Gallie, Felstead, & Green, 2003; Choi, Leiter, & Tomaskovic-Devey, 2008; Brynjolfsson & McAfee, 2014; Autor, 2015). Most of these accounts are analysed in the context of newer digital-based technologies and increased automation in work processes that takes over job functions which can be codified and routinised. While many of those earlier analyses focused primarily on manual and labour-intensive job functions, recent technological developments in terms of enhanced computing power and artificial intelligence have provided the impetus to broaden the analyses to include a wider range of job functions (Gallie, Felstead, & Green, 2003).

These extensive accounts offered mostly mixed and sometimes contradictory views about the impact of technological changes on work processes and the long-term demand for job skills. On the one hand, commentators have suggested that these technologies would substitute for the demand for human capital and provide employers with means for greater control over the way job tasks are carried out, resulting in diminished skills demand from the workforce (Gallie, Felstead, & Green, 2003). On the other, commentators have suggested that these technologies would liberate employees from routine tasks and thus required the upskilling of the workforce to harness the technologies to create value (Autor, 2015). Other commentators have also suggested that these technologies would lead to a polarising effect on the demand for job skills, such that segments of the workforce with relevant skills would benefit from the technologies, while other segments without those skills would experience deskilling, wiping out the bulk of the jobs in the middle (Brynjolfsson & McAfee, 2014).

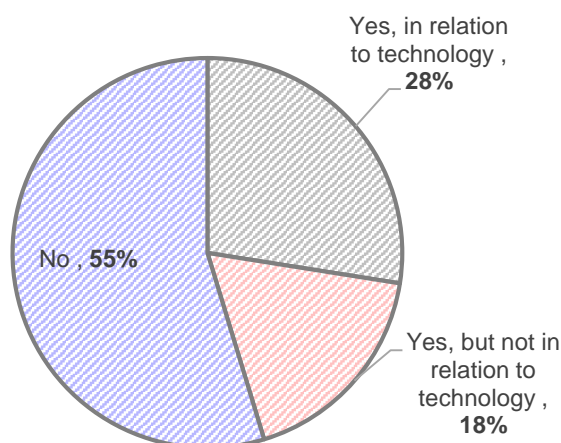
These varied accounts would have to be analysed in the context of the establishments and their diverse job roles and requirements (Gallie, Felstead, & Green, 2003), and the ways that the technology is harnessed. Accordingly, while the data collected in the survey might not allow for a complete range of analyses, it will enable us, in the context of the *current* Singapore workforce, to take a preliminary look at the effects of technological changes in work processes on the number of workers required, and on the average demand for job skills and skills utilisation in the establishments.

#### 4.2.1 *The incidence of technological changes in work processes*

In the survey, the respondents were asked to indicate whether or not the establishment introduced any significant changes in work processes in the last 12 months, and whether or not the changes, if any, were in relation to technology. Figure 16 shows the response distribution.

**Figure 16. Type of changes introduced to the work processes in the last 12 months**

In the last 12 months, did your establishment introduce significant changes in work processes?



Base: all respondents ( $n = 3801$ )

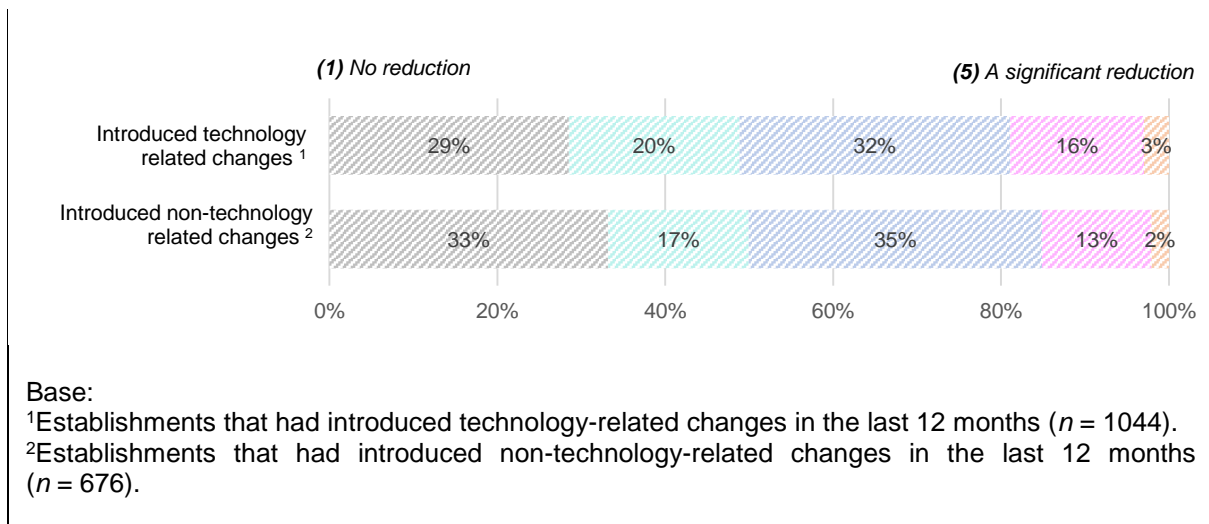
Of the establishments surveyed, 27.5 percent indicated that they had introduced significant technology-related changes in their work processes in the last 12 months, 17.8 percent indicated that they had introduced significant non-technology-related changes in their work processes in the last 12 months, while the remaining 54.7 percent indicated that they did not introduce any significant changes in the work processes in the last 12 months.

#### 4.2.2 *The effect of changes in the work processes on the number of workers required*

We first examined the impact of recent changes in the work processes on the *quantity* of jobs. The survey findings indicated that the majority of the establishments did not experience a considerable reduction in the number of workers they required as a result of the changes introduced. Amongst establishments which had introduced technology-related changes, 19 percent of them indicated that the changes had resulted in considerable reduction in the number of workers required, while amongst the establishments which had introduced non-technology-related changes, 15 percent of them indicated that the changes had resulted in a considerable reduction in the number of workers required. Figure 17 shows the response distribution to the relevant questionnaire item.

**Figure 17: Response distribution of reported change in staff numbers resulting from changes in work processes**

To what extent has the above change in the work processes reduce the number of workers required in your firm?

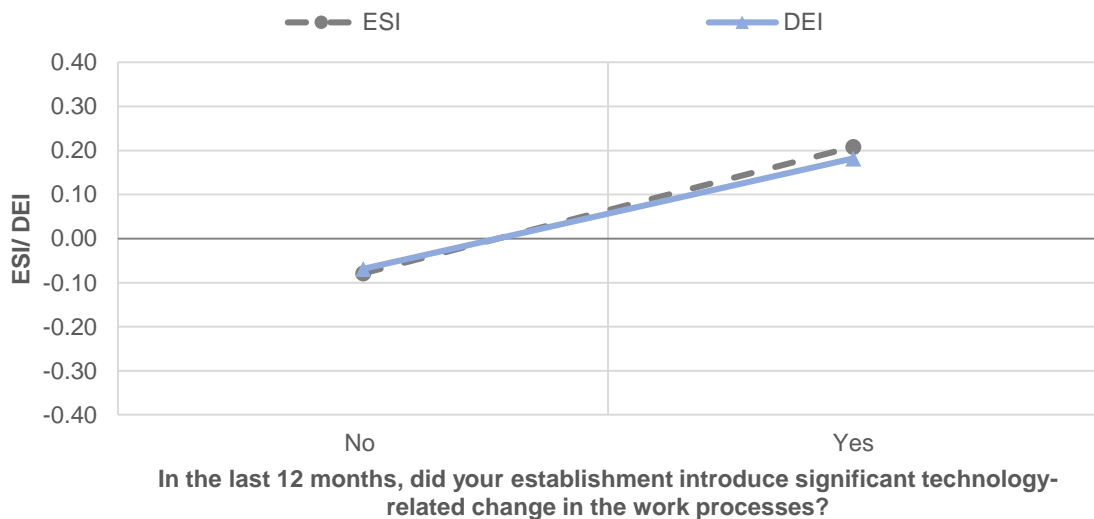


#### 4.2.3 The effect of technological changes in the work processes on skills utilisation

Next, we examined the relationship between technological changes in the work processes and the two dimensions of skills utilisation: skills demand and discretionary effort. Figure 18 shows the mean ESI and mean DEI according to whether or not a technological change was introduced. In addition, two separate ordinary least squares (OLS) regression analyses were also conducted, with the ESI and the DEI (separately) examined against the incidence of technological changes in the work processes. The analyses also included other establishment characteristics as control variables.<sup>6</sup>

**Figure 18. The relationship between technological changes and skills utilisation**

*Mean of the ESI and the DEI by technological changes in work processes*



It was found that establishments which had introduced technology-related changes were significantly more likely to have a higher skills utilisation (ESI and DEI) than establishments which did not introduce technology-related changes. This finding suggested that technology-related

<sup>6</sup> Please see Appendix 3, Table 11 for more information



changes had a positive impact on the technical skill requirements (or skills demand) of job roles and functions, contributing to a demand for better skills. A similar result was obtained in a previous study that examined the effect of the use of computerised or automated equipment in the job on the required qualifications, training time, and on-the-job learning time of employees (Gallie, Felstead, & Green, 2003). In addition to this, there is evidence that technological change had a positive and significant relationship with discretionary effort.

Figure 19 below shows the incidence of technological change for establishments in the four quadrants of job skills utilisation. The results indicated that establishments with *both* above average demand for complexity *and* above average discretionary effort had a higher incidence of technological changes in their work processes ( $I = 35.01\%$ ) than establishments in the other three quadrants.

**Figure 19. The incidence of technological changes for the four quadrants of skills utilisation**

*Incidence of technological changes by the four quadrants of job skills demand*

Discretionary Effort (DEI)	High Discretionary Effort, Low Job Complexity  $I = 28.38\%$	High Discretionary Effort, High Job Complexity  $I = 35.01\%$
	Low Discretionary Effort, Low Job Complexity  $I = 19.97\%$	Low Discretionary Effort, High Job Complexity  $I = 28.95\%$
	Job Complexity (ESI)	

### 4.3 Skills strategy

There has been growing interest in the role of people-focused forms of management (Sung & Ashton, 2014) in work organisation as an important driver of skills demand. To the extent that businesses view their “people” resource as a competitive advantage instead of as a cost to be minimised, their human resource management strategies are accordingly centred on developing a skilled, motivated, and flexible workforce that will be capable of producing innovative and quality products and services and responding flexibly to demanding market imperatives (Becker & Huselid, 1998; Hughes, 2008; Sung & Ashton, 2014). The interest in people-focused management is best represented by the stream of research on HPWPs and high-performance workplace systems (Sung & Ashton, 2014).

HPWPs are human resource management practices that are designed to stimulate more effective employee involvement and commitment (UKCES, 2016) in ways that motivate and create opportunities for employees to use their acquired skills in suitable and effective ways that will contribute to overall business goals (Huselid, 1995; Warhurst & Findlay, 2012). There are a considerable number of studies that have been largely successful in their attempts, both theoretically and empirically, to establish the positive effects of adopting HPWPs on various aspects of business, including workforce productivity and corporate financial performance (Huselid, 1995; Delany & Huselid, 1996; Youndt, Snell, Dean, & Lepak, 1996; Boxall & Macky,

2007). This alludes to great potential in the adoption of HPWPs – both as a driver of skills demand and as means to raise business performance.

However, as we may observe from the data collected, the diffusion of HPWPs amongst establishments in Singapore is at best moderate and also largely uneven across establishments of different characteristics. This raises pertinent questions about the applicability and limitations of these practices. How effective are HPWPs in driving the demand for skills in the workplace and in encouraging effective skills utilisation? In looking at this issue, we should bear in mind the decisions that businesses make on whether or not to adopt HPWPs are influenced by the broader context and purpose of establishments, and informed by an examination of the costs involved and benefits to be derived from such practices (Youndt, Snell, Dean, & Lepak, 1996; Huselid & Rau, 1997; UCKES, 2016).

For simplicity in this report we refer to the workplace practices that are designed to stimulate employee involvement and create opportunities for employees to use their acquired skills as “skills strategy”.

#### 4.3.1 *The dimensions of skills strategy*

With reference to prior studies on skills strategies, a list of practices which were theoretically consistent with the central premises of high-performance working were selected for the questionnaire. For each of these questionnaire items, instead of responding to a dichotomous option indicating the presence or absence of the practice, the respondents were required to indicate the proportion of employees in the establishment that were introduced to that practice. This would provide a richer set of information about the incremental effects that might be expected when the practices were introduced to a larger proportion of the workforce (Huselid, 1995).

The practices were then grouped and analysed according to five broader dimensions. Such a systems approach to studying skills strategy, beyond focusing on concrete practices, would facilitate a stronger conceptual emphasis of the meanings attached to skills strategy, and provide practical insights into how organisations might variously choose to adopt the practices (Huselid, 1995; Huselid & Rau, 1997; Hughes, 2008). The five dimensions were:

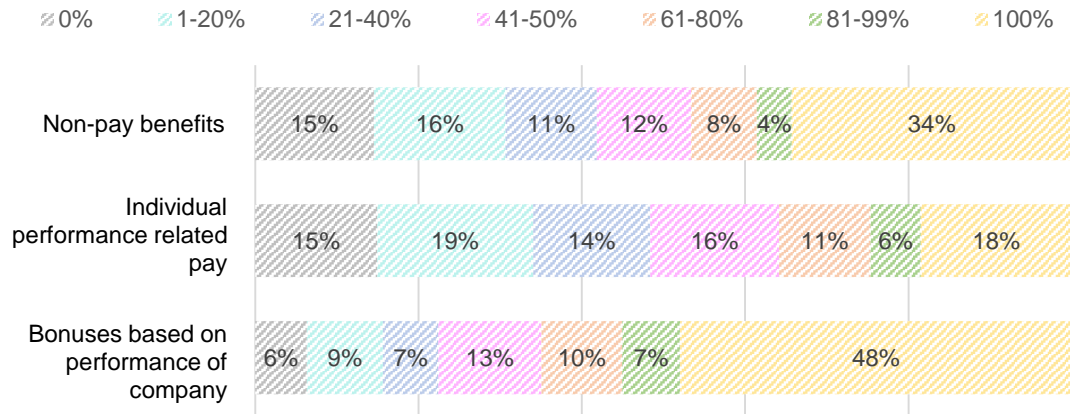
1. **rewards**, which includes practices of rewarding employees with bonuses based on the overall performance of the company, compensating employees according to their individual performance, and providing employees with non-pay benefits such as child care and insurance plans;
2. **trust**, which includes practices that provide employees with opportunities for career advancement and for international assignments or share options;
3. **involvement**, which includes information-sharing practices;
4. **autonomy**, which involves the extent to which employees are given discretion over their working activities;
5. **training**, which includes practices that advance professional development in the establishment such as a training budget and a formal development plan.

For each of the five dimensions of practices, to reflect the extent to which the respective dimension was adopted in the establishment, an index was constructed, by first averaging the scores of each practice in the given dimension, then standardising the scores. In addition to these, we constructed an overall HPWP index by adding up the five separate dimensions. The response distributions for the measures are shown in Figure 20.

**Figure 20. Response distribution for use of HPWPs**

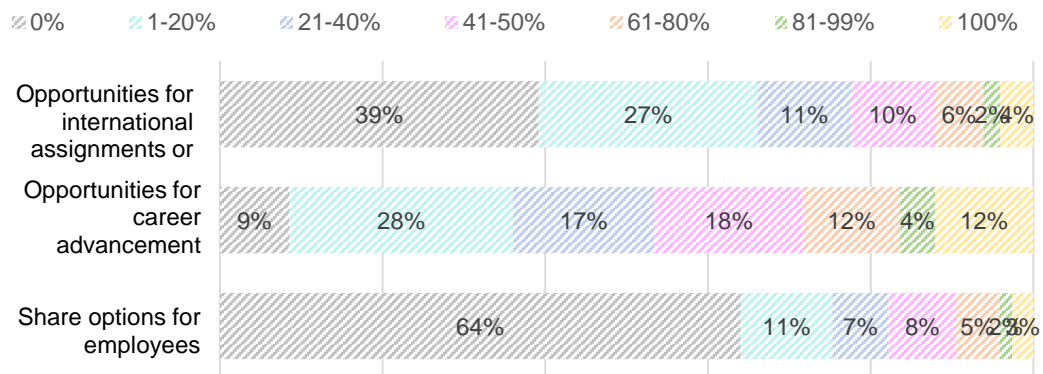
**Rewards**

The percentage of full-time staff who receive:



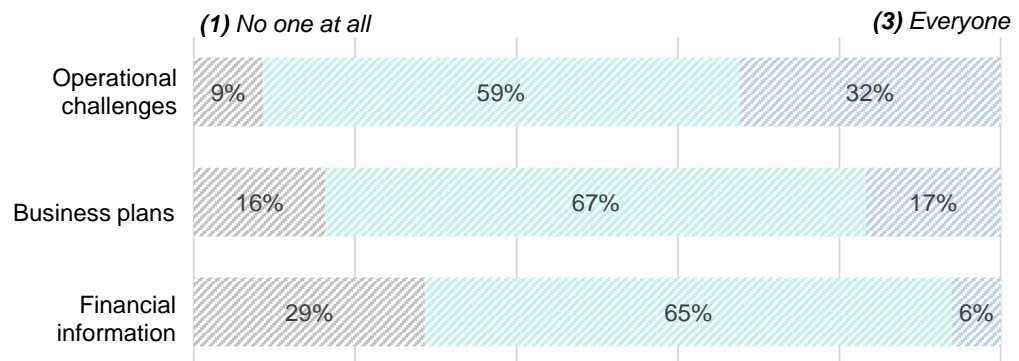
**Trust**

The percentage of full-time staff who receive:



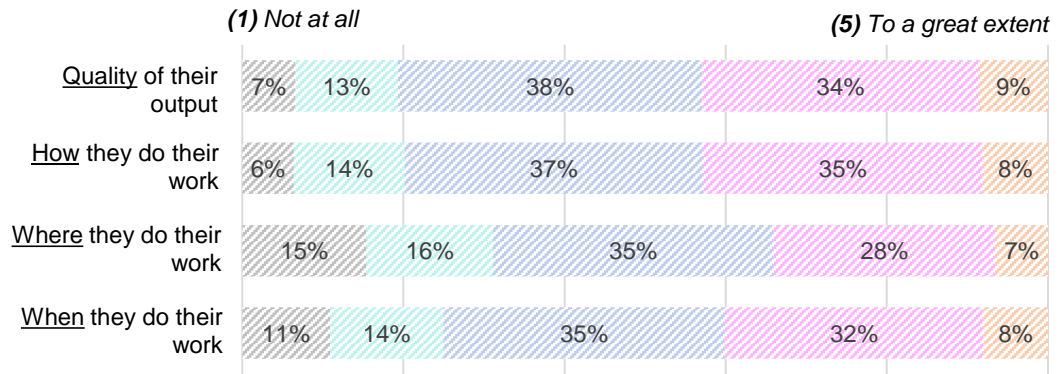
**Involvement**

The extent to which the following information is shared with rank and file employees:



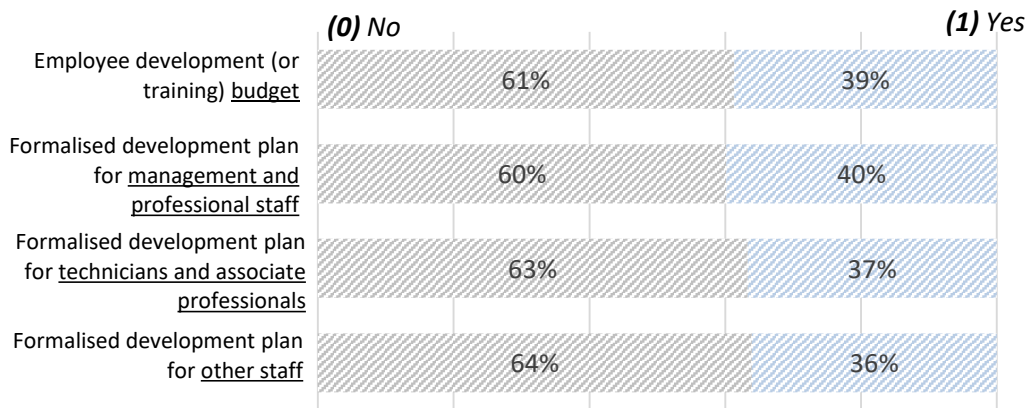
**Autonomy**

The extent to which employees have discretion over:



**Training**

The establishment has a(n):



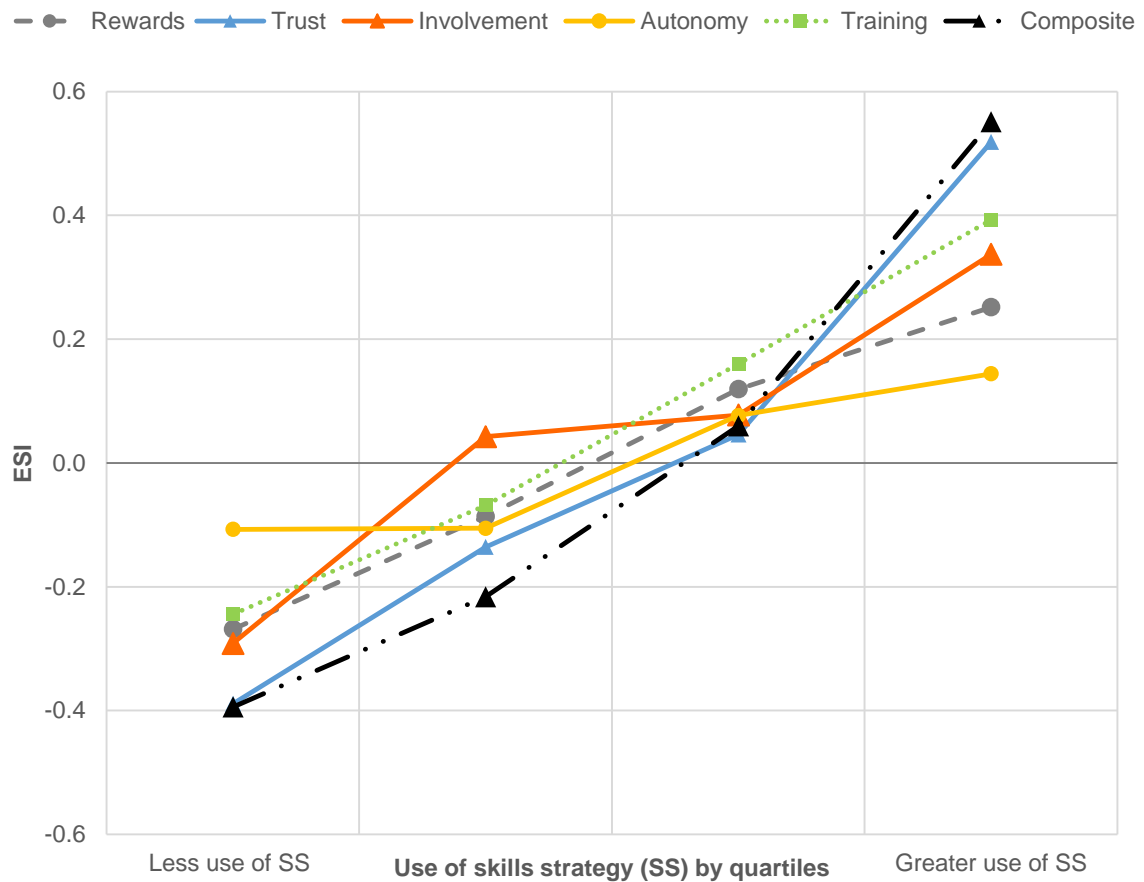
Base: all respondents (n = 3801)

4.3.2 *The effects of the high-performance workplace practices on skills utilisation*

We then examined the effects of the skills strategy on skills demand and discretionary effort. Figure 21 shows the mean ESI by use of skills strategies (broken down into quartiles) for overall use as reflected by the composite scale as well as for each dimension of practices. An OLS regression analysis was also conducted with the ESI and DEI as dependent variables, the composite scale as an independent variable, and controlling for other establishment characteristics. Similar regressions were also conducted, but with each of the five dimensions of practices entered separately as independent variables.<sup>7</sup>

<sup>7</sup> Please see Appendix 3, Table 12, for more information.

**Figure 21: Mean of the ESI by use of HPWPs**



As shown in Figure 21, overall there was a positive and significant relationship between the use of skills strategy and the ESI. This relationship was also significant for four of the five dimensions of skills strategy when they were each entered separately into the regression model. There was, however, no significant relationship between autonomy and skills demand. Generally this suggested that the use of skills strategy was associated with jobs that demanded higher skill complexity.

**Figure 22. The relationship between use of HPWPs and DEI**

*Mean of the DEI by use of HPWPs*

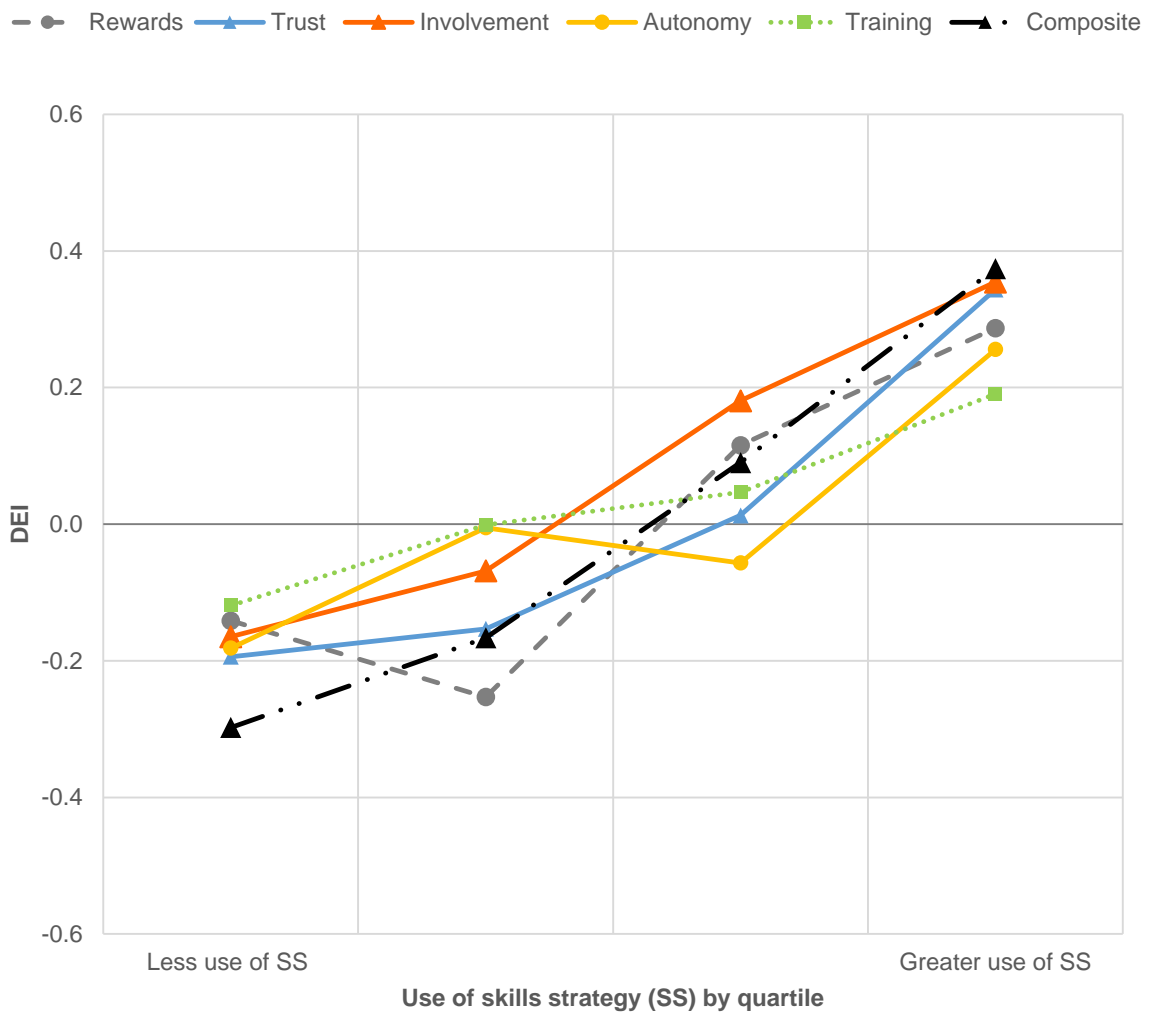


Figure 22 reveals that there was also a positive and significant relationship between the use of skills strategy and the DEI. This relationship was also significant for all the other skills strategy dimensions when they were each entered separately into the regression model. The relationship between training and discretionary effort was, however, only mildly significant. This suggested that, on the whole, the use of skills strategy was associated with discretionary effort.

Figure 23 shows the extent of use of skills strategies for each of the four quadrants of skills utilisation. The results indicated that establishments with above average skills demand *and* above average discretionary effort also had above average adoption of HPWPs, above and beyond those of establishments in the other three quadrants. Further modelling confirmed this result.<sup>8</sup>

On the whole, these results suggested a promising link between the use of skills strategy and both dimensions of skills utilisation.

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<sup>8</sup> Please see Appendix 3, Table 13, for further results.

### Figure 23. Use of HPWPs for the four quadrants of job skills demand

*Extent of use of HPWPs by the four quadrants of job skills demand*

Discretionary Effort (DEI)	High Discretionary Effort, Low Job Complexity  Mean SS = - 0.07	High Discretionary Effort, High Job Complexity  Mean SS = + 0.50
	Low Discretionary Effort, Low Job Complexity  Mean SS = - 0.39	Low Discretionary Effort, High Job Complexity  Mean SS = + 0.07
	Job Complexity (ESI)	

**Note:** the values above reflect the standardised scores on the use of HPWPs across the sample. The scores have a sample mean of 0 and standard deviation of 1.

# 5 Existing skills gaps

## 5.1 Introduction

Skills gaps occur in an establishment when its existing employees lack the ability to perform their job adequately, vis-à-vis the demands of their job. The presence of skills gaps might hinder the establishment's ability to function effectively and efficiently, and thus negatively affect its business productivity and profitability (UKCES, 2015).

This chapter focuses on existing skills gaps in establishments. Accordingly, we will:

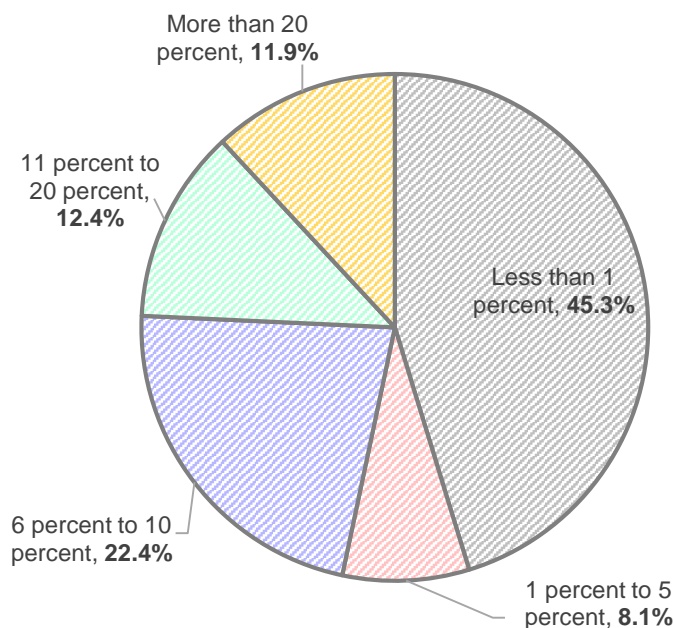
- examine patterns and the extent of existing skills gaps by establishment characteristics, including industry sector, establishment size, and establishment type;
- examine the relationship between existing skills gaps and skills utilisation;
- identify the skills areas in which establishments reported their staff were insufficient to meet the business needs of the company.

## 5.2 The extent of existing skills gaps in Singapore

In the survey, the respondents were asked to indicate the percentage of existing staff at the establishment who were unable to cope with their existing duties. The inability of employees to cope with their duties would suggest that there were deficiencies in the skill set that they possessed compared with that required by the job, constituting a skills gap. Figure 24 shows the response distribution of the questionnaire item.

**Figure 24. Extent of skills gaps in establishments**

*Approximate percentage of existing staff at the establishment who are currently unable to cope with their existing duties.*



Base: all respondents ( $n = 3801$ )



Of the establishments surveyed, 45.3 percent indicated that all their staff were able to cope with their existing duties. Another 8.1 percent indicated that only between 1 and 5 percent of their staff were unable to cope with their existing duties, while a further 22.4 percent indicated that between 6 and 10 percent of their staff were unable to cope with their existing duties. The rest of the respondents (24.3 percent) indicated that more than 10 percent of their staff were unable to cope with their existing duties.

Across the whole sample, the mean percentage of staff (unweighted) in each establishment who were unable to cope with their existing duties was 9.4 percent. Overall, this suggested that the large majority of the Singapore workforce have sufficient skills for their job and are not considerably affected by skills gaps.

### 5.3 Patterns of existing skills gaps

Next, we examined skills gaps against a range of establishment characteristics. Table 2 shows the mean percentage (unweighted) of skills gaps in establishments, broken down by industry sector, establishment size, and whether the establishment was family-owned or part of a multi-national entity.

An OLS regression analysis was also conducted on the extent of skills gaps, with industry sector, establishment size, and other establishment characteristics, such as whether the establishment was family-owned or part of a multi-national entity, as independent variables, and various establishment demographics that were expected to affect existing skills gaps as control variables. This regression analysis allowed us to test for the statistical significance of the relationships observed.<sup>9</sup>

Comparing the means of the sub-groups by establishment characteristics, there were no discernible patterns. The regression analysis also showed no statistically significant differences in the extent of skills gaps across industry sectors, establishment sizes, and other establishment characteristics such as whether the establishment was family-owned or part of a multi-national entity.

**Table 2. Extent of skills gaps by establishment characteristics**

*Mean percentage of existing staff (unweighted) at the establishment who were unable to cope with their existing duties by industry sector, establishment size, and establishment type (family-owned or multi-national entity)*

Category	Sub-group	N	Mean (%)	Standard error
<b>Overall</b>		3794	9.4	0.21
<b>Industry sector*</b>	Manufacturing, mining and quarrying and other industrial	351	8.7	0.62
	Construction	411	9.7	0.56
	Wholesale and retail trade, transportation and storage, accommodation and food service	1459	9.4	0.34

<sup>9</sup> Please see Appendix 4, Table 14, for more information.

	Information and communication	221	8.0	0.69
	Financial and insurance	94	9.8	1.54
	Professional, scientific, technical, administrative and support service	795	9.3	0.47
	Education, human health and social work	170	9.7	1.15
	Other services	205	11.1	0.97
<b>Establishment size</b>	Very small (fewer than 20 employees)	2315	9.6	0.28
	Small (between 20 and 49 employees)	924	8.7	0.36
	Medium (between 50 and 199 employees)	465	9.5	0.61
	Large (200 or more employees)	90	9.0	1.20
<b>Family-owned entity</b>	Yes	1178	9.2	0.37
	No	2605	9.4	0.25
<b>Multi-national entity</b>	Yes	1245	9.1	0.36
	No	2545	9.5	0.26

\*The results for agriculture, forestry, and fishing activities and real estate activities are omitted due to small sample size (less than 50).

#### 5.4 The relationship between existing skills gaps and skills utilisation

We examined the extent of existing skills gaps against job skills demand for both the dimensions of skills demand and discretionary effort. Figure 25 shows the mean percentage of existing staff at the establishment who were unable to cope with their existing duties for each of the four quadrants of skills utilisation. To test for statistical significance of the relationships, an OLS regression analysis was conducted on the extent of skills gaps against the ESI and the DEI. The analysis also included controls for other establishment characteristics.<sup>10</sup>

#### Figure 25. Skills gaps for the four quadrants of job skills demand

*Mean percentage of existing staff (unweighted) at the establishments who were unable to cope with their existing duties, by the four quadrants of job skills demand*

<sup>10</sup> Please see Appendix 4, Table 15, for more information.

Discretionary Effort (DEI)	High Discretionary Effort, Low Job Complexity  Mean Skills Gap = 7.9%	High Discretionary Effort, High Job Complexity  Mean Skills Gap = 7.9%
	Low Discretionary Effort, Low Job Complexity  Mean Skills Gap = 10.9%	Low Discretionary Effort, High Job Complexity  Mean Skills Gap = 10.6%
	Job Complexity (ESI)	

The regression analysis indicated a negative and significant relationship between the extent of skills gaps and discretionary effort. There was, however, no significant relationship found between skills demand and skills gaps. The relatively low strength of the model (adjusted R-squared = 0.036) should also be noted, suggesting that the model as a whole only predicts a small fraction of variation in level of skills gaps. Further, comparing the mean percentages of existing staff unable to cope with their existing duties for each of the four quadrants as shown in Figure 5.3, we find only minimal differences between them.

### 5.5 The areas of skills gaps

Apart from the patterns relating to the *extent* of skills gaps, we sought to examine the skills *areas* among employees that were inadequate. For 10 skill areas relating to both technical and practical skills (that define the content of a job role) as well as people and personal skills (that define the way that the job roles are delivered) (UCKES, 2015), the respondents were asked to indicate whether or not, in the last 12 months, any of those skills of their staff were *insufficient* to meet their business needs. Table 3 shows the findings of the questionnaire items.

**Table 3. Skill area lacking in establishments**

*Percentage of establishments which indicated the skill area that was insufficient to meet their business needs*

Skill area	%	Stand ard error
General numeracy (e.g. "O levels" and below, foundation)	8.8	0.46
Literacy	13.0	0.55
Communication	14.7	0.57
Professional/technical (e.g. engineering, accounting, information technology)	15.7	0.59
Problem solving	16.0	0.60
Management	16.2	0.60
Leadership	19.7	0.65
Selling	19.7	0.65

Specialised numeracy (e.g. statistics, advanced algebra, calculus)	20.2	0.65
Information and communications technology	20.5	0.66

Base: all respondents ( $n = 3801$ )

The results indicated that the skill areas found to be most commonly lacking in the establishments were leadership (19.7 percent), selling (19.7 percent), specialised numeracy (20.2 percent), and information and communications technology (20.5 percent).

# 6 Workplace training and development

## 6.1 Introduction

This chapter addresses the supply side approaches towards skills utilisation at organisational and/or establishment levels. Focusing on classroom-based training and formalised development plans for employees, in this chapter we will examine:

- the patterns of workplace training and development by establishment characteristics, including industry sector, establishment size, and establishment type;
- how workforce training and development relates with job skills demand and employees' performance.

These analyses will provide us with an understanding of how these training and development activities organised at organisational and/or establishment levels relate with their demand for and utilisation of skills.

## 6.2 Classroom-based training

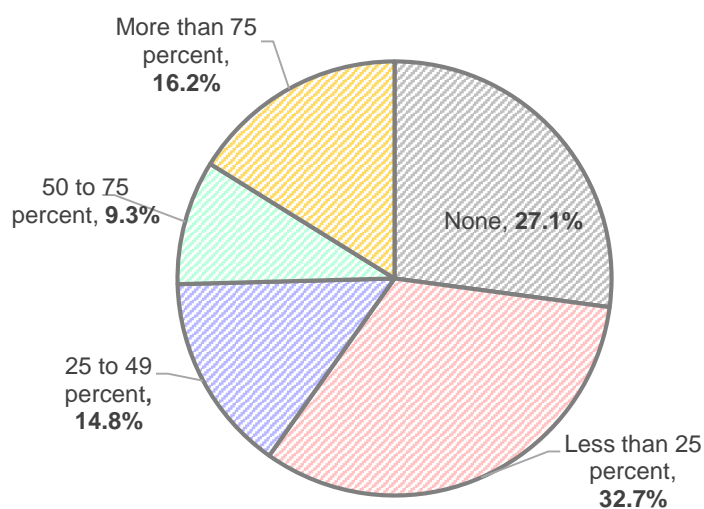
In the survey, the respondents were asked to indicate the percentage of staff that attended some form of classroom-based training in the last 12 months. Figure 26 shows the response distribution.

Of all establishments surveyed, 27.1 percent indicated that none of their staff attended some form of classroom-based training in the last 12 months. Another 32.7 percent indicated that only less than 25 percent of their staff attended such training. A further 14.8 percent indicated that between 25 and 49 percent of their staff attended such training, while 25.4 percent indicated that more than 50 percent of their staff attended such training. Across the whole sample, the mean percentage of staff (unweighted) that attended classroom-based training was 29.5 percent.

## Figure 26. Participation in classroom-based training

*Response distribution for extent of classroom-based training in establishments*

In the last 12 months, what percentage of staff attended some form of classroom-based training?



Base: all respondents ( $n = 3796$ )

### 6.2.1 *The patterns of classroom-based training*

Next, we examined the extent of classroom-based training against a range of establishment characteristics. Table 4 shows the mean percentage of staff (unweighted) across all establishments that attended some form of classroom-based training in the last 12 months. An OLS regression analysis was also conducted on the extent of classroom-based training against those establishment characteristics.<sup>11</sup>

**Classroom-based training and industry sector:** Compared with the overall mean, establishments in the construction (37.7 percent) and education, human health and social work activities (40.6 percent) sectors were likely to have a higher percentage of staff attending classroom-based training. On the other hand, as compared with the overall mean, establishments in manufacturing, mining and quarrying and other industrial activities (22.9 percent), wholesale and retail trade, transportation and storage, accommodation and food service activities (24.8 percent) sectors were likely to have a lower percentage of staff attend classroom-based training.

**Classroom-based training and establishment size:** The results indicated that there was a positive and significant relationship between the percentage of staff attending classroom-based training and establishment size.

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<sup>11</sup> Please see Appendix 5, Table 16, for more information.

**Table 4. Extent of classroom-based training by establishment characteristics**

*Mean percentage of staff (unweighted) at each establishment which attended classroom-based training in the last 12 months by industry sector, establishment size, and establishment type (family-owned or multi-national entity)*

Category	Sub-group	N	Mean (%)	Standard error
Overall		3796	29.5	0.51
Industry sector*	Manufacturing, mining and quarrying and other industrial	351	22.9	1.47
	Construction	442	37.7	1.48
	Wholesale and retail trade, transportation and storage, accommodation and food service	1458	24.8	0.80
	Information and communication	222	30.9	1.91
	Financial and insurance	95	29.8	3.19
	Professional, scientific, technical, administrative and support service	796	33.1	1.15
	Education, human health and social work	169	40.6	2.57
	Other service	205	28.9	2.31
Establishment size	Very small (fewer than 20 employees)	2316	25.4	0.63
	Small (between 20 and 49 employees)	924	32.9	1.04
	Medium (between 50 and 199 employees)	466	38.9	1.43
	Large (200 or more employees)	90	49.2	3.67
Family-owned entity	Yes	1177	28.3	0.91
	No	2608	30.0	0.62
Multi-national entity	Yes	1249	32.2	0.89
	No	2543	28.1	0.62

\*The results for agriculture, forestry, and fishing activities and real estate activities are omitted due to small sample size (less than 50).

**Classroom-based training and family-owned establishments:** The results indicated that there were no significant differences in the percentage of staff attending classroom-based training between family-owned and non-family-owned establishments.

**Classroom-based training and multi-national establishments:** The results indicated that multi-national establishments were significantly more likely to have a higher percentage of staff attending classroom-based training than non-multi-national establishments.

The higher average participation rates for classroom-based training in large(r) and/or multi-national establishments, as indicated by the findings, were probably due to the greater access to

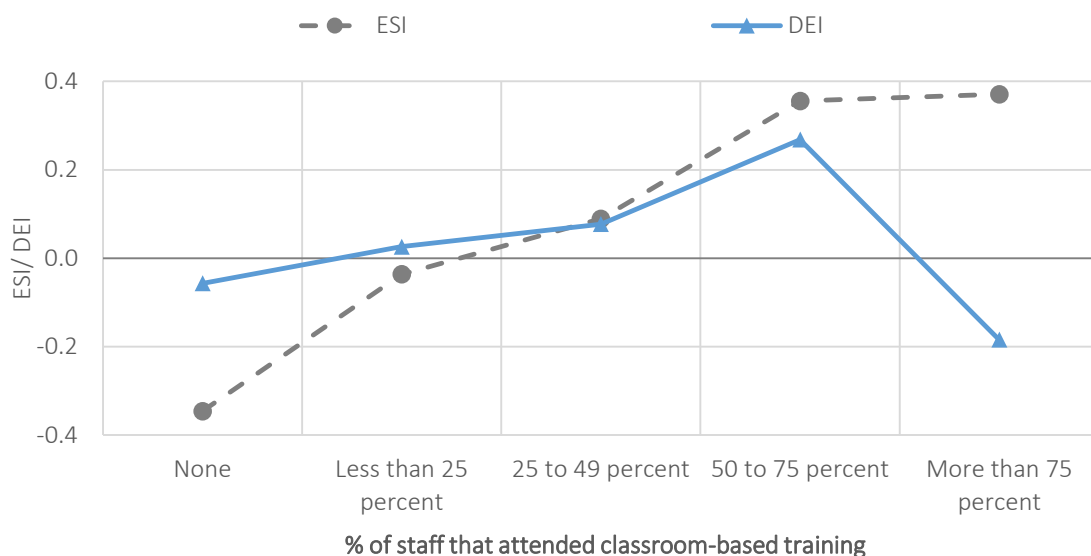
the relevant resources (both in monetary and non-monetary terms) that these establishments had that enabled them to support classroom-based training for their employees.

### 6.2.2 *The relationship between classroom-based training and skills utilisation*

We examined the relationship between the extent of classroom-based training and skills utilisation. Figure 27 shows the ESI and DEI by the percentage of staff at each establishment that attended classroom-based training. Further, two separate OLS analyses were conducted on the ESI and the DEI respectively against the percentage of staff that attended classroom-based training. The analysis also included controls for other establishment characteristics. This analysis allowed us to test for the statistical significance of the relationships.<sup>12</sup>

**Figure 27. The relationship between classroom-based training and skills utilisation**

*Mean of the ESI and the DEI by percentage of staff that attended classroom-based training*



**Classroom-based training and skills demand:** As may be observed from the trend line, there was a positive and significant relationship between the percentage of staff that attended classroom based training and the ESI. This relation is unsurprising. As a matter of survey design, it should be noted that the ESI was constructed to include the demand for induction training and learning/development activities.

**Classroom-based training and discretionary effort:** Figure 27 indicates no significant relationship between the percentage of staff that attended classroom-based training and the DEI.

The lack of relationship observed between the extent of classroom-based training and the demand for job task autonomy and the exertion of discretionary effort showed the limitations of classroom-based training in encouraging more effective skills utilisation within the workplace. Apart from the extent of participation in training, other important considerations, such as the scope and purpose of the training (whether or not the training is expansive or restrictive in nature, and whether or not the training is to meet immediate or future skills demand), vis-à-vis the

<sup>12</sup> Please see Appendix 5, Table 16, for more information.



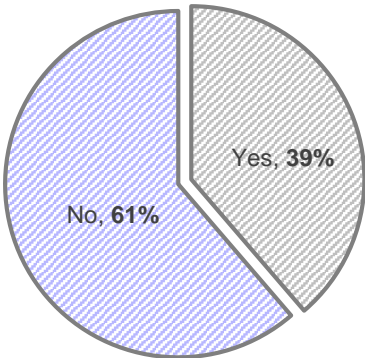
strategic decisions and the TRs and IRs of production, should also be taken into account, to maximise the potential of such investments in skills.

6.2.3 *The relationship between formalised development plans and skills utilisation*

In the survey, the respondents were asked to indicate if their establishment had a formalised employee development (or training) budget in place. Figure 28 shows the response distribution of the questionnaire item.

**Figure 28. The incidence of formalised development plans**

Does your establishment have a formalised employee development (or training) budget in place?



Base: all respondents ( $n = 3788$ )

Of the establishments surveyed, 39 percent of them indicated that they had a formalised development (or training) budget in place.

6.2.4 *The patterns of formalised development plans*

We next examined the incidence of establishments having a formalised development budget in place against various establishment characteristics. Table 5 shows the percentage of establishments with such a budget in place by industry sector, establishment size, and establishment type (family-owned, multi-national). Furthermore, to test for the statistical significance of the relationship, a logistic regression analysis was also conducted on the incidence of having such a budget in place against those establishment characteristics.<sup>13</sup>

**Formalised development plans and industry sectors:** The financial and insurance activities (56 percent), the information and communication activities (51 percent), the education, human health and social work activities (48 percent), and the professional, scientific, technical, administrative, and support service activities (43 percent) sectors had higher than average incidence of having a formalised development budget in place.

**Formalised development plans and establishment size:** The results indicated that larger establishments were significantly more likely to have a formalised development budget in place.

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<sup>13</sup> Please see Appendix 5, Table 18, for more information.

**Formalised development plans and family-owned establishment:** The results indicated that non-family-owned establishments were significantly more likely to have a formalised development budget in place.

**Formalised development plans and multi-national establishment:** The results indicated that multi-national establishments were significantly more likely to have a formalised development budget in place.

Similarly, the higher than average incidence of formalised development plans in large(r), non-family-owned, and multi-national establishments, as indicated by the findings, was probably due to the greater access to the relevant resources (in both monetary and non-monetary terms) that these establishments had that enabled such activities for their employees.

**Table 5. Incidence of formalised development plans by establishment characteristics**

*Percentage of establishments with formalised employee development (or training) budget by industry sector, establishment size, and establishment type (family-owned or multi-national entity)*

Category	Sub-group	N	%	Standard error
Overall		3788	39	0.79
Industry sector*	Manufacturing, mining and quarrying and other industrial	350	32	2.50
	Construction	441	41	2.35
	Wholesale and retail trade, transportation and storage, accommodation and food service	1453	33	1.24
	Information and communication	222	51	3.36
	Financial and insurance	95	56	5.12
	Professional, scientific, technical, administrative and support service	794	43	1.76
	Education, human health and social work	170	48	3.84
	Other service	205	36	3.36
Establishment size	Very small (fewer than 20 employees)	2316	33	0.97
	Small (between 20 and 49 employees)	920	46	1.64
	Medium (between 50 and 199 employees)	463	51	2.33
	Large (200 or more employees)	89	60	5.23
Family-owned entity	Yes	1175	35	1.39
	No	2602	40	0.96
Multi-national entity	Yes	1244	49	1.42

\*The results for agriculture, forestry, and fishing activities and real estate activities are omitted due to small sample size (less than 50).

6.2.5 *The relationship between formalised development plans and skills utilisation*

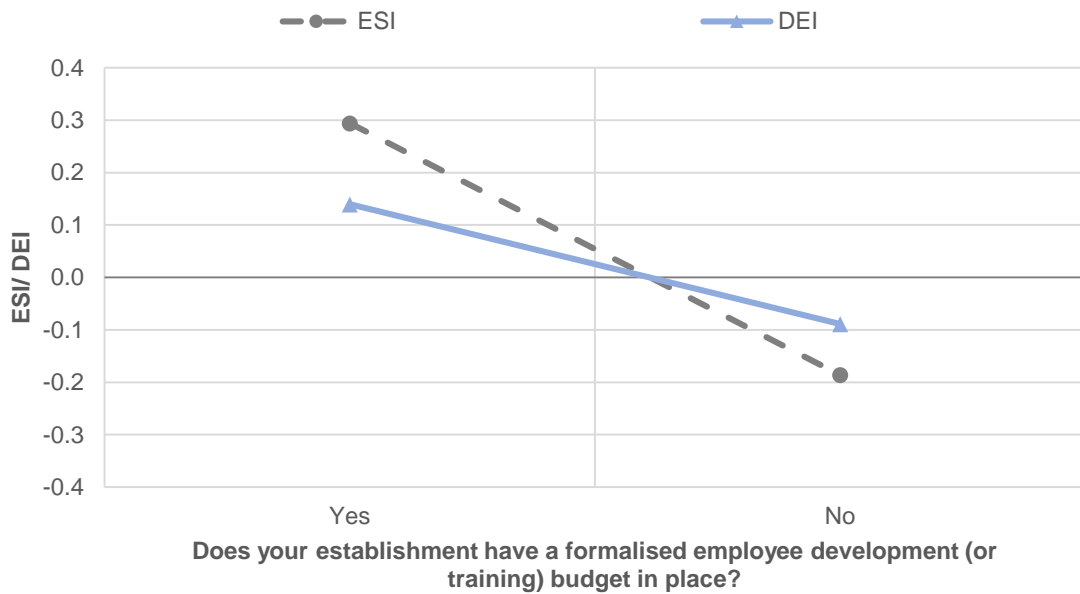
We examined the relationship between the incidence of formalised development (or training) budgets and skills utilisation. Figure 29 shows the ESI and DEI by formalised development (or training) budget. Two separate OLS regression analyses were also conducted, on the ESI and DEI, against formalised development (or training) budget. The analyses also included controls for other establishment characteristics.<sup>14</sup>

**Formalised development plans and skills demand:** The results suggested that establishments with a formalised employee development (or training) budget were significantly more likely to have a higher ESI than those establishments without a development budget.

**The relationship between a formalised development plan and discretionary effort:** Figure 29 shows the DEI by formalised development (or training) budget. An OLS regression analysis was also conducted on the DEI against formalised development (or training) budget. The analysis also included controls for other establishment characteristics.<sup>15</sup>

**Figure 29. The relationship between formalised development plans and job skills demand**

*Mean of the ESI and the TAI by formalised development (or training) budget*



The results suggested that establishments with a formalised employee development (or training) budget were significantly more likely to have a higher DEI than those establishments without a development budget. The presence of a formalised employees' development budget signalled

<sup>14</sup> Please see Appendix 5, Table 19, for more information.

<sup>15</sup> Please see Appendix 5, Table 19, for more information.

the establishment's commitment towards employee development, probably beyond that of current establishment demands, and which also encompassed a more holistic approach.

# 7 Conclusions and policy implications

## 7.1 Introduction

The findings from the BPSS provide key information on the demand-side of skills. This survey instrument aligns closely with recent policy initiatives on the Industry Transformation Programme (ITP), a strategy to promote growth and competitiveness in 23 selected industries by integrating productivity improvement, skills development, innovation, and internationalisation (MTI Singapore, 2016). Accordingly, it is useful for the long-term tracking of skills utilisation vis-à-vis the institutional factors and larger market conditions both for Singapore as a whole and at the sectoral level, to further our understanding of the decisions and related issues faced by the establishments. Such information will contribute to formulating targeted and fine-tuned responses in relation to the ITP.

Accordingly, this chapter draws out the key findings from the analyses and highlights potential key contributions to skills policies.

## 7.2 Effective skills utilisation at establishment level

An important contribution of the study is the development of a system of workplace indicators relating to effective skills utilisation that will provide a baseline for subsequent tracking of skills utilisation at establishment level in the long term. These indicators when tracked and examined over time, whether in isolation or in relation to each other, will potentially reveal vital insights on the trajectory of the demand for and utilisation of skills for Singapore as a whole, as well as at the sectoral level.

On the one hand, effective skills utilisation involves making use of better skills, which relates to the demand for high-quality and high-level job skills. On the other hand, effective skills utilisation also involves making better use of skills, which relates to employees' performance and how effectively their skills are being applied in their jobs. In this regard, the survey adopted the extent of employees' display of discretionary effort as an indication of how skills could translate into tangible value for the establishments.

Indeed, these findings re-affirmed that the notion of skills is multi-faceted. Any skills policy approach should extend beyond increasing skills supply and should focus also on the application and outcomes of skills in the workplace.

## 7.3 Innovation, productivity and jobs and skills

Another key contribution of the study is the findings on the links between skills utilisation and the establishment productive system, including the market conditions, value add strategies, and the technical and interpersonal relations in production.

The survey findings revealed that skills utilisation was closely associated with the pursuit of a high value add strategy. This would suggest that skills policies need to address larger demand-side issues that will encourage businesses to move towards a higher value add strategy. Fundamentally, however, the strategies and skills approaches that businesses adopt (broadly speaking, whether high-road or low-road approach) are largely guided by a profit maximisation objective. Inasmuch as the low-road approach remains profitable at least in the immediate future, businesses may be less motivated to make drastic changes. The survey findings, however, also revealed that businesses adopting the high-road approach were more likely to find themselves in a niche position that was less subjected to external competitive pressures and more

sustainable in the long run. Policies will thus have to address related cost–benefit analyses of employers and break down existing barriers to encourage more to move towards high value add production (Sung & Ashton, 2014) to drive higher productivity and sustainability in the long run.

The survey findings also revealed that technological changes made to work processes are related to increased skills demand, particularly in terms of skills demand, which in turn amplifies the need for greater autonomy to complement those changes.

Furthermore, the survey findings revealed that the demand for skills was closely associated with greater use of skills strategies or HPWP. This suggested an imperative to re-design jobs in ways that can better tap into the capabilities and potential of employees.

#### **7.4 Workplace training and development**

The evolving demand for skills when businesses move towards higher value add strategies and adopt new technologies suggests that businesses can no longer rely solely on the initial qualifications of their workforce to supply skills necessary to meet those changing business needs. While the survey findings showed that the large majority of the Singapore workforce had sufficient skills for their jobs and were not considerably affected by existing skills gaps, the mean percentage of staff in each establishment does have existing skills gaps of around 9.4 percent across the whole sample.

In allowing for a closer examination of the evolving nature of skills gaps and needs at the sectoral level, the study is able to identify where skills gaps exist. Accordingly, these insights will contribute towards formulating targeted responses to address those specific gaps and needs.

Certainly, workplace training and development is essential, particularly in building up the technical and cognitive capabilities of the workforce. The survey findings showed a positive and significant relationship between employee training and development activities and the corresponding demand for skills demand by the establishments.

However, employers should be encouraged to move beyond one-dimensional classroom-based training activities and adopt more holistic employee development plans. These development plans should encompass widened scope and purpose (beyond just immediate needs) and have an expanded focus on how employees may suitably apply the skills that they have acquired.

# References

- Ashton, D., Davies, B., Felstead, A., & Green, F. (1999). *Work skills in Britain*.
- Autor, D. H. (2015). Why are there still so many jobs? The history and future of workplace automation. *Journal of Economic Perspectives*, 29(3), 3–30.
- Becker, B., & Huselid, A. (1998). High performance work systems and firm performance: a synthesis of research and managerial implications. *Personnel and Human Resources Management*, 16, 53–101.
- Boxall, P., & Macky, K. (2007). High-performance work systems and organisational performance: bridging theory and practice. *Asia Pacific Journal of Human Resource*, 45(3), 261–270.
- Boxall, P., & Macky, K. (2009). Research and theory on high-performance work systems: progressing the high-involvement stream. *Human Resource Management Journal*, 19(1), 3–23.
- Brynjolfsson, E., & McAfee, A. (2014). *The second machine age: work, progress, and prosperity in a time of brilliant technologies*. New York: W. W. Norton & Company.
- Choi, S., Leiter, J., & Tomaskovic-Devey, D. (2008). Contingent autonomy: technology, bureaucracy, and relative power in the labour process. *Work and Occupations*, 35(4), 422–455.
- CIPD (Chartered Institute of Personnel and Development). (2015). *Over-qualification and skills mismatch in the graduate labour market*. London: CIPD.
- Delany, J., & Huselid, M. (1996). The impact of human resource practices on perceptions organizational performance. *Academy of Management Journal*, 39(4), 949–969.
- Felstead, A., Gallie, D., Green, F., & Zhou, Y. (2007). *Skills at work, 1986 to 2006*. Oxford: ESRC Research Centre on Skills, Knowledge and Organizational Performance.
- Gallie, D., Felstead, A., & Green, F. (2003). Skill, task discretion and new technology: trends in Britain 1986–2001. *L'Année sociologique*, 53(2), 401–430.
- Green, F. (2007). *Leeway for the loyal: a model of employee discretion*. London: London School of Economics, Manpower Human Resources Lab, Centre for Economic Performance.
- Hughes, J. (2008). *The high-performance paradigm: a review and evaluation – learning as work research paper, no. 16*. Cardiff: Cardiff University.
- Huselid, M. (1995). The impact of human resource management practices on turnover, productivity, and corporate financial performance. *Academy of Management Journal*, 38(3), 635–872.
- Huselid, M. A., & Rau, B. L. (1997). *The determinants of high performance work systems: cross-sectional and longitudinal analyses*. Paper presented at the 1997 Academy of Management Annual Conference, Boston, MA.
- Lloyd, R. (2008). Discretionary effort and the performance domain. *Australian and New Zealand Journal of Organisational Psychology*, 1, 22–34.

- Mason, G. (2004). *Enterprise product strategies and employer demand for skills in Britain: evidence from the employers skill survey – SKOPE research paper no. 50*. Oxford: ESRC Research Centre on Skills, Knowledge and Organizational Performance.
- MOM (Ministry of Manpower), Singapore. (2016, October 25). *SkillsFuture*. Retrieved 27 February 2017, from <http://www.mom.gov.sg/employment-practices/skills-training-and-development/skillsfuture>
- MTI (Ministry of Trade and Industry), Singapore. (2016, September). *Integrated roadmap to drive industry transformation*. Retrieved from <https://www.mti.gov.sg/MTIInsights/SiteAssets/Pages/ITM/Images/Fact%20sheet%20on%20Industry%20Transformation%20Maps.pdf>
- OECD (Organisation for Economic Cooperation and Development). (2012). *Better jobs, better lives: a strategic approach to skills policies*. Paris: OECD.
- Porter, M. E. (1980). *Competitive strategy: techniques for analyzing industries and competitors*.
- Scottish Government. (2008). *Skills utilisation literature review*. Glasgow: Scottish Government.
- Spenner, K. (1990). Skill: meaning, methods and measures. *Work and Occupations*, 17(4), 399–421.
- Sung, J., & Ashton, D. N. (2014). *Skills in business: the role of business strategy, sectoral skills development and skills policy*. London: SAGE.
- Sung, J., Loke, F., Ramos, C., & Ng, M. (2011). *You and your work: skills utilisation in Singapore*. Singapore: Institute for Adult Learning, Centre for Skills, Performance and Productivity Research.
- UKCES (UK Commission for Employment and Skills). (2016). *Employer Skills Survey 2015: UK results – evidence report 97*. London: UKCES.
- Warhurst, C., & Findlay, P. (2012). *More effective skills utilisation: shifting the terrain of skills policy in Scotland – SKOPE research paper no. 107*. Oxford: ESRC Research Centre on Skills, Knowledge and Organizational Performance.
- Youndt, M. A., Snell, S. A., Dean, J. W., & Lepak, D. P. (1996). Human resource management, manufacturing strategy, and firm performance. *Academy of Management Journal*, 39(4), 836–866.



# Appendix

## Appendix 1

Table 6: Results of regression analyses (OLS) on the DEI against skills demand (ESI)

		DEI	
Skills demand (ESI)		0.165	***
Industry sector#	Manufacturing, mining and quarrying and other industrial activities	-0.266	***
	Construction	-0.117	
	Wholesale and retail trade, transportation and storage, accommodation and food service activities	-0.177	**
	Financial and insurance activities	-0.029	
	Professional, scientific, technical, administrative and support service activities	-0.156	**
	Public administration and defence, education, human health and social work activities	-0.149	
	Other service activities	-0.374	***
Establishment size (ln)		-0.055	***
Employee demographics	% of managers and professionals	0.008	***
	% of technicians and associate professionals	0.004	***
	% of mature employees (older than 40 years)	0.001	
	% of foreign employees	-0.002	**
	% of permanent contract employees	0.001	**
Establishment type	Family-owned entity (yes = 1, no = 0)	0.012	
	Multi-national entity (yes = 1, no = 0)	0.152	***
Constant		-0.085	
N		3694	
Adjusted R-squared		0.111	

\* $p$ -value < 0.1/\*\* $p$ -value < 0.05/\*\*\* $p$ -value < 0.01.

#The results for agriculture, forestry, and fishing activities and real estate activities are omitted due to small sample size (less than 50).

# Appendix 2

**Table 7. Results of regression analyses (OLS) on the value add strategies against the market competitive conditions**

		Value add strategy	
Market competitive conditions (1 = less competitive; 3 = more competitive)	Threat of substitutes	0.030	
	Threat of entrants	-0.325	***
	Supplier's bargaining power	0.311	***
	Intensity of price competition	0.083	**
	Buyer's bargaining power	0.113	**
Industry sector <sup>#</sup>	Manufacturing, mining and quarrying and other industrial activities	-0.195	
	Construction	-0.552	***
	Wholesale and retail trade, transportation and storage, accommodation and food service activities	-0.513	***
	Financial and insurance activities	-0.434	**
	Professional, scientific, technical, administrative and support service activities	-0.341	***
	Public administration and defence, education, human health and social work activities	-0.175	
	Other service activities	-0.417	***
Establishment size (ln)		0.069	**
Employee demographics	% of managers and professionals	0.004	***
	% of technicians and associate professionals	0.002	**
	% of mature employees (older than 40 years)	-0.004	***
	% of foreign employees	-0.002	*
	% of permanent contract employees	0.000	
Establishment type	Family-owned entity (yes = 1, no = 0)	-0.007	
	Multi-national entity (yes = 1, no = 0)	0.132	**
Constant		-0.367	
N		3632	
Adjusted R-squared		0.065	

\**p*-value < 0.1/\*\**p*-value < 0.05/\*\*\**p*-value < 0.01.

<sup>#</sup>The results for agriculture, forestry, and fishing activities and real estate activities are omitted due to small sample size (less than 50).

**Table 8. Results of regression analyses (OLS) on the ESI against market competitive conditions and the value add strategies**

		ESI		ESI		ESI	
Value add strategy		-		0.058	***	0.056	***
Market competitive conditions (1 = less competitive; 3 = more competitive)	Threat of substitutes	-0.035		-		-0.038	
	Threat of entrants	-0.058	**	-		-0.041	*
	Supplier's bargaining power	0.053		-		0.038	
	Intensity of price competition	-0.043		-		-0.048	*
	Buyer's bargaining power	0.041		-		0.035	
Industry sector#	Manufacturing, mining and quarrying and other industrial activities	-0.654	***	-	0.615	-0.643	***
	Construction	-0.519	***	-	0.461	-0.488	***
	Wholesale and retail trade, transportation and storage, accommodation and food service activities	-0.573	***	-	0.521	-0.546	***
	Financial and insurance activities	-0.150		-	0.091	-0.124	
	Professional, scientific, technical, administrative and support service activities	-0.189	***	-	0.134	-0.166	**
	Public administration and defence, education, human health and social work activities	0.079		0.105		0.083	
	Other service activities	-0.453	***	-	0.408	-0.430	***
Establishment size (ln)		0.014		0.018		0.009	
Employee demographics	% of managers and professionals	0.009	***	0.009	***	0.009	***
	% of technicians and associate professionals	0.002	***	0.002	***	0.002	***
	% of mature employees (older than 40 years)	-0.001	**	-	0.001	-0.001	*
	% of foreign employees	0.002	***	0.002	***	0.002	***
	% of permanent contract employees	0.003	***	0.003	***	0.003	***
Establishment type	Family-owned entity (yes = 1, no = 0)	-0.118	***	-	0.123	-0.119	***
	Multi-national entity (yes = 1, no = 0)	0.221	***	0.234	***	0.214	***
Constant		-0.048		-	0.180	-0.022	*

<i>N</i>	3636	3688	3631
Adjusted R-squared	0.158	0.161	0.164

\**p*-value < 0.1/\*\**p*-value < 0.05/\*\*\*\**p*-value < 0.01.

#The results for agriculture, forestry and fishing activities and real estate activities are omitted due to small sample size (less than 50).

**Table 9. Results of regression analyses (OLS) on the DEI against market competitive conditions and the value add strategies**

		DEI		DEI		DEI	
Value add strategy		-		0.080	***	0.081	***
Market competitive conditions (1 = less competitive; 3 = more competitive)	Threat of substitutes	-0.043		-		-0.046	
	Threat of entrants	-0.030		-		-0.005	
	Supplier's bargaining power	-0.043		-		-0.067	**
	Intensity of price competition	0.042		-		0.034	
	Buyer's bargaining power	0.040		-		0.030	
Industry sector#	Manufacturing, mining and quarrying and other industrial activities	-0.362	***	-0.354	***	-0.346	***
	Construction	-0.206	**	-0.149	*	-0.162	*
	Wholesale and retail trade, transportation and storage, accommodation and food service activities	-0.252	***	-0.225	***	-0.212	***
	Financial and insurance activities	-0.029		-0.007		0.007	
	Professional, scientific, technical, administrative and support service activities	-0.174	**	-0.147	**	-0.146	*
	Public administration and defence, education, human health and social work activities	-0.127		-0.118		-0.119	
	Other service activities	-0.437	***	-0.409	***	-0.404	***
Establishment size (ln)		-0.056	**	-0.060	***	-0.063	***
Employee demographics	% of managers and professionals	0.010	***	0.009	***	0.009	***
	% of technicians and associate professionals	0.005	***	0.004	***	0.004	***
	% of mature employees (older than 40 years)	0.000		0.001		0.001	
	% of foreign employees	-0.001	*	-0.001	*	-0.001	
	% of permanent contract employees	0.001	***	0.001	***	0.001	***

Establishment type	Family-owned entity (yes = 1, no = 0)	0.000		-0.007		0.000
	Multi-national entity (yes = 1, no = 0)	0.183	***	0.178	***	0.173
Constant		-0.056		-0.116		-0.015
<i>N</i>		3632		3684		3627
Adjusted R-squared		0.088		0.101		0.101

\**p*-value < 0.1/\*\**p*-value < 0.05/\*\*\**p*-value < 0.01.

#The results for agriculture, forestry and fishing activities and real estate activities are omitted due to small sample size (less than 50).

**Table 10. Results of regression analyses (OLS) on the value add strategy against the interaction between ESI and DEI**

		Value add strategy			
Skills utilisation	Skills demand (ESI)	0.117	***	0.111	***
	Discretionary effort (DEI)	0.164	***	0.164	***
Interaction term	ESI × DEI	-		0.040	*
Industry sector <sup>#</sup>	Manufacturing, mining and quarrying and other industrial activities	-0.049		-0.054	
	Construction	-0.478	***	-0.476	***
	Wholesale and retail trade, transportation and storage, accommodation and food service activities	-0.449	***	-0.447	***
	Financial and insurance activities	-0.500	***	-0.505	***
	Professional, scientific, technical, administrative and support service activities	-0.381	***	-0.385	***
	Public administration and defence, education, human health and social work activities	-0.242		-0.242	
	Other service activities	-0.332	**	-0.331	**
Establishment size (ln)		0.119	***	0.119	***
Employee demographics	% of managers and professionals	0.002	*	0.002	*
	% of technicians and associate professionals	0.001		0.001	
	% of mature employees (older than 40 years)	-0.004	***	-0.004	***
	% of foreign employees	-0.002	*	-0.002	*
	% of permanent contract employees	0.000		0.000	
Establishment type	Family-owned entity (yes = 1, no = 0)	0.019		0.020	
	Multi-national entity (yes = 1, no = 0)	0.124	**	0.124	**

Constant	0.054	0.043
N	3684	3684
Adjusted R-squared	0.048	0.049

\* $p$ -value < 0.1/\*\* $p$ -value < 0.05/\*\*/ $p$ -value < 0.01.

#The results for agriculture, forestry, and fishing activities and real estate activities are omitted due to small sample size (less than 50).

# Appendix 3

**Table 11. Results of regression analyses (OLS) on job skills demand against technological changes in the work processes**

		ESI		DEI	
Change in work processes	Introduced technology related changes (yes = 1, no = 0)	0.163	***	0.159	***
Industry sector#	Manufacturing, mining and quarrying and other industrial activities	-0.592	***	-0.336	***
	Construction	-0.456	***	-0.161	*
	Wholesale and retail trade, transportation and storage, accommodation and food service activities	-0.513	***	-0.230	***
	Financial and insurance activities	-0.095		-0.022	
	Professional, scientific, technical, administrative and support service activities	-0.132	*	-0.152	**
	Public administration and defence, education, human health and social work activities	0.126		-0.112	
	Other service activities	-0.402	***	-0.415	***
Establishment size (ln)		0.013		-0.064	***
Employee demographics	% of managers and professionals	0.009	***	0.009	***
	% of technicians and associate professionals	0.001	**	0.004	***
	% of mature employees (older than 40 years)	-0.001	**	0.001	
	% of foreign employees	0.002	***	-0.001	*
	% of permanent contract employees	0.003	***	0.001	***
Establishment type	Family-owned entity (yes = 1, no = 0)	-0.130	***	-0.016	
	Multi-national entity (yes = 1, no = 0)	0.235	***	0.182	***
Constant		-0.206	**	-0.134	
<i>N</i>		3698		3694	
Adjusted R-squared		0.160		0.093	

\**p*-value < 0.1/\*\**p*-value < 0.05/\*\*\**p*-value < 0.01.

#The results for agriculture, forestry and fishing activities, and of real estate activities are omitted due to small sample size (less than 50).

**Table 12. Results of regression analyses (OLS) on the ESI against the skills strategy**

		ESI		DEI			
Skills strategy	Composite	0.300	***	-	0.228	***	-
	Rewards	-		0.076	***	-	0.084

	Trust	-	0.218	***	-	0.121	***		
	Involvement	-	0.085	***	-	0.071	***		
	Autonomy	-	0.025	-	-	0.065	***		
	Training	-	0.121	***	-	0.033	*		
Industry sector <sup>#</sup>	Manufacturing, mining and quarrying and other industrial activities	-	0.521	***	-	0.534	***		
	Construction	-	0.385	***	-	0.405	***		
	Wholesale and retail trade, transportation and storage, accommodation and food service activities	-	0.436	***	-	0.460	***		
	Financial and insurance activities	-	0.095	-	-	0.126	0.028	0.026	
	Professional, scientific, technical, administrative and support service activities	-	0.098	-	-	0.136	**	0.133	*
	Public administration and defence, education, human health and social work activities	-	0.195	**	-	0.157	*	0.065	-
	Other service activities	-	0.324	***	-	0.364	***	0.363	***
Establishment size (ln)	-	0.006	-	-	0.018	0.076	***	-	
Employee demographics	% of managers and professionals	-	0.007	***	-	0.006	***	0.008	***
	% of technicians and associate professionals	-	0.001	**	-	0.001	**	0.004	***
	% of mature employees (older than 40 years)	-	0.001	-	-	0.001	*	0.001	*
	% of foreign employees	-	0.002	***	-	0.002	**	0.001	*
	% of permanent contract employees	-	0.002	***	-	0.002	***	0.001	***
Establishment type	Family-owned entity (yes = 1, no = 0)	-	0.111	***	-	0.102	***	0.000	0.002
	Multi-national entity (yes = 1, no = 0)	-	0.138	***	-	0.120	***	0.111	***
Constant	-	0.080	0.019	-	0.034	-	0.047	-	
<i>N</i>		3698	3661	3694	3657				
Adjusted R-squared		0.236	0.255	0.135	0.135				

\**p*-value < 0.1/\*\**p*-value < 0.05/\*\*\**p*-value < 0.01.

<sup>#</sup>The results for agriculture, forestry, and fishing activities, and of real estate activities are omitted due to small sample size (less than 50).

**Table 13. Results of regression analyses (OLS) on skills strategy against skills utilisation**

		Skills strategy			
Skills utilisation	Skills demand (ESI)	0.288	***	0.288	***



	Discretionary effort (DEI)	0.180	***	0.180	***
Interaction term	ESI × DEI	-		-0.001	
Industry sector <sup>#</sup>	Manufacturing, mining and quarrying and other industrial activities	-0.105		-0.104	
	Construction	-0.185	**	-0.185	**
	Wholesale and retail trade, transportation and storage, accommodation and food service activities	-0.180	***	-0.180	***
	Financial and insurance activities	-0.049		-0.049	
	Professional, scientific, technical, administrative and support service activities	-0.137	**	-0.137	**
	Public administration and defence, education, human health and social work activities	-0.302	***	-0.302	**
	Other service activities	-0.161	*	-0.161	*
Establishment size (ln)		0.109	***	0.109	***
Employee demographics	% of managers and professionals	0.005	***	0.005	***
	% of technicians and associate professionals	0.000		0.000	
	% of mature employees (older than 40 years)	-0.001	**	-0.001	**
	% of foreign employees	-0.001		-0.001	
	% of permanent contract employees	0.000		0.000	
Establishment type	Family-owned entity (yes = 1, no = 0)	-0.001		-0.001	
	Multi-national entity (yes = 1, no = 0)	0.252	***	0.252	***
Constant		-0.283	***	-0.283	***
N		3694		3694	
Adjusted R-squared		0.221		0.221	

\**p*-value < 0.1/\*\**p*-value < 0.05/\*\*\**p*-value < 0.01.

<sup>#</sup>The results for agriculture, forestry, and fishing activities, and of real estate activities are omitted due to small sample size (less than 50).

## Appendix 4

**Table 14. Results of regression analysis (OLS) on the extent of skills gaps against establishment characteristics**

		% unable to cope with existing duties
Industry sector <sup>#</sup>	Manufacturing, mining and quarrying and other industrial activities	0.613
	Construction	1.220
	Wholesale and retail trade, transportation and storage, accommodation and food service activities	0.867
	Financial and insurance activities	1.591
	Professional, scientific, technical, administrative and support service activities	0.981
	Public administration and defence, education, human health and social work activities	1.107
	Other service activities	2.366 *
Establishment size (ln)		-0.050
Employee demographics	% of managers and professionals	-0.002
	% of technicians and associate professionals	-0.014 *
	% of mature employees (older than 40 years)	-0.008
	% of foreign employees	0.012
	% of permanent contract employees	-0.037 ***
Establishment type	Family-owned entity (yes = 1, no = 0)	-0.087
	Multi-national entity (yes = 1, no = 0)	-0.060
Constant		11.391 ***
<i>N</i>		3695
Adjusted R-squared		0.014

\**p*-value < 0.1/\*\**p*-value < 0.05/\*\*\**p*-value < 0.01.

<sup>#</sup>The results for agriculture, forestry, and fishing activities, and of real estate activities are omitted due to small sample size (less than 50).

**Table 15. Results of regression analysis (OLS) on the extent of skills gaps against job skills demand**

		% unable to cope with existing duties
Skills demand (ESI)		– 0.061
Discretionary effort (DEI)		– 2.009 ***
Industry sector#	Manufacturing, mining and quarrying and other industrial activities	– 0.148
	Construction	0.788
	Wholesale and retail trade, transportation and storage, accommodation and food service activities	0.280
	Financial and insurance activities	1.484
	Professional, scientific, technical, administrative and support service activities	0.608
	Public administration and defence, education, human health and social work activities	0.867
	Other service activities	1.441
Establishment size (ln)		– 0.139
Employee demographics	% of managers and professionals	0.018 *
	% of technicians and associate professionals	– 0.005
	% of mature employees (older than 40 years)	– 0.007
	% of foreign employees	0.009
	% of permanent contract employees	– 0.034 ***
Establishment type	Family-owned entity (yes = 1, no = 0)	– 0.126
	Multi-national entity (yes = 1, no = 0)	0.315
Constant		11.13 6 ***
<i>N</i>		3689
Adjusted R-squared		0.036

\**p*-value < 0.1/\*\**p*-value < 0.05/\*\*\**p*-value < 0.01.

#The results for agriculture, forestry, and fishing activities, and of real estate activities are omitted due to small sample size (less than 50).

# Appendix 5

**Table 16. Results of regression analysis (OLS) on classroom-based training against establishment characteristics**

		Classroom-based training	
Industry sector#	Manufacturing, mining and quarrying and other industrial activities	–	**
		6.695	
	Construction	2.370	
	Wholesale and retail trade, transportation and storage, accommodation and food service activities	–	
		3.227	
	Financial and insurance activities	1.434	
	Professional, scientific, technical, administrative and support service activities	3.635	
Public administration and defence, education, human health and social work activities		13.87	***
		7	
Other service activities	1.352		
Establishment size (ln)		5.572	***
Employee demographics	% of managers and professionals	–	***
		0.094	
	% of technicians and associate professionals	–	**
		0.040	
	% of mature employees (older than 40 years)	–	***
	0.071		
% of foreign employees	0.074	***	
% of permanent contract employees	0.117	***	
Establishment type	Family-owned entity (yes = 1, no = 0)	–	
		0.909	
	Multi-national entity (yes = 1, no = 0)	3.251	***
Constant		8.471	***
N		3697	
Adjusted R-squared		0.094	

\**p*-value < 0.1/\*\**p*-value < 0.05/\*\*\**p*-value < 0.01.

#The results for agriculture, forestry, and fishing activities, and of real estate activities are omitted due to small sample size (less than 50).

**Table 17. Results of regression analysis (OLS) on skills utilisation against classroom-based training**

		ESI		DEI	
Classroom-based training (%)	Staff that attended classroom-based training	0.006	***	–0.001	
Industry sector#	Manufacturing, mining and quarrying and other industrial activities	–0.582	***	–0.374	***

	Construction	−0.509	***	−0.196	**
	Wholesale and retail trade, transportation and storage, accommodation and food service activities	−0.532	***	−0.271	***
	Financial and insurance activities	−0.133		−0.049	
	Professional, scientific, technical, administrative and support service activities	−0.187	***	−0.180	**
	Public administration and defence, education, human health and social work activities	0.022		−0.130	
	Other service activities	−0.442	***	−0.445	***
<hr/>					
	Establishment size (ln)	−0.010		−0.047	**
<hr/>					
Employee demographics	% of managers and professionals	0.010	***	0.010	***
	% of technicians and associate professionals	0.002	***	0.005	***
	% of mature employees (older than 40 years)	−0.001		0.001	
	% of foreign employees	0.002	**	−0.001	**
	% of permanent contract employees	0.002	***	0.001	***
<hr/>					
Establishment type	Family-owned entity (yes = 1, no = 0)	−0.116	***	−0.009	
	Multi-national entity (yes = 1, no = 0)	0.224	***	0.195	***
<hr/>					
	Constant	−0.243	***	−0.112	
<hr/>					
	<i>N</i>	3695		3691	
<hr/>					
	Adjusted R-squared	0.193		0.088	

\**p*-value < 0.1/\*\**p*-value < 0.05/\*\*\**p*-value < 0.01.

#The results for agriculture, forestry, and fishing activities, and of real estate activities are omitted due to small sample size (less than 50).

**Table 18. Results of logistic regression analyses (logistic) on formalised development plans against establishment characteristics**

			Formalised development plans (yes = 1, no = 0)
Industry sector#	Manufacturing, mining and quarrying and other industrial activities	−0.634	***
	Construction	−0.387	**
	Wholesale and retail trade, transportation and storage, accommodation and food service activities	−0.519	***
	Financial and insurance activities	0.253	
	Professional, scientific, technical, administrative and support service activities	−0.238	

	Public administration and defence, education, human health and social work activities	0.092	
	Other service activities	-0.223	
<hr/>			
Establishment size (ln)		0.463	***
<hr/>			
Employee demographics	% of managers and professionals	0.009	***
	% of technicians and associate professionals	0.002	
	% of mature employees (older than 40 years)	-0.002	
	% of foreign employees	0.000	
	% of permanent contract employees	0.000	
<hr/>			
Establishment type	Family-owned entity (yes = 1, no = 0)	-0.089	
	Multi-national entity (yes = 1, no = 0)	0.529	***
<hr/>			
Constant		-1.869	***
<hr/>			
<i>N</i>		3689	
<hr/>			
Pseudo R-squared		0.056	
<hr/>			

\**p*-value < 0.1/\*\**p*-value < 0.05/\*\*\**p*-value < 0.01.

#The results for agriculture, forestry, and fishing activities, and of real estate activities are omitted due to small sample size (less than 50).

**Table 19. Results of regression analysis (OLS) on job skills demand against formalised development budget**

		ESI		DEI	
Formalised development plan	(Yes = 1, no = 0)	0.334	***	0.152	***
<hr/>					
Industry sector#	Manufacturing, mining and quarrying and other industrial activities	-0.575	***	-0.344	***
	Construction	-0.463	***	-0.189	**
	Wholesale and retail trade, transportation and storage, accommodation and food service activities	-0.513	***	-0.250	***
	Financial and insurance activities	-0.142		-0.058	
	Professional, scientific, technical, administrative and support service activities	-0.143	**	-0.174	**
	Public administration and defence, education, human health and social work activities	0.099		-0.136	
	Other service activities	-0.414	***	-0.437	***
<hr/>					
Establishment size (ln)		-0.010		-0.065	***
<hr/>					
Employee demographics	% of managers and professionals	0.009	***	0.009	***

	% of technicians and associate Professionals	0.002	***	0.005	***
	% of mature employees (older than 40 years)	-0.001	**	0.001	
	% of foreign employees	0.002	***	-0.001	**
	% of permanent contract employees	0.003	***	0.001	***
Establishment type	Family-owned entity (yes = 1, no = 0)	-0.116	***	-0.004	
	Multi-national entity (yes = 1, no = 0)	0.205	***	0.172	***
Constant		-0.210	**	-0.135	
<i>N</i>		3688		3684	
Adjusted R-squared		0.180		0.093	

\**p*-value < 0.1/\*\**p*-value < 0.05/\*\*\**p*-value < 0.01.

#The results for agriculture, forestry, and fishing activities, and of real estate activities are omitted due to small sample size (less than 50).