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Development of Management Capability Scores

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Abstract

International literature finds management practices to be a key driver of firm performance, however, little quantitative work has been done to create evidence of the importance of management practices in Australia. Following Bloom and Van Reenen (2007) on the US Management and Organizational Practices Survey, we use data from the Australian Bureau of Statistics' Management and Organisational Capabilities Module to calculate six different scores of management capabilities. We further look at the association of these scores with two measures of firm performance: labour productivity and exports intensity. We find a positive and significant association between management capabilities and labour productivity and between supply chain management and export performance.

JEL Codes: L2, M2

Keywords: Management scores, management capability, firm performance



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Key points

- We introduce a method for the development of firm-level management capability scores in Australian firms.
- To develop the management capability scores we use unit record data from *Management and Organisational Capabilities of Australian Businesses* as part of the Management Capabilities Module (MCM) for the Business Characteristics Survey (BCS) 8172.0 published in August 2017.
- In this study we developed six different management capability scores:
 - Strategic Management Capability Score (SMC)
 - Supply chain Management Capability Score (SCM)
 - Digital Management Capability Score (DMC)
 - Environmental Management Capability Score (EMC)
 - Overall Management Capability Score (OMC)
 - Structured Management Practice Score for Manufacturing (for comparison with US manufacturing firms)
- We assess the validity of these scores by looking at the association between the management capability scores and specific firms' characteristics. The results show that:
 - The average overall management capability (OMC) score for larger firms is higher than for smaller firms.
 - Australian firms aged nine years or more, tend to have higher scores of management capabilities (in all types of management categories) than their younger counterparts.
 - The two best performing industry sectors on overall management capabilities are Accommodation and Food services and Health Care and Social Assistance.
 - The Agricultural industry was the lowest performing industry in terms of the overall management score.
 - Firms that had some degree of foreign ownership tend to have higher scores of management capabilities across all dimensions than those that did not have foreign ownership.

- For all management scores, innovation-active firms displayed a significantly higher score than non-innovation-active firms
- A score based on a subset of management practices for the manufacturing sector shows that US manufacturing firms had more structured management practices than their Australian counterparts.
- An investigation of the association between the management practice scores and measures of firm performance found:
 - A positive and significant association between management capabilities and labour productivity.
 - A positive and significant association between supply chain management and export performance

1. Introduction

A key driver of firms' performance is their level of management capability. A number of studies have shown that variations in management capabilities account for differences in productivity at both the firm and national levels (Bloom and Van Reenen 2007; 2010; Agarwal, Green et al. 2013; Agarwal, Brown et al. 2014). The evidence implies that the adoption of 'better' or 'structured' management practices can lead to significant improvements in productivity, competitiveness and innovativeness (Agarwal, Brown et al. 2014; Bloom et al. 2018).

Research on the performance of Australian manufacturing firms has indicated that Australian management capabilities lag behind the world's best in the dimensions of operations, people and performance management (Green et al. 2009). Other research also indicated the need for better management and leadership, especially regarding innovation in Australian firms (Agarwal, Bajada et al 2014, Agarwal and Green 2011). This points to the need for the assessment of management quality in Australia as it may be an important factor hindering future productivity and growth.

There is a dearth of evidence on the association between the characteristics of firms and management capabilities in Australia. Moreover, consistent metrics are needed to allow benchmarking of firms across industries at the national level and comparing Australian firms with firm from other countries. While there have been a series of studies that seek to observe the management quality of firms across various industries, a constant challenge has been how to objectively measure management quality. For example, the World Management Survey (WMS) provides an opportunity to investigate differences in management capabilities between firms across more than 15 countries. The WMS utilised a unique double-blind scoring interview methodology to measure management practices across 18 dimensions. However, that approach was extremely labour intensive and expensive and thus not suitable for a longer term measurement of management practices.

In 2010, the US Census Bureau completed the first large-scale survey of management practices in over 40,000 manufacturing establishments. The US Management and Organizational Practices Survey (US MOPS) collected information on the people, operations and performance aspects of management, as well as related background information. A subsequent survey was conducted in 2015, containing additional sections on data, decision-making and uncertainty. This survey approach provided a long-term mechanism for the ongoing measurement of management practice capabilities. This facilitates standard techniques of data collection for better international benchmarking.

Inspired by the US MOPS, the Management Capabilities Module (MCM) was developed in 2016 as part of the ABS' Business Characteristics Survey (BCS)¹

¹ ABS (2017) Management and Organisational Capabilities of Australian Business, 2015-16

to measure management practices of Australian firms.² This survey expanded the core theme of the US MOPS that focused on production and operations management to four additional dimensions of strategic management (SM), supply chain management (SCM), digital Management (DM) and environmental management (EM). ABS tested the survey conceptually and cognitively before rolling it out in financial year 2015–16 to more than 15,000 Australian firms. This survey is the first of its kind in Australia.

The data from Management and Organisational Capabilities of Australian Businesses was published in August 2017 under catalogue number 8172.0. This data provides the opportunity to measure and benchmark the management practices and capabilities of Australian firms for not only the traditional strategic management (SM) dimensions such as planning and monitoring, but also the newly explored areas of supply chain management, digital management, and environmental management.

- The objective of this paper is to develop methodologies for calculating management capability scores at the firm level and investigate the association between these scores and firm performance. The report will describe the development of six different management capability scores: Strategic Management Capabilities (SMC)
- Supply Chain Management Capabilities (SCMC)
- Digital Management Capabilities (DMC)
- Environmental Management Capabilities (EMC)
- Overall Management Capabilities (OMC)
- Structured Management Practices Score for Manufacturing (for comparison with US manufacturing firms).

The development of the code for analysis of these management capability scores and the analysis of the association of these scores with firm performance indicators will enable an improved understanding of the role of management capability in Australia. It also a major step in value adding the ABS data from the Management and Organisational Capabilities of Australian Businesses as scores can be used directly in econometric analysis.³

The development of scores of management capability and its integration into the Business Longitudinal Analysis Data Environment (BLADE) open the opportunity to conduct future research evaluating and examining management capabilities in Australian firms and their impact.

² This was a collaboration between the Australian Bureau of Statistics (ABS) the Department of Industry, Innovation and Science (DIIS), the University Technology Sydney (UTS) Business School and with the technical assistance of Professor Nick Bloom from Stanford University.

³ This EDAN research paper builds on prior collaborations between UTS business school and the DIIS on management capabilities and strategic management in Australian firms. Financial support for this project was provided by the Department of the Prime Minister and Cabinet's Data Integration Partnership Australia (DIPA) through the Economic Data Analysis Network (EDAN).

This paper is structured as follows:

- Section 2 provides a brief literature review on management capabilities, specifically the key areas of Strategic, Supply Chain, Digital and Environmental management.
- Section 3 is the core part of this paper, it describes the methodology behind the development of the scores for management practices, and contains information on the process for selecting appropriate questions and weightings for each respective score, coding treatments, and score calculations.
- Section 4 provides descriptive statistics of the six calculated scores by firm size, industry, age of firms, foreign ownership and innovation status.
- Section 5 provides comparisons of management practice scores for the Australian and the US manufacturing sectors.
- Section 6 contains the two pieces of analysis investigating the association of the management capabilities scores and selected firm performance indicators.

2. Literature review

The significance of management capabilities in organisational performance is rapidly becoming a key area of concern for both policy makers and practitioners alike. Recent large-scale studies from a wide range of industries suggest certain practices appear “better” than others in achieving greater firm performance and productivity (Bloom and Van Reenen, 2007, Bloom et al., 2018, Agarwal et al., 2013, Agarwal Bajada et al., 2015, Agarwal, Brown et al., 2014, Green et al., 2014). This literature review draws upon insights from these studies, including the World Management Survey⁴ (WMS) and the more recent US Management and Organisational Practice Survey⁵ in order to highlight the key theoretical basis guiding the development of scores for strategic, digital, environmental and supply chain management capabilities⁶

In 2010, the U.S. Census Bureau introduced the first ever large-scale survey of management practices for the United States referred to as the Management and Organisational Practices Survey (MOPS). The second iteration of the survey was conducted in 2015. The survey collected information on management practices, organisational characteristics and related background information for firms in the U.S. manufacturing sector. The core sections on management practices comprised of 16 individual questions on targets,

⁴ See <http://worldmanagementsurvey.org/>

⁵ See <https://www.census.gov/programs-surveys/mops.html> for a detailed description of this survey.

⁶ Where a capability is defined as “a high-level routine (or collection of routines) that confers an organisations’ management a set of decision options for producing significant outputs of a particular type” Winter, S. G. (2000). *Strategic management journal*, 981-996. In this paper, we recognise that a capability involves continuously making organisational decisions and such decisions will have a significant impact on an organisations’ viability in the long-term.

monitoring and incentives. The targets section of the survey asked how well firms design and integrate forward-looking goals and productive targets. The monitoring section asked firms the extent to which they collect and use information to measure performance and improve their productive processes. The incentives section asked how the firm manages bonuses, promotions and dismissal of employees.

2.1 Strategic management capabilities

One of the key questions guiding the strategic management literature is how an organisation can create and sustain competitive advantage (Ambrosini and Bowman, 2009, Stacey and Mowles, 2016). Given the dynamic nature of today's competitive market, creating competitive advantage is one thing but sustaining it over an extended period is quite another (O'Reilly III and Tushman, 2016).

Formal planning activities contribute to greater organisational performance (Wolf and Floyd, 2017). These activities are made more effective by including insights from all the relevant stakeholders within the various functions of an organisation (Wolf and Floyd, 2017). Though formal planning is seemingly fundamental as a business activity, managers have not been able to capitalise on its benefits, as only 11 per cent of managers perceived planning to be a useful exercise (Mankins and Steele, 2006).

Following closely from this is the ability to effectively set and monitor key performance indicators (KPI); something that has been found to contribute significantly to organisational performance (Agarwal, Brown et al., 2014, Bloom et al., 2018). The effective use of KPIs also helps inform key human resource decisions including incentive schemes and promotion/demotion activities that also contribute towards improved organisational performance (Agarwal, Brown et al., 2014, Bloom et al., 2018). Organisations must be able to explore new opportunities whilst exploiting existing resources to incrementally improve organisational performance (O'Reilly III and Tushman, 2016). Such "ambidextrous" capabilities contribute to increased organisational performance (Derbyshire, 2014, Junni et al., 2013).

2.2 Digital management capabilities

Digital management capabilities involve the effective adoption of digital technologies such as mobile devices, social media, data analytics, cloud computing and Internet of Things (Bilgeri et al., 2017). Digital management capabilities also include the integration of these technologies into the operations of an organisation towards increased competitive advantage, business transformation and strategy (Kane et al., 2015b). This also means modifications to the business model to suit the strategy (Westerman et al., 2011). These modifications involve fundamentally changing the manner by which value is delivered to the customer. Improved digital literacy (Martin, 2005, OECD, 2000), investing in cyber security (Accenture, 2018) and increased collaboration (both internally and externally) are examples of key practices that facilitate effective digital transformation (see O'Hea, 2011). Digital transformation and adoption provides benefits such as improved operational efficiency, effective knowledge sharing, successful innovation

outcomes, enhanced customer service and greater resilience against disruption (Kane et al., 2015a, Wade, 2015).

2.3 Environmental management capabilities

Environmental management in organisations has long moved from issues of compliance to ones involving greater organisational performance (Orsato, 2006, Orsato, 2009). Environment management capability is underpinned by an organisations' ability to leverage the management of the environmental impact and resources towards greater competitive advantage while considering tangible societal public benefits (Orsato, 2006).

The first consideration involves aligning environmental management practices to an organisations strategy. Although, intuitively this can be thought of as a strategic "fit", it is not necessarily straight forward. The environmental management practices should be suited to the market orientation of the organisation adopting the practices, whether it is a strategy focussed on price, increasing differentiation or the strategic orientation of internal resources (Orsato, 2009). Other considerations also involve effective management of waste and pollution, including measurement practices and taking action based on intended performance requirements. Therefore, performance management as it pertains to the environmental impact from the use of materials and resources is key towards building environmental management competence (OECD, 2011).

Performance management is also closely linked to key administrative practices including the assignment of staff specifically focussed on environmental management initiatives (OECD, 2011) and innovation activities whereby research and development is geared towards achieving greater environmental outcomes (Alfred and Adam, 2009). The adoption of such practices can help in achieving cost-savings, such as reduced energy usage and material wastage that improve revenue and provide improved business opportunities (Orsato, 2009, Alfred and Adam, 2009).

2.4 Supply chain management

Supply chain management (SCM) can be defined as "the systemic, strategic coordination of the traditional business functions and the tactics across these business functions within a particular company and across businesses within the supply chain, for the purposes of improving the long-term performance of the individual companies and the supply chain as a whole" (Mentzer et al., 2001). Thus, supply chain management capability encompasses management practices geared towards achieving competitive advantage by paying attention to the various internal and external business activities and the relationships between them.

Alignment of supply chain management and strategy is an important way to leverage greater competitive advantage and ensure long-term viability of an organisation (Gattorna, 2015). Given the demand-driven nature of today's markets, organisations must be able to effectively perform segmentation activities and individually tailor supply chain strategies according to the specific characteristics of disparate segments (Gattorna, 2015). This also requires increased staff, as well as supplier training and awareness (Formentini and

Taticchi, 2016), effective information and knowledge sharing activities (Bagchi et al., 2005) and a greater overall collaboration of capabilities (Juran, 1993) to meet the needs of customers and the other stakeholders in the supply chain. As with other key operational processes, SCM also involves effective performance management including adopting the right metrics, at the right time, and involving the right stakeholders (Bai and Sarkis, 2014).

The brief review of literature presented above outlines some of the key management practices that contribute towards the development of strategic, digital, environmental and supply chain management capabilities. These theoretical insights guide the selection of questions used in the calculation of each management score presented in this paper.

3. Development of management capability scores

This section provides an overview of the questions selected to produce each of the firm-level management capability scores and the method of calculating the scores. The section also contains a description of the alignment of the Management Capability Module (MCM) questions for the development of a comparable score from the US Management and Organizational Practices Survey (US MOPS).

Construction of the overall management practices score requires a clear definition of the boundaries of the variable and what it represents. A management capability score measures the presence and use of management practices in an organisation. The management capability score for a specified area of management is a measure of the presence (and use) of management practices that relate explicitly to the respective dimension of management such as supply chain, digital and environmental management capabilities. A higher management capability score suggests that a firm uses more practices in this specific dimension of management capability. On the other hand, a lower management capability score suggests the firm utilises fewer management practices in that particular dimension. The management capability score is a measure of the extent to which a firm indicates they have management practices, regardless of whether the specific management practice is 'better' or 'worse'.

3.1 Selection of questions

Based on the literature review, we have identified questions from the MCM which best reflect each respective management capability score, namely the SMC, DMC, EMC, SCMC and OMC as detailed in Appendix C. The questions are selected based on their relevance and appropriateness to specific dimensions of management. These questions measure both the use and the extent of use of various management practices in the firm.

The MCM has many questions that relate to the context of the firm. As such, appropriateness of a question depends on the content of the question. Whilst questions can be related to a particular dimension of management, they may refer to the context of the firm rather than a measure of capability per se. These context questions were omitted from the calculation of the management

capability scores. Questions are selected based on them representing the extent and use of a particular management practice in the organisation.

For the purposes of constructing the scores, each identified question represents a single specific aspect of management capability. For questions that contain a separate part for managers and non-managers, these two components are split and treated as individual questions for the purposes of the score construction. Similarly, some questions contain a list of various management practices. In these instances, each separate response is treated as an individual question for the purposes of score construction. Each respective management capabilities score will thereby comprise of a selection of questions that each represent a single dimension of management. A breakdown of the number of questions for each respective management capability score is presented in Table 3.1. Appendix C provides additional details on each of the selected questions used to compute each score.

Table 3.1: Number of questions for the construction of the management capability scores

	Strategic management score (SMC)	Supply chain management score (SCMC)	Environmental management score (EMC)	Digital management score (DMC)
Number of individual questions for calculation of scores	33	15	20	10

As the SMC score uses many questions, the score has been divided into four sub-scores of 'Planning', 'Monitoring', 'Execution' and 'Innovation'. Each individual question selected for the SMC is also assigned to one of the four sub-scores. Table 3.2 presents the breakdown of SMC questions into the four sub-scores.

Table 3.2: Number of questions for strategic management scores (SMC)

Sub-score	Planning	Monitoring	Execution	Innovation	Total SMC questions
Number of individual questions	6	7	14	6	33

3.2 Calculating overall management capability (OMC) score

The OMC scores are calculated using scores from different dimensions of management capability: strategic, digital, environment, and supply-chain. Different approaches to calculating the 'Overall Management Capability' score across all dimensions of the management practices are suggested, with each having small variations in the calculation and interpretation of the overall MC score. The broad approaches involve either constructing an overall management capability score using values of sub-scores (i.e. values of DMC, EMC, SCMC and SMC) or using scores at the question level. The OMC scores developed here are based on an unweighted average of each the individual question included avoiding double counting. The Overall Management Capabilities score (OMC) is based on 72 questions and Overall Management Capabilities score that excludes supply chain questions (OMCv2) is based on 59 questions,

3.3 Aligning the MCM for comparison with US firms

The MCM provides an opportunity to make comparisons of management capabilities with other countries, in particular the US, from which a number of MCM questions were derived. We use the MCM to construct a management capability score, comparable to the US MOPS structured score of management. In some instances, the response parts for the MCM questions were adjusted to align with the responses to questions in US MOPS. In total, twelve individual questions in the MCM were identified as being comparable with US MOPS for the calculation of the comparable score. This total takes into consideration the split questions for managers and non-managers. Four other questions from the 'Data Use and Decision Making' section was also identified as being comparable to questions in the US MOPS. However, these specific questions were not used for the construction of the US MOPS structured management score and so are not included in the score construction.⁷

In terms of assigning weights, all questions selected for the US MOPS comparison score are of scaled type and have incremental weightings. To ensure consistency, the weights used in the US MOPS were also applied to the corresponding 12 MCM questions. Treatment for invalid responses are also consistent with the treatment in the US MOPS, such that responses that are invalid are either excluded from the sample or the responses are given a score value of zero. The calculation of dimension scores and overall scores are also consistently applied. A summary of the selected MCM questions and the adjustments made for alignment to US MOPS are found in Appendix D.

In developing results comparable to US MOPS, the categorical groupings regarding size, industry and age were adjusted to be consistent across the two surveys. The industry codes used by the US, North American Industry Classification System (NAICS) were compared to the Australian and New Zealand Standard Industry Classification (ANZSIC) categories. Table 3.3 below presents the US MOPS NAICS manufacturing industry categories and identifies those that have an equivalent ANZSIC category. The international

⁷ The four questions in the MCM that have been identified to be derived from the US MOPS are MCM Q18, Q19, Q20 and Q21.

comparison can only be conducted for those industry categories that are able to be aligned across the two surveys.

Table 3.3: US Management and Organisational Practices Survey (MOPS) manufacturing industry classification comparison with ANZSIC

NAICS code		Comparable With ANSZIC
31-33	Manufacturing	Yes
311	Food Manufacturing	No
312	Beverage and Tobacco Product Manufacturing	Yes
313	Textile Mills*	No
314	Textile Product Mills*	No
315	Apparel Manufacturing*	Yes
316	Leather and Allied Product Manufacturing*	Yes
321	Wood Product Manufacturing	No
322	Paper Manufacturing*	No
323	Printing and Related Support Activities	No
324	Petroleum and Coal Products Manufacturing	No
325	Chemical Manufacturing*	No
326	Plastics and Rubber Products Manufacturing*	Yes
327	Non-metallic Mineral Product Manufacturing	No
331	Primary Metal Manufacturing	No
332	Fabricated Metal Product Manufacturing	Yes
333	Machinery Manufacturing	Yes
334	Computer and Electronic Product Manufacturing	No
335	Electrical Equipment, Appliance, and Component Manufacturing*	Yes
336	Transportation Equipment Manufacturing	No
337	Furniture and Related Product Manufacturing	No
339	Miscellaneous Manufacturing*	Yes

Notes: * Denotes those categories with no equivalent ANZSIC codes for sub-divisions of manufacturing industry.

Source: US Census Bureau, Massachusetts Institute of Technology, National Bureau of Economic Research and Stanford University (2015) Management and Organizational Practices Survey.

A similar issue also arises for the categories of employee size and firm age. In order to conduct an international comparison, the results from the MCM are aligned to US MOPS categories. The comparison between the US and Australian scores are presented in Section 5. Furthermore, the calculated US MOPS structured management score consists of the unweighted average score of 16 questions, whereas the comparable MCM only contains 12 of the 16 in the international comparison. For a more accurate comparison, the

structured management score was constructed using 12 US MOPS questions comparable to MCM.⁸

3.4 Use of the BLADE dataset

To conduct the analysis in this report, two separate derivations of MCM data are used: The Management and Organisational Capabilities of Australian Businesses Microdata (referred to as the MOC microdata), and a dataset linking the MOC microdata with financial data collected for tax purposes referred to as the Business Longitudinal Analysis Data Environment (BLADE). For the analysis that required BLADE data (presented in Section 6) comments are included on the reduction in sample size due to the availability of common data linking the individual firms across the two datasets. Analysis could only be conducted for firms that have the required data present across the two separate derivations of MCM data, potentially resulting in different sample size. It is worth noting that in MOC microdata firm size categories differ from the MCM data, for example the top employment range in the MOC is 100 or more employees, while in the MCM is 200 or more employees.

3.5 Sample descriptive statistics

Table 3.4 describes the distribution of sample based on firm characteristics. For the firm size (employment range), a greater number of firms that participated in the survey consisted of 0–4 number of employees. The majority of firms that became a part of the study had been in business for more than 9 years. Out of the sample of 12,536, only 5.3 per cent of companies had franchising agreement whereas around 12.7 per cent of the firms had foreign ownership. 61.7 per cent of the firms that participated in the study had undertaken innovative activity.

⁸ The US MOPS score is scaled down by first calculating the individual question scores for the specific 12 comparable questions that are present in both surveys. The individual question score for the US MOPS results are derived from the response rates of each question and applying the assigned weights for each respective question. The scaled US MOPS score based on 12 questions is calculated by taking the unweighted average of the 12 calculated individual question scores. To scale down the US MOPS scores for the size, industry and firm age crosstab results, a multiplier is applied to the US MOPS scores based on 16 questions. This multiplier is derived from taking the average score for US MOPS based on 12 questions (0.553) as calculated above and dividing it by the score for US MOPS based on 16 questions (0.549). The multiplier that is applied to scale down the US MOPS scores based on 16 questions equals (1.007). Appendix C of UTS project report contains the calculated average individual question scores based on the US MOPS response rates. A comparison of the MCM and US MOPS is to be interpreted with caution. A precise comparison will require the raw unit data for US MOPS to construct a comparable score using only 12 out of the 16 questions for 'Structured Management', which is currently unavailable.

Table 3.4: Survey sample descriptive statistics of firm characteristics, 2015–16

Variable	Category	Frequency	Per cent
Firm Size (employment range)	0 to 4 employees	5,393	43.0
	5 to 19 employees	3204	25.6
	20 to 99 employees	1244	9.9
	100 or more employees	2695	21.5
Firm Age (years of operation - regardless of ownership)	Less than 1 to less than 4 years	1769	14.1
	4 to less than 9 years	1918	15.3
	9 years or more	8801	70.2
	Missing	48	0.4
Franchising Agreement	No	11769	93.9
	Yes	661	5.3
	Missing	106	0.9
Foreign Ownership	No	10857	86.6
	Yes	1587	12.7
	Missing	92	0.7
Innovation-active	No	4805	30.3
	Yes	7731	61.7

Source: Australian Bureau of Statistics 2016, Management and Organisational Capabilities of Australian Business, 2015–16. Expanded Confidentialised Unit Record File (CURF)

The Table 3.5 presents the basic sample descriptive statistics of the manager level characteristics for the sample of MCM respondents for the period 2015–16.

Table 3.5: Descriptive statistics of principal manager characteristics, 2015–16

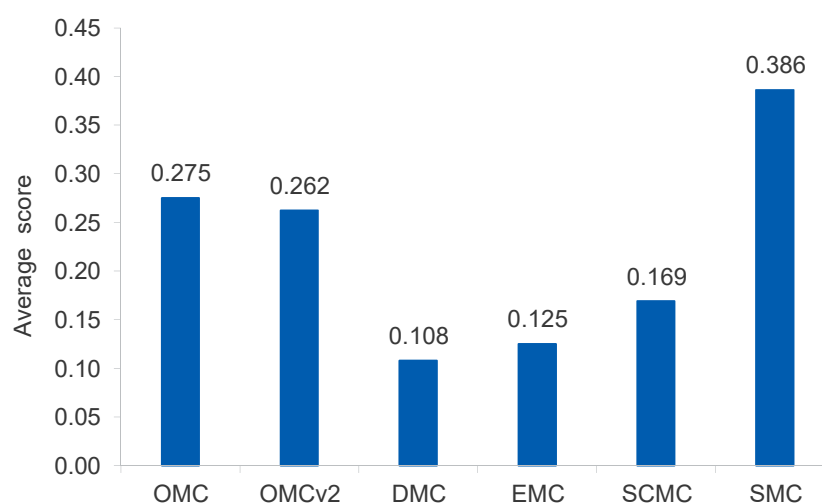
Variable	Category	Sample size	Per cent
Age of Principal Manager	Less than 30 years old	296	2.36
	30 to 39 years old	1,532	12.22
	40 to 49 years old	3,451	27.53
	50 to 59 years old	4,406	35.15
	60 or more years old	2,617	20.88
	Missing	234	1.87
Gender of Principal Manager	Male	10,223	81.55
	Female	1,916	15.28
	Missing	397	3.17
Tenure of the Principal Manager	Less than 5 years	3,387	27.02
	5 to 9 years	2,346	18.71
	10 to 14 years	1,792	14.29
	15 to 19 years	1,568	12.51
	Greater than or equal to 20 years	3,000	23.93
	Missing	443	3.53
Education of the Principal Manager	Bachelor degree or higher	5,873	46.85
	Advanced diploma or diploma	1,394	11.12
	Certificate III or IV (including trade	1,765	14.08
	Year 12 or equivalent	1,614	12.87
	Year 11 or below	1,432	11.42
	Did not go to school	65	0.52
	Missing	393	3.13

Source: Australian Bureau of Statistics 2016, Management and Organisational Capabilities of Australian Business, 2015–16. Expanded Confidentialised Unit Record File (CURF).

4. Analysis of Australian management capability scores

This section presents average management capability scores across different dimensions for the entire sample as well as differences by firm characteristics. Average scores for each individual unique question is provided in Appendix B.

Figure 4.1: Average management capability scores, all firms, 2015–16



Notes: Authors' calculations

Source: Australian Bureau of Statistics 2016, Management and Organisational Capabilities of Australian Business, 2015-16. Expanded Confidentialised Unit Record File (CURF), ABS DataLab.

Table 4.1: Descriptive statistics of Australian management scores, all firms, 2015–16

Score	Number of Observations (n)	Average score	Median	Standard Deviation
Overall Management Capability (OMC)	7537	0.275	0.262	0.147
Overall Management Capability (OMCv2) ⁹	12536	0.262	0.244	0.158
Digital Management Capability (DMC)	12536	0.108	0.00	0.159
Environmental Management Capability (EMC)	12536	0.125	0.05	0.178
Supply Chain Management Capability (SCMC)	7537	0.169	0.133	0.173
Strategic Management Capability (SMC)	12536	0.386	0.380	0.204

Notes: Authors' calculations

Source: Australian Bureau of Statistics 2016, Management and Organisational Capabilities of Australian Business, 2015–16. Expanded Confidentialised Unit Record File (CURF), ABS DataLab

The smaller sample size for SCMC (n= 7537) is due to the reasons described in Section 3.4. The lowest performing score is related to DMC at 0.108 showing a lack of digital and technology integration into businesses. This is followed closely by EMC at 0.125, indicating a very low penetration and adoption of environmental practices by the sampled firms. SMC is the highest scoring dimension found to be 0.386 indicating that firms on average tend to have more general management practices such as performance measurement and strategic planning before having the more nuanced practices of EMC, DMC or SCMC. The following sections provide descriptive results by a number of firm's characteristics.

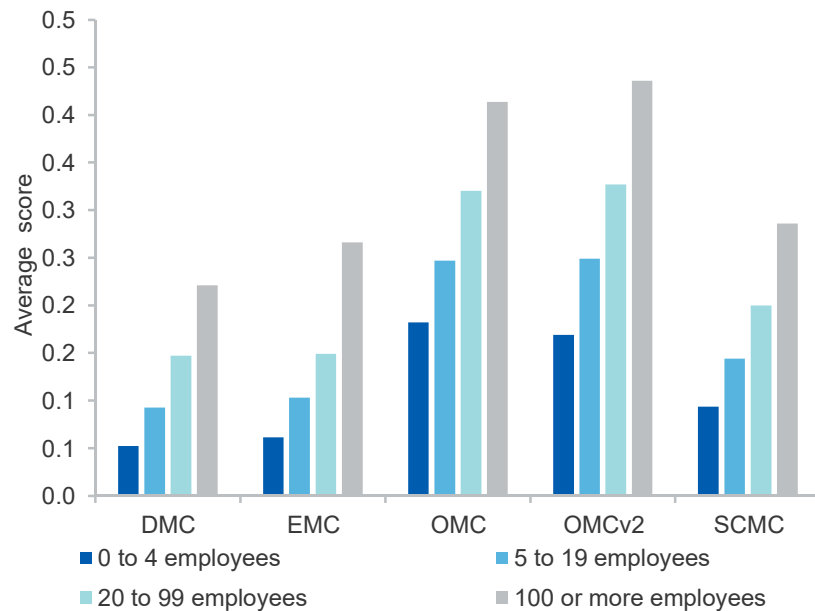
4.1 Management capability scores by firm employment size

Figure 4.2 illustrates the average management capability scores by firm size according to number of employees in the firm. Values are presented in Table B1 Appendix B. An interesting note in this figure is that there is a consistency in the magnitude of scores irrespective of the dimension of management capability. As expected, the average MC scores for the larger firms are higher than smaller firms across all management score dimensions. This is consistent with earlier studies that have shown the level of management capability, and

⁹ The difference between the OMC and OMCv2 is that the latter does not include supply chain management questions.

the presence of structured management practices tend to increase with firm size (Bloom and Van Reenen 2010). The variations in management scores across the different sized firms are statistically significant.

Figure 4.2: Average management capability scores of Australian firms by employment size, 2015–16



Notes: Authors' calculations. Detailed information in Table B1 Appendix B.

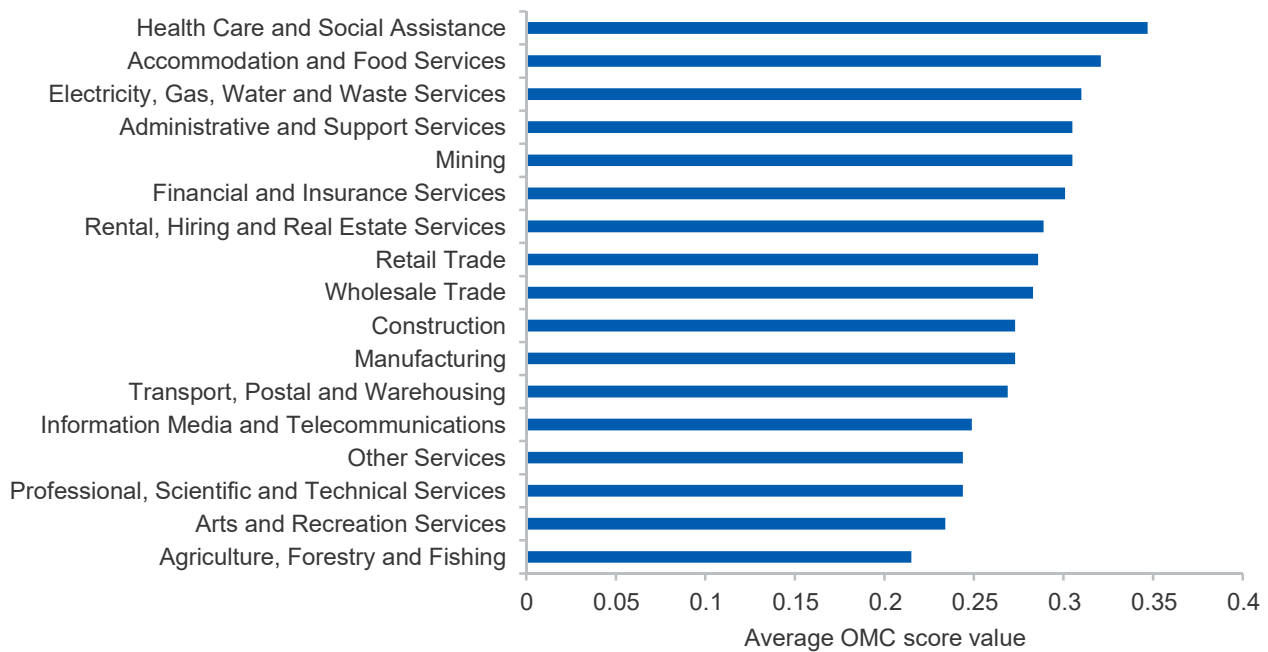
Source: Australian Bureau of Statistics 2016, Management and Organisational Capabilities of Australian Business, 2015–16. Expanded Confidentialised Unit Record File (CURF), ABS DataLab

4.2 Management capability scores by industry

Figures 4.3 to 4.7 (and Table B2 Appendix B) present the average for each management capability score type by ANZSIC industry division ranked from highest to lowest.

In terms of Overall Management Capability (Figure 4.3) the best performing industry sector is the *Health Care and Social Assistance* industry, closely followed by *Accommodation and Food Services* while *Agriculture* is the lowest performing sector in this score.

Figure 4.3: Average Overall Management Capability (OMC) Score by ANZSIC industry division, 2015–16

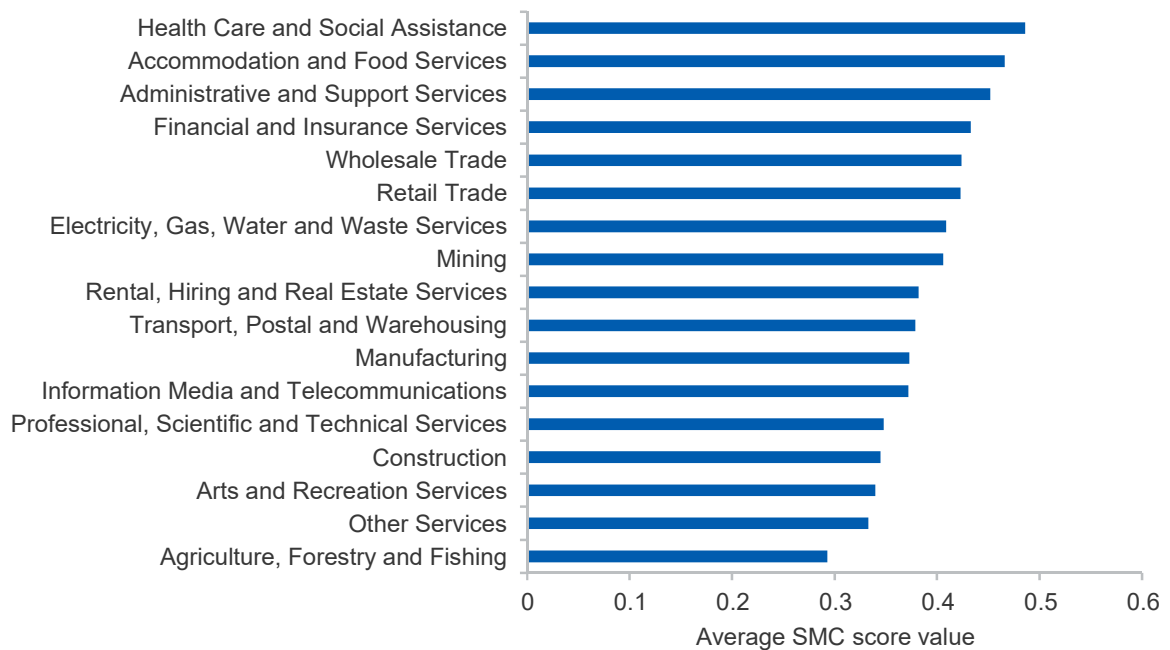


Notes: OMCv2 excludes supply chain management. Authors' calculations. Detailed information in Table B2, Appendix B.

Source: Australian Bureau of Statistics 2016, Management and Organisational Capabilities of Australian Business, 2015–16. Expanded Confidentialised Unit Record File (CURF), ABS DataLab

Figure 4.4 (and Table B2 Appendix B) show the SMC score across all ANZSIC divisions. The values of the score suggest that strategic management practices have been adopted across all industry divisions to a larger extent than other more specific management practices. However, there are also some noticeable differences across industry sectors. For example, *Health Care and Social Assistance*; *Accommodation and Food Services*; and *Administrative and Support Services* show the highest level of strategic management score whereas *Agriculture, Forestry and Fishing* shows the lowest score.

Figure 4.4: Average Strategic Management Capability (SMC) Score by ANZSIC industry division, 2015–16



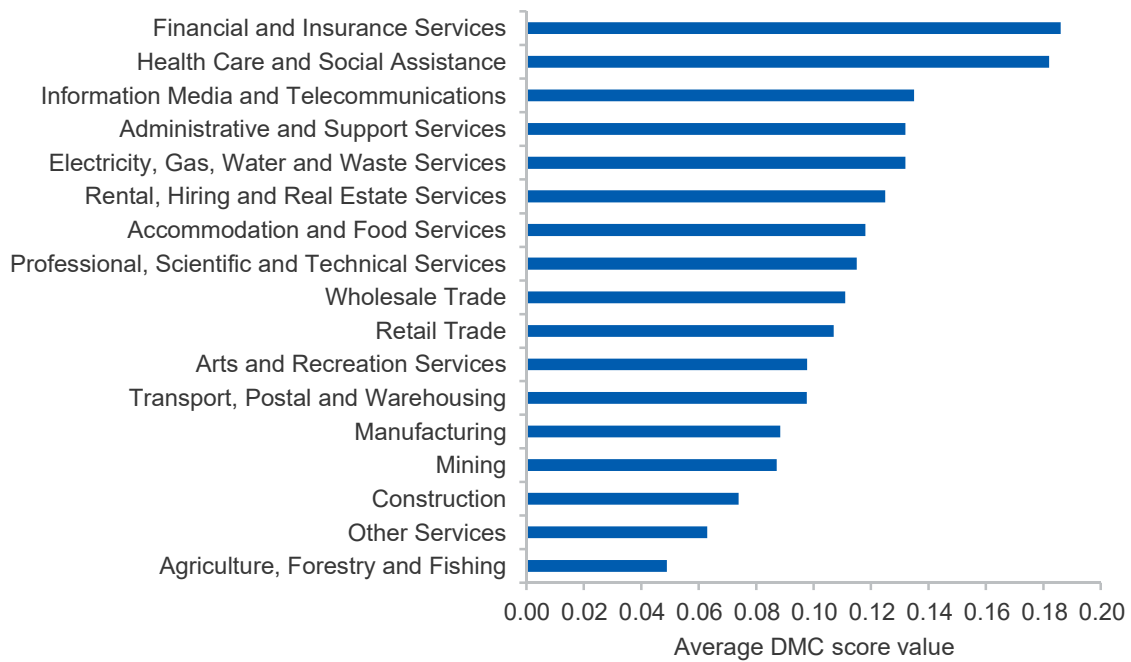
Notes: Authors' calculations. Excludes supply chain management. Detailed information in Table B2 Appendix B.

Source: Australian Bureau of Statistics 2016, Management and Organisational Capabilities of Australian Business, 2015–16. Expanded Confidentialised Unit Record File (CURF), ABS DataLab

For the more specific management capabilities, there are also some significant differences across industries. For example, for Digital Management Capability score Figure 4.5 (and Table B2 Appendix B), *Financial and Insurance Services*, and *Healthcare and Social Assistance* industry divisions show the highest scores of digital management capability relative to the other industry sectors.

Mining and *Electricity, Gas, Water and Waste services* show the most advanced environmental management practices (Figure 4.6). This could be partly due to the nature of operations (and type of business activity) that have a more direct impact on environmental concerns than other industries.

Figure 4.5: Average Digital Management Capability (DMC) score by ANZSIC industry division, 2015–16

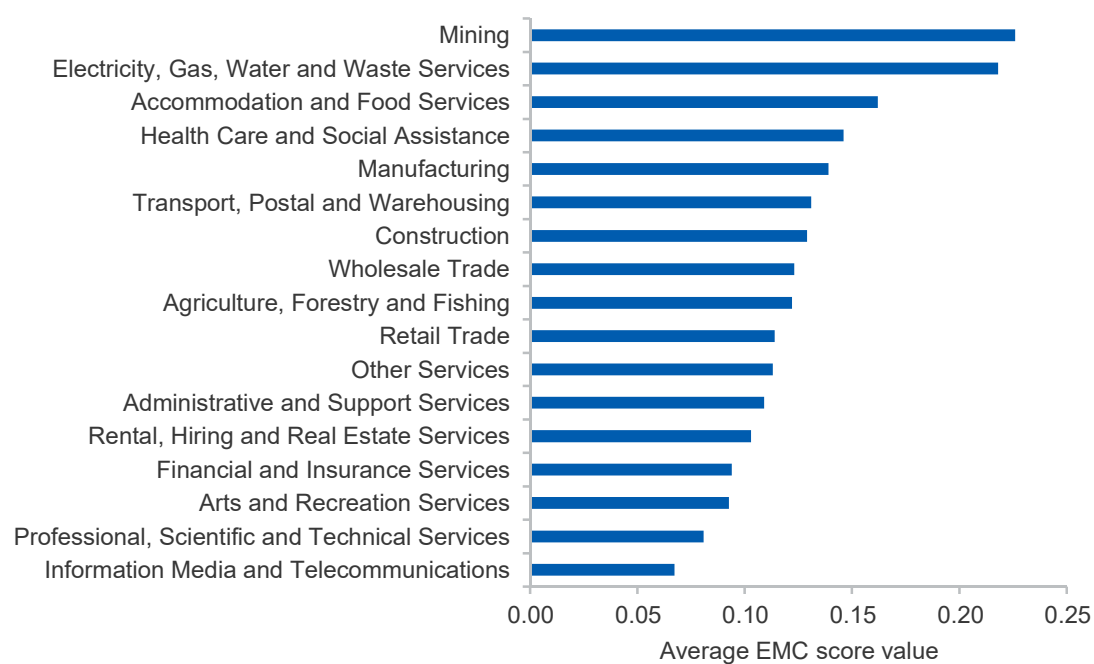


Notes: Authors' calculations. Detailed information in Table B2 Appendix B.

Source: Australian Bureau of Statistics 2016, Management and Organisational Capabilities of Australian Business, 2015–16. Expanded Confidentialised Unit Record File (CURF), ABS DataLab

Similarly, the highest scoring industries for SCMC are *Wholesale Trade* and *Retail Trade* (Figure 4.7). Although the nature of the business operations in these sectors, which primarily involving the distribution of goods and services, may bias the higher SCMC score towards these industries, the score involves a number of generic questions related to training, KPIs and relationships with customers. Other supply chain related sectors such as *Transport, Postal and Warehousing*, and *Financial and Insurance Services* ranked significantly lower in the SCMC score. The *Arts and Recreation Services* scored the lowest for supply chain related management practices relative to the other industry sectors. *Agriculture*, which includes food supply chain operations also shows a very low supply chain management capability score.

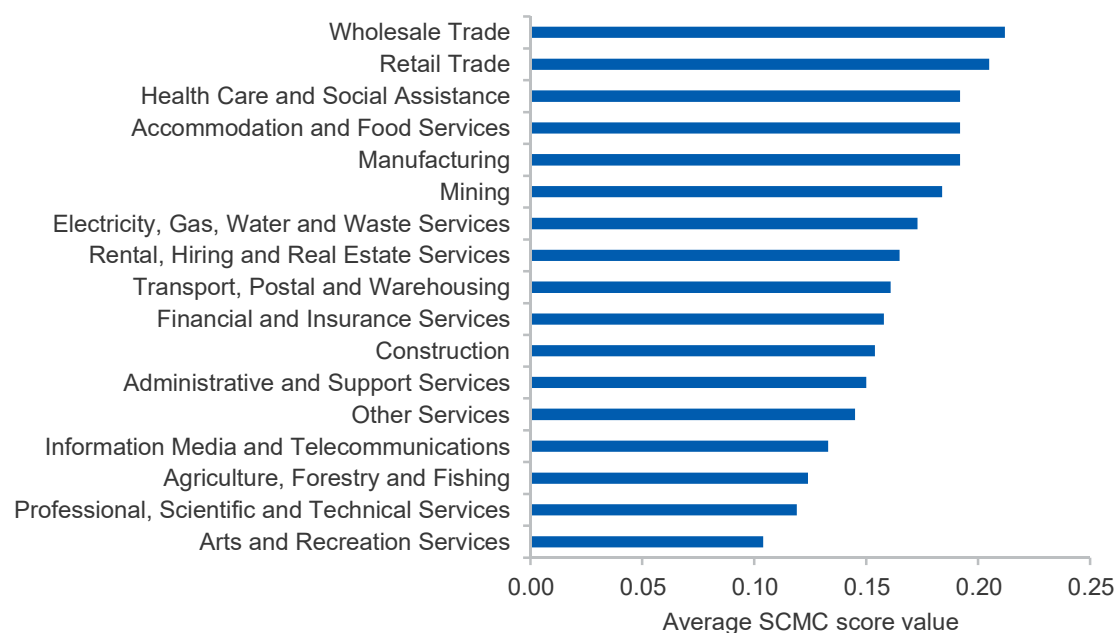
Figure 4.6: Average Environmental Management Capability (EMC) score by ANZSIC industry division, 2015–16



Notes: Authors' calculations. Detailed information in Table B2 Appendix B.

Source: Australian Bureau of Statistics 2016, Management and Organisational Capabilities of Australian Business, 2015–16. Expanded Confidentialised Unit Record File (CURF), ABS DataLab

Figure 4.7: Average Supply chain Management Capability (SCMC) score by ANZSIC industry division, 2015–16



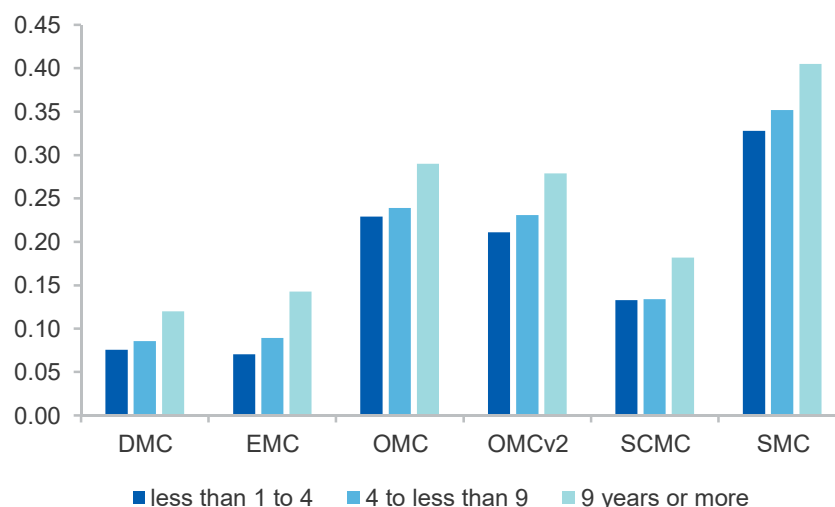
Notes: Authors' calculations. Detailed information in Table B2 Appendix B.

Source: Australian Bureau of Statistics 2016, Management and Organisational Capabilities of Australian Business, 2015–16. Expanded Confidentialised Unit Record File (CURF), ABS DataLab

4.3 Management capability scores by firm age

Figure 4.8 (and Table B3 Appendix B) present average management capability scores by firm age measured by the number of years in operation. Firms that have been in operation for at least nine years tend to have a higher score in all dimensions of management capability compared to their younger counterparts. Although the difference between firms that are less than 1 to 4 years old and 4 to less than 9 is less apparent, the results indicate the older the firm, the better the management capability score.

Figure 4.8: Average management capability scores of Australian firms by firm age, 2015–16



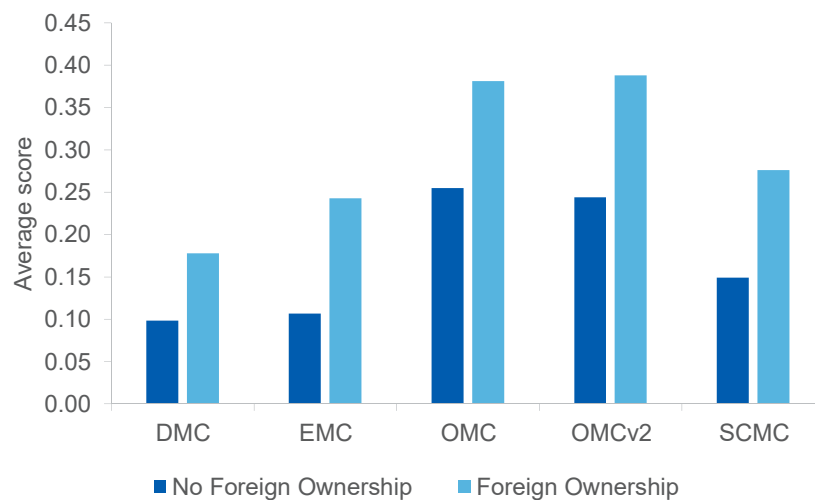
Notes: Authors' calculations. Detailed information in Table B3 Appendix B

Source: Australian Bureau of Statistics 2016, Management and Organisational Capabilities of Australian Business, 2015–16. Expanded Confidentialised Unit Record File (CURF), ABS DataLab

4.4 Management capability scores by foreign ownership

Figure 4.9 (and Table B4 in Appendix B) present average management capability scores by foreign ownership status of firms. The results indicate that those firms that had some degree of foreign ownership tend to have higher scores of management capability across all dimensions than those that did not have foreign ownership. Prior evidence depicts similar results: foreign multinationals tend to encourage more structured management practices than purely domestic firms (Agarwal, Brown et al. 2014). Interestingly, in specific dimensions like DMC, EMC and SCMC the gap in scores between locally and foreign owned firms widens.

Figure 4.9: Average management capability scores of Australian firms by foreign ownership status, 2015–16



Notes: Authors' calculations. Detailed information in Table B4, Appendix B.

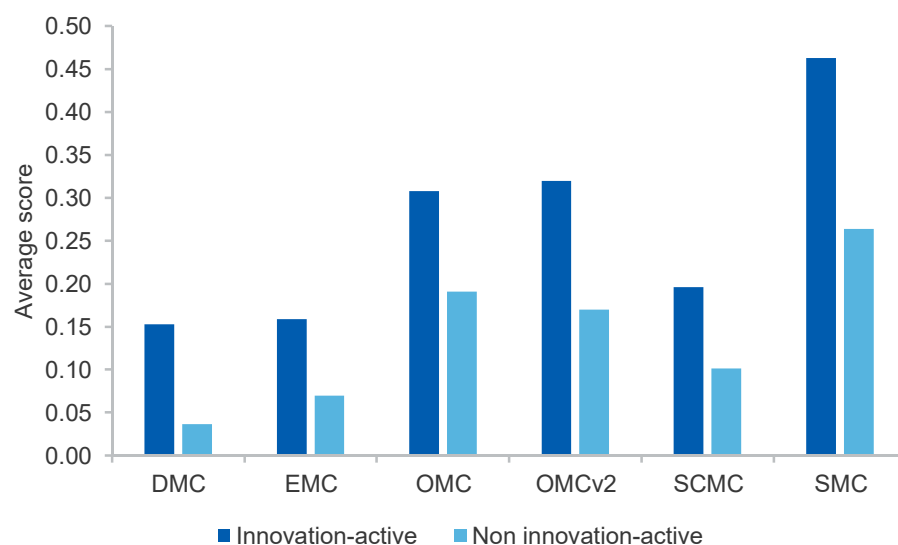
Source: Australian Bureau of Statistics 2016, Management and Organisational Capabilities of Australian Business, 2015–16. Expanded Confidentialised Unit Record File (CURF), ABS DataLab.

4.5 Management capability scores by firms' innovation status

Figure 4.10 (and Table B5 Appendix B) present average management capability scores by innovation status of firms. Following the definition used by the ABS in the Business Characteristics Survey, innovation-active firms are firms that undertake any innovative activity whether it be introducing innovation, innovation still in progress or abandoned.

For all dimension of management, innovation-active firms have a significantly higher score than those classified as non-innovation-active firms. It has been widely documented that firms that implement structured management practices tend to be more innovative than those that do not (Agarwal Brown et al. 2014).

Figure 4.10: Average management capability scores of Australian firms by innovation status, 2015–16



Notes: Authors' calculations. Detailed information in Table B5, Appendix 5

Source: Australian Bureau of Statistics 2016, Management and Organisational Capabilities of Australian Business, 2015–16. Expanded Confidentialised Unit Record File (CURF), ABS DataLab.

5. Comparisons of structured management practices scores between Australian and US firms

This section compares management capabilities between Australian and US firms using the calculation methodology in section 3.3. Questions from the US MOPS that are used for the comparison are presented in Appendix D. As the US MOPS only covers the manufacturing industry, we calculate the international comparison score for the manufacturing industry only (ANZSIC industry division C).

Table 5.1 presents the average score for the international comparison score using 12 comparable questions but also the 16 questions from US MOPS. The variation between the score calculated with 12 and 16 questions is small. Following the terminology of US MOPS, the score is referred to as the *Structured Management Practices score*. The subsequent analyses in this Section show comparisons of this score by firm size, industry and firm age. The results show that US firms consistently have higher scores than their Australian counterparts.

Table 5.1: Comparison of structured management practices score between US and Australian manufacturing firms

Score	US average score (16 questions)	US average score (12 questions)	Australia average score (12 questions)
Structured management	0.549	0.553	0.348

Source: U.S. Census Bureau, Massachusetts Institute of Technology, National Bureau of Economic Research, and Stanford University; 2015 Management and Organizational Practices Survey. Source for Australian data, Australian Bureau of Statistics 2016, Management and Organisational Capabilities of Australian Business, 2015–16. Expanded Confidentialised Unit Record File (CURF), ABS DataLab. Authors' calculations.

5.1 Comparison by firm employment size

Figure 5.1 presents the average Australian and US structured management practice score by firm size using US MOPS categories for employee size.¹⁰ As described in Section 3.3, to scale down the scores by size, industry and firm age, a multiplier is applied to the US MOPS scores that is based on 16 questions.¹¹

¹⁰ As explained in section 3.3, the sample size has decreased from the overall MOPS score in Table 13, as a result of the linkage between the two datasets.

¹¹The multiplier calculated to scale down the US Score to 12 questions is (US16/US12): $0.553/0.549 = 1.007$

Figure 5.1: Comparison of structured management practices score between US and Australian manufacturing firms by employment size



Source: U.S. Census Bureau, Massachusetts Institute of Technology, National Bureau of Economic Research, and Stanford University; 2015 Management and Organizational Practices Survey. Source for Australian data, Australian Bureau of Statistics 2016, Management and Organisational Capabilities of Australian Business, 2015–16. Expanded Confidentialised Unit Record File (CURF), ABS DataLab. Authors' calculations.

Figure 5.1 shows that US firms outperform Australian firms regardless of the employment size. The differences are larger for smaller firms (up to 100 employees) compared to the larger sized categories (firms with more than 100 employees). For example, in the 5-9 employee size category the difference between the US and AUS is 0.290, while in the 500-999 employee size category the difference is 0.142. As expected, results show that the management capability scores of larger firms are generally higher than smaller firms.

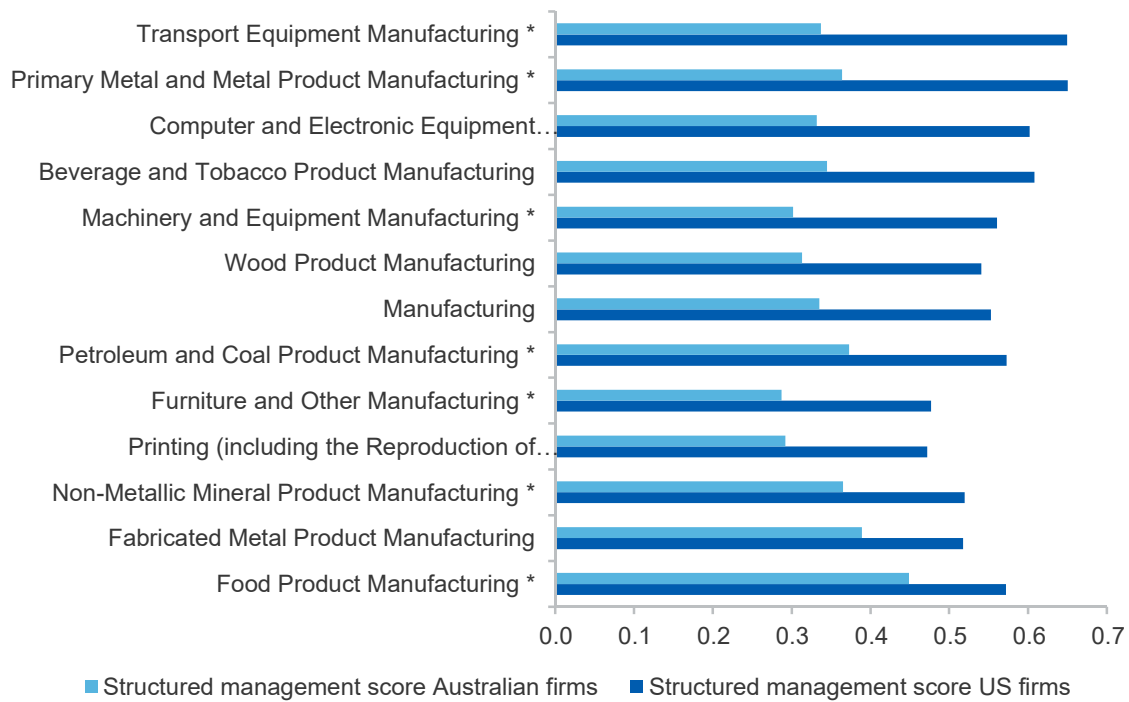
5.2 Manufacturing industry groups

Figure 5.2 presents the average structured management score by the comparable industry groups between NAICS and ANZSIC for the manufacturing industry¹².

For all of the manufacturing sub industry classifications, the comparison indicates a lower level of structured management practices in Australian firms compared to their US counterparts. The industry with the largest difference between the two surveys is the *Transport Equipment Manufacturing* with a difference in scores of 0.313. The smallest difference is in *Food Product Manufacturing* with a difference of 0.123 in favour of the US firms.

¹² As described in Section 3.3, to scale down the US MOPS scores for the size, industry and firm age crosstab results, a multiplier is applied to the US MOPS scores that is based on 16 questions. The multiplier calculated to scale down the US Score to 12 questions is (US16/US12): $0.553/0.549 = 1.007$

Figure 5.2: Comparison of structured management practices score between US and Australian manufacturing firms by manufacturing industry sub-groups

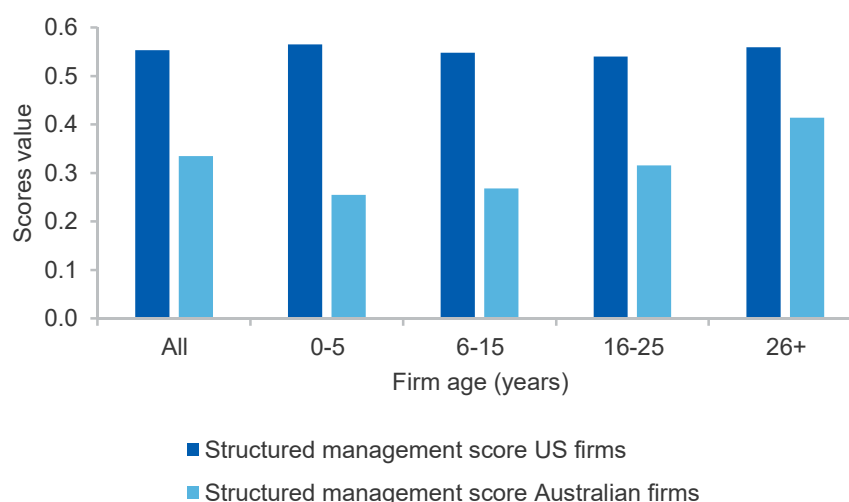


Source: U.S. Census Bureau, Massachusetts Institute of Technology, National Bureau of Economic Research, and Stanford University; 2015 Management and Organizational Practices Survey. Source for Australian data, Australian Bureau of Statistics 2016, Management and Organisational Capabilities of Australian Business, 2015–16. Expanded Confidentialised Unit Record File (CURF), ABS DataLab. Authors' calculations.

Figure 5.3 indicates a lower level of structured management practices in Australian firms compared to their US counterparts in all firm age groups.¹³ Interestingly, in the US manufacturing sector the youngest age bracket (0-5 years) presents the highest score of structured management practices. In other words, start-ups in the US manufacturing seem to be using better management practices than other firm age groups. In Australia, on the other hand, age seems to be the factor driving better management practices; the older the firm the more structured the management practice.

¹³ As described in Section 3.3, to scale down the US MOPS scores for the size, industry and firm age results, a multiplier is applied to the US MOPS scores that is based on 16 questions. The multiplier calculated to scale down the US Score to 12 questions is (US16/US12): $0.553/0.549 = 1.007$

Figure 5.3: Comparison of structured management practice score between US and Australian manufacturing firms by firm's age



Source: U.S. Census Bureau, Massachusetts Institute of Technology, National Bureau of Economic Research, and Stanford University; 2015 Management and Organizational Practices Survey. Source for Australian data, Australian Bureau of Statistics 2016, Management and Organisational Capabilities of Australian Business, 2015–16. Expanded Confidentialised Unit Record File (CURF), ABD Data Lab. Authors' calculations.

6. Management capability scores and firm performance

In this section we look at association between scores of management capability and indicators of firm performance. Regression analysis is used to show, the association between the management capability scores and productivity, and the association between supply chain management capability score and indicators of export performance.

6.1 Management capability and productivity

We examine the association between management capabilities and labour productivity, particularly, value added per employee and sales per employee. We report the change in labour productivity by changing the relevant management capability score by 0.1 (on the scale of 0 to 1).

Table 6.1 displays the association between management capability scores and two indicators of labour productivity in Australian firms: value added per employee and firm sales per employee.¹⁴ All regression analyses were controlled by firm size, industry and age of the firm.

The coefficients on the various management capability scores are positive and significant for value added per employee and sales per employee variables. This indicates that management capabilities have a positive association with labour productivity. The coefficient estimates on OMC and OMCv2 are similar

¹⁴ We also estimated labour profitability using profits per employee but the estimated results were insignificant (except for EMC).

for both measures of labour productivity. The smaller coefficient estimate for SCMC may suggest that businesses are not as well interconnected as they could be their effect on labour productivity is small.

Table 6.1: Association between MC Scores and labour productivity among Australian firms, 2015–16

Management capability score	Number of Observations	Value added per employee	Number of Observations	Sales per employee
OMC	5761	0.619***	6269	1.311***
OMCv2	9415	0.614***	10230	1.327***
DMC	9409	0.272***	10232	0.450***
EMC	9406	0.376***	10235	0.760***
SCMC	5765	0.184*	6257	0.659***
SMC	9412	0.400***	10219	0.924***

Notes: *** Significant at 1 per cent level; ** significant at 5 per cent level, * significant at 10 per cent level. Authors' calculations.

Source: ABS (2018) Business Longitudinal Analysis Data Environment.

To analyse the impact of the improvement of management practices on productivity we model the change on productivity generated by an increase of 0.1 unit in the management practice scores. Figures 6.1 (a) to (f) show that overall management practices scores (OMC, OMCv2) have the highest impact on both measures of productivity. The strategic management (SMC) also has a considerable impact; however, the influence is minor for the more specific scores such as DMC, EMC and SCMC.

Figure 6.1: Impact of management capability on two measures of firm productivity

Figure 6.1(a): Impact of overall management capability (OMC) on two measures of firm productivity

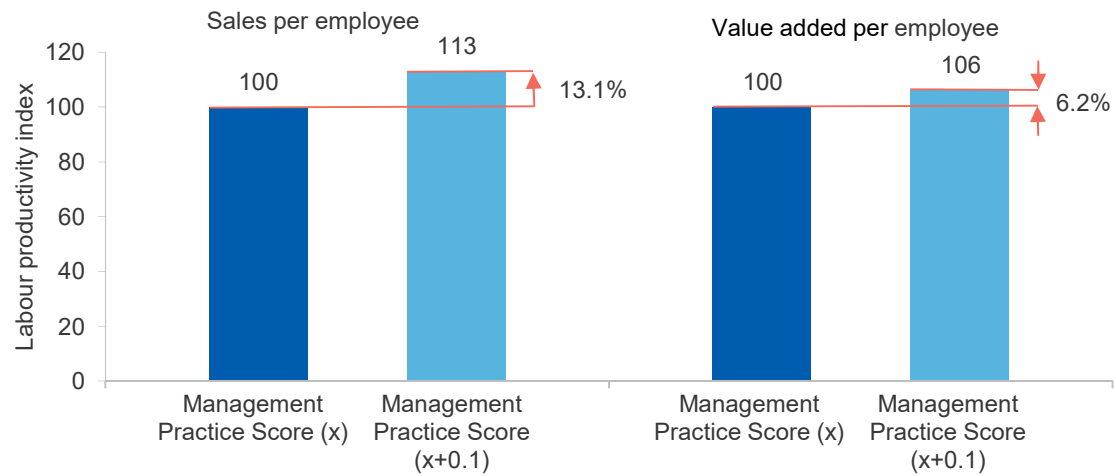


Figure 6.1(b): Impact of overall management capability v2 (OMCv2) on two measures of firm productivity

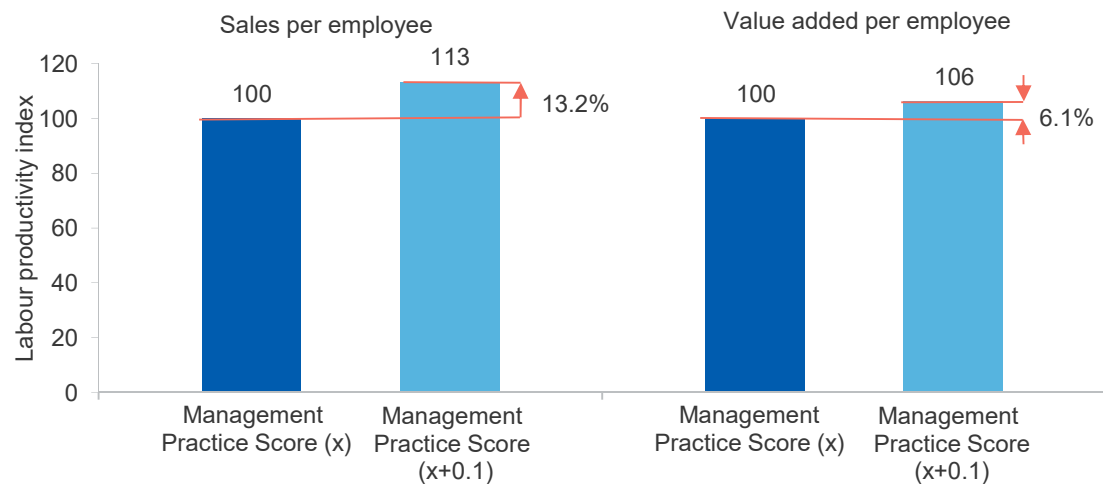


Figure 6.1(c): Impact of digital management capability (DMC) on two measures of firm productivity

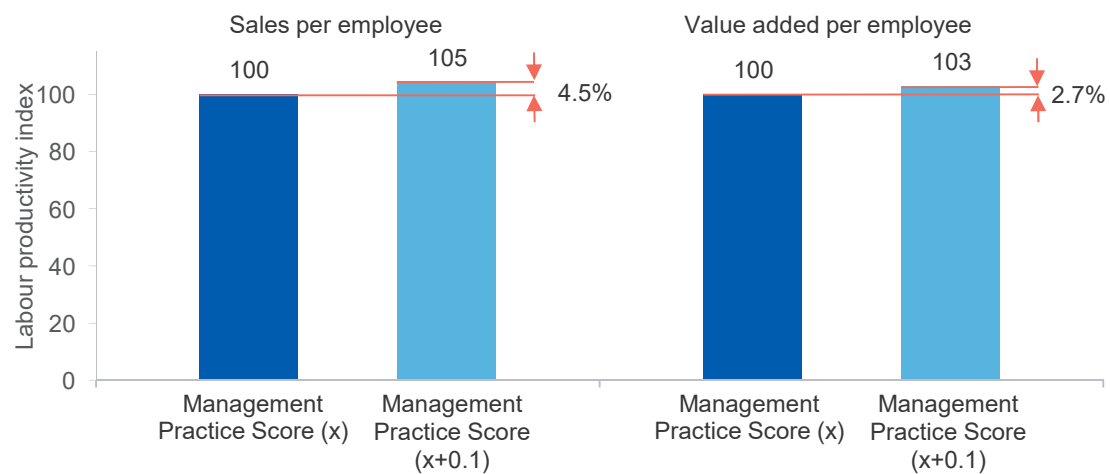


Figure 6.1(d): Impact of environmental management capability (EMC) on two measures of firm productivity

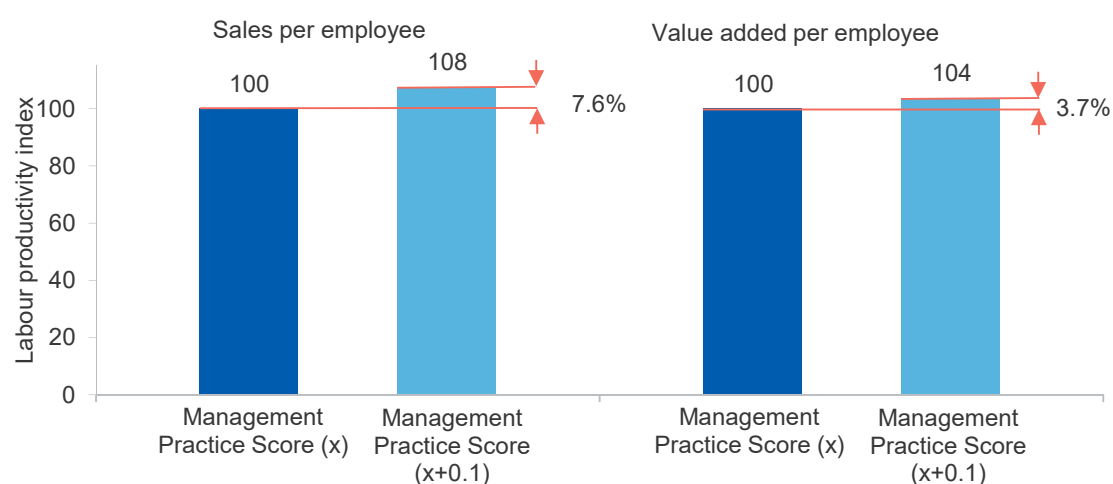


Figure 6.1(e): Impact of supply chain management capability (SCMC) on two measures of firm productivity

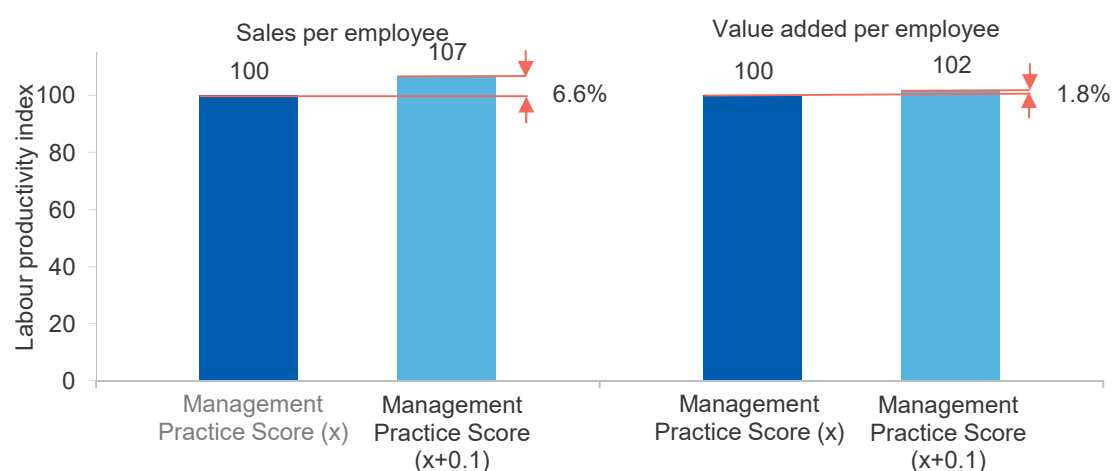
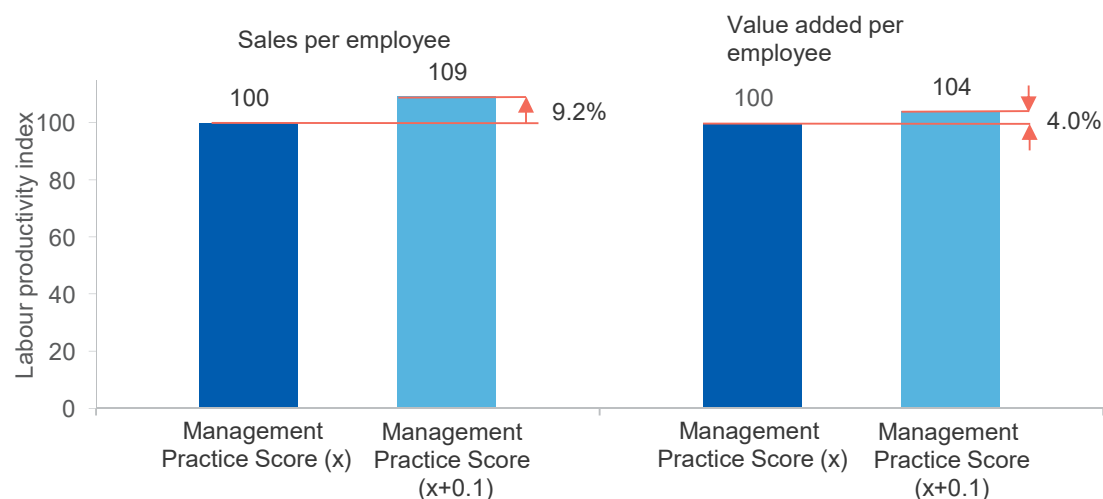


Figure 6.1(f): Impact of strategic management capability (SMC) on two measures of firm productivity



Notes: Authors' calculations. Estimated impact of 0.1 increase in score on labour productivity measures.

Source: ABS (2018) Business Longitudinal Analysis Data Environment.

6.2 Supply chain management capability and export performance

Table 6.2 presents the association between SCMC score and export performance measures; export sales per employee and export sales to total sales. As explained in Section 3.4, the sample size for this analysis is reduced because of limited export data in BLADE. After controlling for firm size, industry and age of the firm, the results indicate a significant positive association between SCMC score and export sales per employee, and export sales/total sales. The models explain 29 and 10 per cent of the variation in export sales per employee and export sales/total sales, respectively.

Table 6.2: Association of SCMC score with export per employee and export sales per total sales, 2015–16

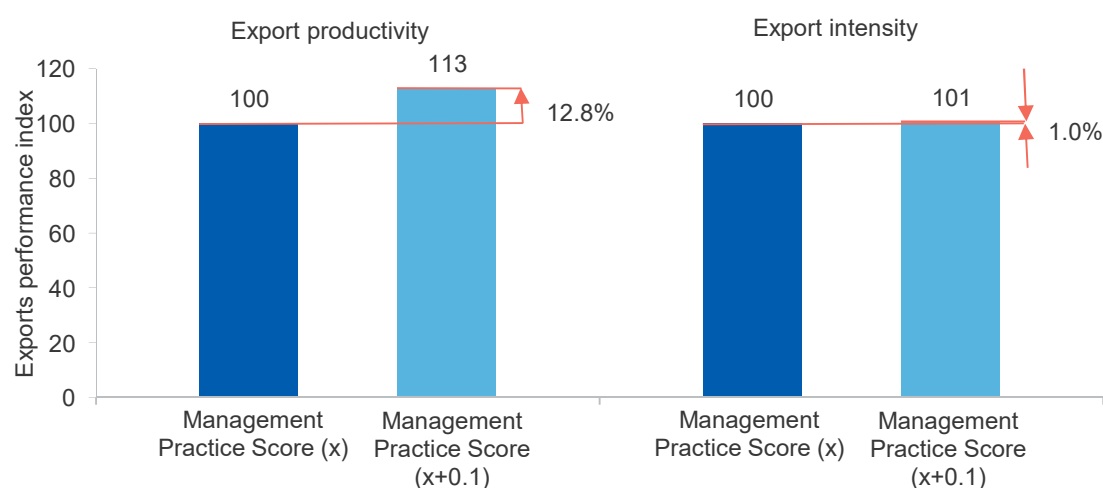
Management capability score	Number of observations	Exports per employee	Number of observations	Export sales/ Total sales
SCMC	1685	1.283***	6698	0.050***

Notes: *** Significant at 1 per cent level, Authors' calculations.

Source: ABS (2018) Business Longitudinal Analysis Data Environment (BLADE)

Figure 6.2 shows the effect on export performance from a change of 0.1 in the SCMC score. An increase of 0.1 in the SCMC score increases exports per employee by 12.8 per cent and export sales/total sales less than 1 per cent. The impact on export productivity is much larger than export intensity.

Figure 6.2: Impact of supply chain management capability (SCMS) score on export productivity and export intensity, 2015–16



Notes: Authors' calculations. Estimated impact of 0.1 increase in score on export productivity and intensity measures.

Source: ABS (2018) Business Longitudinal Analysis Data Environment.

7. Discussion

In this paper we developed six different scores of management capability and undertook analysis to test the relevance of the scores for firm performance. The results provide evidence for the importance of management capability for firm performance.

Firm size is the most important factor affecting the six types of management capability scores. For example, overall management capability scores for firms with more than 100 employees are more than double that of micro firms (0-4 employees) and about four times higher for specific scores such as digital, environment and supply chain management scores. This reflects differences in availability of resources to develop management capabilities, particularly in more specific areas.

Industry differences in management capability scores are also considerable. The difference between the industry with the top overall management capability (OMC) score and the bottom industry, *Health Care and Social Assistance, and Agriculture, Forestry and Fishing*, is about 66 per cent. The difference is even larger (around 279 per cent) between *Financial and Insurance Services, and Agriculture, Forestry and Fishing* when we look at the digital management capability score. Although these marked differences can be partially attributed to differences in concentrations of small firms between industry sectors, they can be affected by other factors such as the access to managerial resources and infrastructure. These results may be helpful informing more targeted policies for the development of management and digital capabilities.

One of the most interesting results of this paper relates to the differences between US and Australian firms in their scores of structured management by the age of the firm. American firms show better scores than Australian firms, particularly for young firms. This may suggest that US start-ups ecosystems are more developed and that founders' management capabilities are stronger in the US than in Australia. These results may help to explain Australia's combination of good entrepreneurship conditions but difficulty in scaling up new ventures to larger size (Hendrickson et al 2015).

Finally, the results showing the association between management capability scores and firm performance are consistent and indicate that increasing management capability even at a moderate level has direct benefits for productivity and exports intensity. These results, however, should be tested with more elaborate econometric models.

References

- Accenture. 2018, *Redefine your Company Based on the Company you Keep: Intelligent Enterprise Unleashed*, Industry Report, Accenture, viewed 15 June 2018, <https://www.accenture.com/t20180227T215953Z__w__/us-en/_acnmedia/Accenture/next-gen-7/tech-vision-2018/pdf/Accenture-TechVision-2018-Tech-Trends-Report.pdf#zoom=50>
- Agarwal, R., Bajada, C., Brown, P. & Green, R. 2015, 'Global Comparison of Management Practises', *Handbook of Research and Managing Managers*, pp. 327-350.
- Agarwal, R., Brown, P.J., Green, R., Randhawa, K. & Tan, H. 2014, 'Management Practices of Australian Manufacturing Firms: Why are Some Firms More Innovative?', *International Journal of Production Research*, vol. 52, no. 21, pp. 6496-6517.
- Agarwal, R., Bajada, C., Brown, P.J. & Green, R. 2014, 'Managerial Practices in a High Cost Manufacturing Environment: a Comparative Analysis of Australia and New Zealand', *Succeeding in a High Cost Operating Environment*, pp. 268-289.
- Agarwal, R., Green, R., Brown, P.J., Tan, H. & Randhawa, K. 2013, 'Determinants of Quality Management Practices: An Empirical Study of New Zealand Manufacturing Firms', *International Journal of Production Economics*, vol. 142, no. 1, pp. 130-145.
- Agarwal, R. & Green, R. 2011, 'The Role of Educations and Skills in Australian Management Practice and Productivity', *Fostering Enterprise: the Innovation and Skills Nexus*, vol. 978, pp. 79-102.
- Alfred, A.M. & Adam, R.F. 2009, 'Green Management Matters Regardless', *The Academy of Management Perspectives*, vol. 23, no. 3, pp. 17-26.
- Ambrosini, V. & Bowman, C. 2009, 'What are Dynamic Capabilities and Are They a Useful Construct in Strategic Management?', *International Journal of Management Reviews*, vol. 11, no. 1, pp. 29-49.
- Bagchi, P.K., Chun Ha, B., Skjoett-Larsen, T. & Boege Soerensen, L. 2005, 'Supply Chain Integration: a European Survey', *The International Journal of Logistics Management*, vol. 16, no. 2, pp. 275-294.
- Bai, C. & Sarkis, J. 2014, 'Determining and Applying Sustainable Supplier Key Performance Indicators', *Supply Chain Management: An International Journal*, vol. 19, no. 3, pp. 275-291.
- Bilgeri, D., Wortmann, F. & Fleisch, E. 2017, 'How Digital Transformation Affects Large Manufacturing Companies' Organisation'.
- Bloom, N., Brynjolfsson, E., Foster, L., Jarmin, R.S., Patnaik, M., Saporta-Ersten, I. & Van Reenen, J. 2018, 'What Drives Differences in Management?', *National Bureau of Economic Research*, 25th April 2018 version.
- Bloom, N., and J. Van Reenen. 2007, "Measuring and Explaining Management Practices across Firms and Countries." *Quarterly Journal of Economics* 122: 1351–1408.

Bloom, N & Van Reenen, J 2010, 'Why do management practices differ across firms and countries?' *Journal of Economic Perspectives*, vol. 24, no. 1, pp. 203–224.

Derbyshire, J. 2014, 'The Impact of Ambidexterity on Enterprise Performance: Evidence from 15 Countries and 14 Sectors', *Technovation*, vol.34, no. 10, pp. 574-581.

Formentini, M. & Taticchi, P. 2016, 'Corporate Sustainability Approaches and Governance Mechanisms in Sustainable Supply Chain Management', *Journal of Cleaner Production*, vol. 112, pp. 1920-1933.

Gattorna, J. 2015, 'Dynamic Supply Chains: How to Design, Build and Manage People-Centric Value Networks', *FT Press*.

Green, R., Agarwal, R., Bajada, C., Brown, P. (2014) "Management Practices in Medium-Sized Enterprises: Insights from Benchmarking Australian Manufacturing firms", in the SEEANZ Research Book titled "Meeting the Globalisation Challenge: Smarter and innovative SMEs in a globally competitive environment" by Tilde Publications; Ed: Mazzarol, T., Clark,D., Foley, D. and McKeown,T.

Green, R., Agarwal, R., Van Reenen, J., Bloom, N., Mathews, J., Boedker, C., Sampson, D., Gollan, P., Toner, P., Tan, H., Randhawa, K., Brown, P. J., 2009, Management Matters in Australia – Just how productive are we?, Report for the Department of Innovation, Industry, Science and Research (DIISR) on manufacturing firms, Australia.

Hendrickson L, Bucifal S, Balaguer A and Hansell D (2015) The employment dynamics of Australian entrepreneurship, Office of the Chief Economist Research Paper, Department of Industry and Science, Canberra.

Junni, P., Sarala, R.M., Taras, V. & Tarba, S.Y. 2013, 'Organisational Ambidexterity and Performance: A Meta-Analysis', *The Academy of Management Perspectives*, vol. 27, no. 4, pp. 299-312.

Juran, J.M. 1993, 'Quality Planning and Analysis: From Product Development through Use'..

Kane, G.C., Palmer, D., Phillips, A.N. & Kiron, D. 2015a, 'Is your Business Ready for a Digital Future?', *MIT Sloan Management Review*, vol. 56, no. 4, pp. 37.

Kane, G.C., Palmer, D., Phillips, A.N., Kiron, D. & Buckley, N. 2015b, 'Strategy, Not Technology, Drives Digital Transformation', *MIT Sloan Management Review and Deloitte University Press*, vol. 14, pp. 1-25.

Mankins, M.C. & Steele, R. 2006, 'Stop Making Plans; Start Making Decisions', *Harvard Business Review*, vol. 84, no. 1, pp. 76.

Martin, A. 2005, 'DigEuLit-a European Framework for Digital Literacy: A Progress Report', *Journal of eLiteracy*, vol. 2, no. 2, pp. 130-136.

Mentzer, J.T., Derwitt, W., Keebler, J.S., Min, S., Nix, N.W., Smith, C.D. & Zacharia, Z.G. 2001, 'Defining Supply chain Management', *Journal of Business Logistics*, vol. 22, no 2, pp. 1-25.

O'Hea, K. 2011, 'Digital Capacity: How to Understand, Measure, Improve and Get Value From It', *IVI Executive Briefing Series*.

O'Reilly III, C.A. & Tushman, M.L. 2011, 'Lead and Disrupt: How to Solve the Innovator's Dilemma', *Stanford University Press*.

Rogers, A., OECD. 2000, 'Literacy in the Information Age Final Report of the International Adult Literacy Survey: Final Report of the International Adult Literacy Survey', *OECD Publishing*, vol. 46, no. 5, pp. 467-473.

OECD. 2011, *Sustainable Manufacturing Toolkit*, Industry Report, viewed 16 June 2018, <<http://www.oecd.org/innovation/green/toolkit/48704993.pdf> >

Orsato, R. 2009, 'Sustainability Strategies: When Does it Pay to be Green?', *Palgrave Macmillan*, pp. 3-22.

Orsato, R.J. 2006, 'Competitive Environmental Strategies: When Does it Pay to be Green?', *California Management Review*, vol. 48, no. 2, pp. 127-143.

Stacey, R. & Mowles, C. 2016, 'Strategic Management and Organisational Dynamics: The Challenge of Complexity to Ways of Thinking About Organisations', *Personal Education*..

Wade, M. 2015, 'Digital Business Transformation: A Conceptual Approach', *Transformation*..

Westerman, G., Calm  jane C., Bonnet, D., Ferraris, P. & McAfee, A. 2011, 'Digital Transformation: A Roadmap for Billion-Dollar Organisations', *MIT Center for Digital Business and Capgemini Consulting*, pp. 1-68.

Wolf, C. & Floyd, S.W. 2017, 'Strategic Planning Research: Toward a Theory-Driven Agenda', *Journal of Management*, vol. 43, no. 6, pp. 1754-1788.

Appendix A Methodological steps in developing management capability scores

To calculate a score for management capability, each identified question will have a weighting score for each of its respective response parts. The values for the scores for an individual response range from zero to one. The assigned weighting indicates the level of importance of that particular response relative to others within that same question, with importance being the indication of the extent and use of that particular practice in the organisation. The weightings for the responses within a particular question can be either incremental in scale (i.e. increasing level of importance) or equally weighted (i.e. responses have equal importance).

The distribution of weights across the response parts within a question will be dependent on the particular structure of the question in the MCM. The questionnaire has three types of structural questions that have been identified as either a 'Scaled', 'List', or 'List and Scaled'.

A.1 Scaled type

A scaled question contains responses that have an incremental scale of importance. Each response component will have an increasing weighting score assigned to them depending on the number of responses for that specific question, with the least important assigned a zero and the most important assigned a value of one. An example of scaled type question is given in Figure A.1.

Specifically, the questions that contain responses representing time periods have been grouped into similar time periods and have accordingly being assigned weightings by these groupings. For example, the time periods 'Annually' and 'Biannually' have been grouped together and have been assigned the same weighting score. For specific questions (for example, Q19 and Q20), all the time periods except for 'Ad hoc' have been grouped together, with 'Ad hoc' being weighted relatively lower.¹⁵ In some instances, a question contains the option 'Other' so that the respondent can specify in writing their own distinct response. An 'Other' response within a scaled question has been assigned a zero-weight score value for calculation purposes due to the low number of 'Other' responses and feasibility of interpreting each individual written response.

¹⁵ Robustness involved testing the different weighting options for the questions.

Figure A1: Example of scaled question type, MCM questionnaire, question 10

10 During the year ended 30 June 2016, how many Key Performance Indicators were monitored by this business?

Tick one box

(a) 1 or 2	<input type="checkbox"/>
(b) 3 to 5	<input type="checkbox"/>
(c) 6 to 9	<input type="checkbox"/>
(d) 10 or more	<input type="checkbox"/>
(e) Don't know	<input type="checkbox"/>
(f) No Key Performance Indicators monitored.....	<input type="checkbox"/> Go to Question 16

Source: ABS (2017) Management and Organisational Capabilities of Australian Business 2015-16, Cat. No 8172.0, Questionnaire sample

With some exceptions, scaled question types in the MCM require the respondent to select a single response. This single response will be the score for that respective question. In the instances where there is more than one response, the score given will equal the highest value response selected by the respondent. A summary of question types and assigned weightings for each management capabilities score can be found in Appendix C.

A.2 List type

A list type question contains responses that do not have an incremental scale of importance, but rather comprises a list of responses in which the respondent is able to select as many of the choices that apply (see Figure A.2). The weighting scores are equally distributed across the responses and are assigned a weight depending on the number of valid responses for that particular question. In some instances, a question may contain an 'Other' response. This response is considered valid for list type questions and is included for calculation purposes. The specific response 'None of the above' is assigned a weighting score of zero. The sum of the assigned weighting scores for a list type question will equal to one, and the more responses a respondent selects, the higher the score they receive.

Figure A2: Example of list question type, MCM questionnaire, question 11

11 What were the topics of focus for the Key Performance Indicators monitored by this business? Tick all that apply

(a) Financial measures (e.g. profit, sales, market share, return on investment)	<input type="checkbox"/>
(b) Operational measures (e.g. asset utilisation, on-time delivery)...	<input type="checkbox"/>
(c) Quality measures (e.g. customer satisfaction, defect rates)	<input type="checkbox"/>
(d) Innovation measures (e.g. new processes, new value added products)	<input type="checkbox"/>
(e) Human resource measures (e.g. job satisfaction, skills development)	<input type="checkbox"/>
(f) Environmental measures (e.g. recycling program, energy efficiency)	<input type="checkbox"/>
(g) Social measures (e.g. social license to operate, community engagement)	<input type="checkbox"/>
(h) Health and safety measures (e.g. hazard analysis)	<input type="checkbox"/>
(i) None of the above	<input type="checkbox"/>

Source: ABS (2017) Management and Organisational Capabilities of Australian Business 2015–16, Cat. No 8172.0, Questionnaire sample.

Questions 43, 46 and 49 in the MCM provide a list of responses that represent a number of different management practices (see Appendix C). As mentioned above, these particular questions will be split by their respective response options and each will be treated as an individual question for the purposes of score construction. Each of these individual questions representing an individual practice will have a score of 1 if the response is selected and 0 otherwise. For these specific questions, the response ‘None of the above’ is excluded from calculations.

A.3 List and scaled type

These questions comprise of a list of response parts, with each part having its own individual incremental scale. For example, question 20 from the MCM as shown in Figure A.3, contains four response parts, each having an incremental scale of time periods. List and scaled structure types treat each individual response as an individual question and will follow the assigning of weights and calculations as per scaled types.

Figure A3: Example of listed and scaled question type, MCM questionnaire, question 20

20 How frequently were each of the following activities influenced by data analysis at this business?

Note

- Examples of Demand forecasting include market research and expectation surveys.
- Examples of Supply chain management include management of logistics, distribution, sourcing, production processes, purchasing and supply.

Tick all that apply

	Not at all	Daily	Weekly	Monthly	Quarterly	Annually	Ad hoc
(a) Design of new goods or services	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(b) Demand forecasting	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(c) Supply chain management ...	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(d) Environmental management	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Source: ABS (2017) Management and Organisational Capabilities of Australian Business 2015–16, Cat. No 8172.0, Questionnaire sample.

A.4 Calculating individual management capability question scores

For each individual MC question, a question score from 0 to 1 will be calculated at the unit record level. The MC question score is calculated using the assigned weighting scores for that specific question.

For scaled type MC questions, the question score will equal the assigned weight for the single response indicated by the respondent. In the instances that allow multiple response parts to be selected for a scaled question, the MC question score will equal the highest weighting value response selected. For list type questions, the MC question score is calculated by taking the total sum of the weighted score values for each selected response part.

A.5 Treatment and invalid responses

Invalid responses for calculation purposes have been identified to be those responses that are either missing, missing due to survey sequencing or those responses that have incorrectly ticked more than one box.

Respondents that have an identified missing or missing due to sequencing response are assigned a score of 0 for that question. The only exception here is in the calculation of the Supply Chain Management Capability (SCMC) score. In this case, if the respondent has a missing response due to sequencing, (specifically for question 43), that individual unit record will be excluded from the calculation of a SCMC score.

Respondents that have incorrectly ticked more than one box is deemed an invalid response and will be excluded from the calculation of the specific MC score.

Appendix B Management capability scores, detailed information

Table B1: Average management capability scores by employment size among Australian firms, 2015–16

Number of employees	OMC		OMCv2		DMC		EMC		SCMC		SMC	
	N	mean	N	mean	N	mean	N	mean	N	mean	N	mean
All	7537	0.28	12536	0.26	12536	0.11	12536	0.13	7537	0.17	12536	0.39
0–4	2727	0.18	5393	0.17	5393	0.05	5393	0.06	2727	0.09	5393	0.26
5–19	1977	0.25	3204	0.25	3204	0.09	3204	0.10	1977	0.14	3204	0.38
20–99	851	0.32	1244	0.33	1244	0.15	1244	0.15	851	0.20	1244	0.48
100+	1982	0.41	2695	0.44	2695	0.22	2695	0.27	1982	0.29	2695	0.61

Notes: N denotes number of observations

Source: Australian Bureau of Statistics 2016, Management and Organisational Capabilities of Australian Business, 2015–16. Expanded Confidentialised Unit Record File (CURF), ABS DataLab. Results based on use of ABS Microdata. ABS (2018) Business Longitudinal Analysis Data Environment

Table B2: Average management capability scores by industry division in Australia, 2015–16

ANZSIC CODE	OMC		OMCv2		DMC		EMC		SCMC		SMC	
	N	mean	N	mean	N	mean	N	mean	N	mean	N	mean
All	7537	0.28	12536	0.26	12536	0.11	12536	0.13	7537	0.17	12536	0.39
Agriculture, Forestry and Fishing	346	0.22	567	0.20	567	0.05	567	0.12	346	0.12	567	0.29
Mining	298	0.31	467	0.30	467	0.09	467	0.23	298	0.18	467	0.41
Manufacturing	2059	0.27	3099	0.26	3099	0.09	3099	0.14	2059	0.19	3099	0.37
Electricity, Gas, Water and Waste Services	198	0.31	347	0.30	347	0.13	347	0.22	198	0.17	347	0.41
Construction	264	0.27	541	0.24	541	0.07	541	0.13	264	0.15	541	0.35
Wholesale Trade	584	0.28	772	0.28	772	0.11	772	0.12	584	0.21	772	0.42
Retail Trade	462	0.29	685	0.28	685	0.11	685	0.11	462	0.21	685	0.42
Accommodation and Food Services	232	0.32	430	0.32	430	0.12	430	0.16	232	0.19	430	0.47
Transport, Postal and Warehousing	503	0.27	818	0.26	818	0.10	818	0.13	503	0.16	818	0.38
Information Media and Telecommunications	351	0.25	626	0.24	626	0.14	626	0.07	351	0.13	626	0.37
Financial and Insurance Services	313	0.30	483	0.29	483	0.19	483	0.09	313	0.16	483	0.43
Rental, Hiring and Real Estate Services	89	0.29	190	0.26	190	0.13	190	0.10	89	0.17	190	0.38
Professional, Scientific and Technical Services	855	0.24	1654	0.23	1654	0.12	1654	0.08	855	0.12	1654	0.35
Administrative and Support Services	232	0.31	433	0.30	433	0.13	433	0.11	232	0.15	433	0.45
Health Care and Social Assistance	403	0.35	724	0.33	724	0.18	724	0.15	403	0.19	724	0.49
Arts and Recreation Services	7537	0.28	12536	0.26	12536	0.11	12536	0.13	7537	0.17	12536	0.39
Other Services	346	0.22	567	0.20	567	0.05	567	0.12	346	0.12	567	0.29

Notes: N denotes number of observations

Source: Australian Bureau of Statistics 2016, Management and Organisational Capabilities of Australian Business, 2015–16. Expanded Confidentialised Unit Record File (CURF), ABS DataLab. Findings based on use of ABS Microdata. ABS (2018) Business Longitudinal Analysis Data Environment

Table B3: Average management capability scores by firm age among Australian firms, 2015–16

Age of the firm	OMC		OMCv2		DMC		EMC		SCMC		SMC	
	N	mean	N	mean	N	mean	N	mean	N	mean	N	mean
All	7537	0.28	12536	0.26	12536	0.11	12536	0.13	7537	0.17	12536	0.39
0–4 years	916	0.23	1796	0.21	1796	0.08	1796	0.07	916	0.13	1796	0.33
4–9 years	1061	0.24	1918	0.23	1918	0.09	1918	0.09	1061	0.13	1918	0.35
More than 9 years	5524	0.29	8801	0.28	8801	0.12	8801	0.14	5524	0.18	8801	0.41

Notes: N denotes number of observations

Source: Australian Bureau of Statistics 2016, Management and Organisational Capabilities of Australian Business, 2015–16. Expanded Confidentialised Unit Record File (CURF), ABS DataLab. Findings based on use of ABS Microdata. ABS (2018) Business Longitudinal Analysis Data Environment

Table B4: Average management capability scores by foreign ownership status among Australian firms, 2015–16

Foreign ownership	OMC		OMCv2		DMC		EMC		SCMC		SMC	
	N	mean	N	mean	N	mean	N	mean	N	mean	N	mean
All firms	7537	0.28	12536	0.26	12536	0.11	12536	0.13	7537	0.17	12536	0.39
With foreign ownership	1192	0.38	1587	0.39	1587	0.18	1587	0.24	1192	0.28	1587	0.54
No foreign ownership	6288	0.26	10857	0.24	10857	0.10	10857	0.11	6288	0.15	10857	0.36

Notes: N denotes number of observations

Source: Australian Bureau of Statistics 2016, Management and Organisational Capabilities of Australian Business, 2015–16. Expanded Confidentialised Unit Record File (CURF), ABS DataLab. Findings based on use of ABS Microdata. ABS (2018) Business Longitudinal Analysis Data Environment

Table B5: Average management capability scores by innovation status among Australian firms, 2015–16

Foreign ownership	OMC		OMCv2		DMC		EMC		SCMC		SMC	
	N	mean	N	mean	N	mean	N	mean	N	mean	N	mean
All firms	7537	0.28	12536	0.26	12536	0.11	12536	0.13	7537	0.17	12536	0.39
Innovation-active firms	5440	0.31	7731	0.32	7731	0.15	7731	0.16	5440	0.20	7731	0.46
Non innovation active firms	2097	0.19	4805	0.17	4805	0.04	4805	0.07	2097	0.10	4805	0.26

Notes: N denotes number of observations

Source: Australian Bureau of Statistics 2016, Management and Organisational Capabilities of Australian Business, 2015–16. Expanded Confidentialised Unit Record File (CURF), ABS DataLab. Findings based on use of ABS Microdata. ABS (2018) Business Longitudinal Analysis Data Environment

Appendix C Summary question selection and weights

C.1 Strategic Management capability

Table C1: Strategic management capability

MCM Question Number	Structure Type	Question part	Description	Weight	Sub-Score topic	Question Score
10. During the year ended 30 June 2016, how many Key Performance Indicators were monitored by this business?	Scaled	a	1 or 2	1/4	Monitoring	0.334
		b	3 to 5	2/4		
		c	6 to 9	3/4		
		d	10 or more	1		
		e	Don't know	0		
		f	No Key Performance indicators monitored	0		
11. What were the topics of focus for the Key Performance Indicators monitored by this business?	List	a	Financial measures	1/8	Planning	0.284
		b	Operational measures	1/8		
		c	Quality measures	1/8		
		d	Innovation measures	1/8		
		e	Human resource measures	1/8		
		f	Environmental measures	1/8		
		g	Social measures	1/8		
		h	Health and safety measures	1/8		
		i	None of the above	0		
12. What best describes the period of time covered by Key Performance Indicators set by management at this business?	Scaled	a	Short-term (up to one year)	1/3	Planning	0.427
		b	Long-term (more than one year)	2/3		
		c	Combination of short-term and long-term	1		
		d	None of the above	0		

MCM Question Number	Structure Type	Question part	Description	Weight	Sub-Score topic	Question Score
13.1 How frequently were the Key Performance Indicators monitored by managers and non-managers of this business?	Scaled	a	Frequency KPIs monitored by non-managers – Annually	1/4	Execution	0.220
		b	Frequency KPIs monitored by non-managers - Biannually	1/4		
		c	Frequency KPIs monitored by non-managers - Quarterly	2/4		
		d	Frequency KPIs monitored by non-managers - Monthly	2/4		
		e	Frequency KPIs monitored by non-managers - Weekly	3/4		
		f	Frequency KPIs monitored by non-managers - Daily	1		
		g	Frequency KPIs monitored by non-managers - Hourly or more frequently	1		
		h	Frequency KPIs monitored by non-managers - Other review period(s)	0		
		i	Frequency KPIs monitored by non-managers - Never	0		
13.2 How frequently were the Key Performance Indicators monitored by managers and non-managers of this business?	Scaled	a	Frequency KPIs monitored by managers - Annually	1/4	Execution	0.350
		b	Frequency KPIs monitored by managers - Biannually	1/4		
		c	Frequency KPIs monitored by managers - Quarterly	1/2		
		d	Frequency KPIs monitored by managers - Monthly	1/2		
		e	Frequency KPIs monitored by managers - Weekly	3/4		
		f	Frequency KPIs monitored by managers - Daily	1		

MCM Question Number	Structure Type	Question part	Description	Weight	Sub-Score topic	Question Score
		g	Frequency KPIs monitored by managers - Hourly or more frequently	1		
		h	Frequency KPIs monitored by managers - Other review period(s)	0		
		i	Frequency KPIs monitored by managers - Never	0		
14.1 What were the performance bonuses of managers and non-managers based on?	List	a	No performance bonus system - Non-managers	0	Monitoring	0.076
		b	Own performance based on KPIs -Non-managers	1/4		
		c	Team performance based on KPIs-Non-managers	1/4		
		d	Business performance based on KPIs-Non-managers	1/4		
		e	Other-Non-managers	1/4		
14.2 What were the performance bonuses of managers and non-managers based on?	List	a	No performance bonus system - Managers	0	Monitoring	0.115
		b	Own performance based on KPIs - Managers	1/4		
		c	Team performance based on KPIs - Managers	1/4		
		d	Business performance based on KPIs - Managers	1/4		
		e	Other - Managers	1/4		
15.1 What percentage of non-managers and managers at this business received performance bonuses?	Scaled	a	No performance bonus paid	0	Execution	0.825
		b	1-33% (up to one third)	1/4		
		c	34-66% (up to two thirds)	1/2		
		d	67-99% (more than two thirds to almost all)	3/4		
		e	100% (all)	1		

MCM Question Number	Structure Type	Question part	Description	Weight	Sub-Score topic	Question Score
15.2 What percentage of non-managers and managers at this business received performance bonuses?	Scaled	a	No performance bonus paid	0	Execution	0.770
		b	1-33% (up to one third)	1/4		
		c	34-66% (up to two thirds)	1/2		
		d	67-99% (more than two thirds to almost all)	3/4		
		e	100% (all)	1		
16.1 What were the primary ways managers and non-managers were promoted at this business?	Scaled	a	Promotions were based solely on performance and ability	1	Execution	0.335
	Scaled	b	Promotions were based partly on performance and ability and other factors	2/3		
	Scaled	c	Promotions were based mainly on factors other than performance and ability	1/3		
	Scaled	d	Staff were not promoted	0		
16.2 What were the primary ways managers and non-managers were promoted at this business?	Scaled	a	Promotions were based solely on performance and ability	1	Execution	0.321
		b	Promotions were based partly on performance and ability and other factors	2/3		
		c	Promotions were based mainly on factors other than performance and ability	1/3		
		d	Staff were not promoted	0		
17.1 When under-performance was identified, were managers or non-managers demoted or dismissed?	Scaled	a	Yes within 6 months	1	Execution	0.192
		b	Yes after 6 months	1/2		
		c	No, not demoted or dismissed	0		
		d	No under-performance identified	0		
	Scaled	a	Yes within 6 months	1	Execution	0.133

MCM Question Number	Structure Type	Question part	Description	Weight	Sub-Score topic	Question Score
17.2 When under-performance was identified, were managers or non-managers demoted or dismissed?		b	Yes after 6 months	1/2		
		c	No, not demoted or dismissed	0		
		d	No under-performance identified	0		
18. During the year ended 30 June 2016, who or what determined the type of data to collect in decision making at this business?	List	a	Managers at this business	1/6	Execution	0.227
		b	Managers at another business/entity owned by the same company	1/6		
		c	Employees/non-managers	1/6		
		d	Customers	1/6		
		e	Government regulation	1/6		
		f	Other (please specify)	1/6		
		g	None of the above	0		
19.1 How frequently were each of the following sources of data used in decision making at this business?	List scaled	a	Performance data - Not at all	0	Execution	0.510
		a	Performance data - Daily	1		
		a	Performance data - Weekly	1		
		a	Performance data - Monthly	1		
		a	Performance data - Quarterly	1		
		a	Performance data - Annually	1		
		a	Performance data - Ad hoc	1/2		
19.2 How frequently were each of the following sources of data used in decision making at this business?	List scaled	b	Feedback from managers - Not at all	0	Execution	0.651
		b	Feedback from managers - Daily	1		
		b	Feedback from managers - Weekly	1		

MCM Question Number	Structure Type	Question part	Description	Weight	Sub-Score topic	Question Score
		b	Feedback from managers - Monthly	1		
		b	Feedback from managers - Quarterly	1		
		b	Feedback from managers - Annually	1		
		b	Feedback from managers - Ad hoc	1/2		
19.3 How frequently were each of the following sources of data used in decision making at this business?	List scaled	c	Feedback from employees/non-managers - Not at all	0	Execution	0.636
		c	Feedback from employees/non-managers - Daily	1		
		c	Feedback from employees/non-managers - Weekly	1		
		c	Feedback from employees/non-managers - Monthly	1		
		c	Feedback from employees/non-managers - Quarterly	1		
		c	Feedback from employees/non-managers - Annually	1		
		c	Feedback from employees/non-managers - Ad hoc	1/2		
19.4 How frequently were each of the following sources of data used in decision making at this business?	List scaled	d	Information from external sources - Not at all	0	Execution	0.628
		d	Information from external sources - Daily	1		
		d	Information from external sources - Weekly	1		
		d	Information from external sources - Monthly	1		

MCM Question Number	Structure Type	Question part	Description	Weight	Sub-Score topic	Question Score
		d	Information from external sources - Quarterly	1		
		d	Information from external sources - Annually	1		
		d	Information from external sources - Ad hoc	1/2		
20.1 How frequently were each of the following activities influenced by data analysis at this business?	List scaled	a	Design of new goods or services - Not at all	0	Monitoring	0.513
		a	Design of new goods or services - Daily	1		
		a	Design of new goods or services - Weekly	1		
		a	Design of new goods or services - Monthly	1		
		a	Design of new goods or services - Quarterly	1		
		a	Design of new goods or services - Annually	1		
		a	Design of new goods or services - Ad hoc	1/2		
20.2 How frequently were each of the following activities influenced by data analysis at this business?	List scaled	b	Demand forecasting - Not at all	0	Monitoring	0.546
		b	Demand forecasting - Daily	1		
		b	Demand forecasting - Weekly	1		
		b	Demand forecasting - Monthly	1		
		b	Demand forecasting - Quarterly	1		
		b	Demand forecasting - Annually	1		
		b	Demand forecasting - Ad hoc	1/2		

MCM Question Number	Structure Type	Question part	Description	Weight	Sub-Score topic	Question Score
20.3 How frequently were each of the following activities influenced by data analysis at this business?	List scaled	c	Supply chain management - Not at all	0	Monitoring	0.457
		c	Supply chain management - Daily	1		
		c	Supply chain management - Weekly	1		
		c	Supply chain management - Monthly	1		
		c	Supply chain management - Quarterly	1		
		c	Supply chain management - Annually	1		
		c	Supply chain management - Ad hoc	1/2		
20.4 How frequently were each of the following activities influenced by data analysis at this business?	List scaled	d	Environmental management - Not at all	0	Monitoring	0.422
		d	Environmental management - Daily	1		
		d	Environmental management - Weekly	1		
		d	Environmental management - Monthly	1		
		d	Environmental management - Quarterly	1		
		d	Environmental management - Annually	1		
		d	Environmental management - Ad hoc	1/2		
21. How frequently does this business rely on predictive analysis?	Scaled	a	Daily	1	Execution	0.364
		b	Weekly	3/4		
		c	Monthly	3/4		
		d	Quarterly	3/4		

MCM Question Number	Structure Type	Question part	Description	Weight	Sub-Score topic	Question Score
		e	Annually	2/4		
		f	Ad hoc	1/4		
		g	Never	0		
29. During the year ended 30 June 2016, did this business have a strategic plan or policy?	Scaled	a	No	0	Planning	0.428
		b	Yes, and described in a written document	1		
		c	Yes, but not a written plan or policy	1/2		
30. Who contributed to developing the content in this business's strategic plan or policy?	List	a	Principal manager	1/9	Planning	0.194
		b	Commercial manager	1/9		
		c	Chief financial officer	1/9		
		d	Production/operations manager	1/9		
		e	Research and development manager	1/9		
		f	Sales/marketing manager	1/9		
		g	Committee, team or board of directors	1/9		
		h	Other person(s) within the business	1/9		
		i	External consultant	1/9		
31. What areas were covered in this business's strategic plan or policy?	List	a	Revenue	1/13	Planning	0.267
		b	KPIs	1/13		
		c	Marketing, advertising and promotion	1/13		
		d	Business continuity/contingency	1/13		
		e	Supply chain	1/13		

MCM Question Number	Structure Type	Question part	Description	Weight	Sub-Score topic	Question Score
		f	Innovation	1/13		
		g	Information and communication technology	1/13		
		h	Environmental	1/13		
		i	Workforce	1/13		
		j	Customer relations	1/13		
		k	Social	1/13		
		l	Health and safety	1/13		
		m	Government regulation and compliance	1/13		
		n	None of the above	0		
32. Who was responsible for managing the areas outlined in this business's strategic plan or policy?	List	a	Principal manager	1/8	Planning	0.181
		b	Commercial manager	1/8		
		c	Chief financial officer	1/8		
		d	Production/operations manager	1/8		
		e	Research and development manager	1/8		
		f	Sales/marketing manager	1/8		
		g	Committee, team or board of directors	1/8		
		h	Other person within the business	1/8		
36. To what extent do you agree or disagree with the following statements about entrepreneurial orientation and culture within this business?	List scaled	a	This business takes a proactive approach to market competition	0 (Strongly disagree) / 0.25 (Disagree) / 0.5 (Neither)	Innovation	0.602
		b	This business normally initiates changes upon which its competitors react			0.470

MCM Question Number	Structure Type	Question part	Description	Weight	Sub-Score topic	Question Score
		c	This business often gets involved in high risk/high reward projects	/ 0.75 (Agree) / 1 (Strongly agree)		0.325
		d	This business continually seeks out new partners to collaborate with			0.422
		g	This business constantly reviews its business model			0.529
		h	This business has a high capacity to acquire and exploit knowledge external to the business			0.047
Total Average Strategic Management Capability (SMC) Score						0.386*

Notes: * Average score based on use of ABS Microdata

Source: Australian Bureau of Statistics 2016, *Management and Organisational Capabilities of Australian Business, 2015-16*.
Expanded Confidentialised Unit Record File (CURF), ABS DataLab

C.2 Supply chain management capability

Table C2: Supply chain management capability

Question in MCM	Structure Type	Question Part	Responses	Weight	Question Score
20. How frequently were each of the following activities influenced by data analysis at this business?	Scaled	c	Supply chain management - Not at all	0	0.457
			Supply chain management - Daily	1	
			Supply chain management - Weekly	3/4	
			Supply chain management - Monthly	3/4	
			Supply chain management - Quarterly	3/4	
			Supply chain management - Annually	2/4	
			Supply chain management - Ad hoc	1/4	
31. What areas were covered in this business's strategic plan or policy?	List	e	Supply Chain	1 (Yes)	0.202
				0 (No)	
43. What were the management actions undertaken by the business to respond to the factors affecting the supply chain?	List	a	Assessed and recorded changes associated with the supply chain	1	0.281
		b	Implemented a contingency plan to address risks to the supply chain	1	0.288
		c	Carried out quality assurance testing of supplier's products	1	0.145
		d	Carried out an environmental assessment or accreditation	1	0.065
		e	Carried out quality assurance testing of this business's products	1	0.131
		f	Introduced a tender process to review suppliers	1	0.084
		g	Increased/decreased inventories/stock	1	0.270
		h	Trained suppliers in the business's supply chain products	1	0.047
		i	Trained staff in the business's supply chain practices	1	0.148
		j	Introduced a new market testing process to seek customer/buyer feedback	1	0.070
		k	Introduced new training for staff in customer engagement/assurance	1	0.111
		l	Introduced new KPIs on supply chain performance	1	0.091
		m	Other	1	0.034
		n	None of the above	Exclude	

Total Average Supply Chain Management Capability (SCMC) Score	0.169*
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Notes: * Average score based on use of ABS Microdata

Source: Australian Bureau of Statistics 2016, Management and Organisational Capabilities of Australian Business, 2015–16. Expanded Confidentialised Unit Record File (CURF), ABS DataLab.

C.3 Digital management capability

Table C3: Digital management capability

Question in MCM	Structure Type	Question Part	Responses	Weight	Question Score
31. What areas were covered in this business's strategic plan or policy?	List	g	Information and communication technology (e.g. digital capability)	1 (Yes)	0.232
				0 (No)	
49. Were any of the following management practices for the use of information and communication technologies and/or the internet implemented?	List	a	Introduced or changed a digital business strategy	1	0.135
		b	Approved the investment in new digital technologies or infrastructure for this business	1	0.202
		c	Introduced new training programs to upskill staff	1	0.154
		d	Reviewed staff performance against digital skills targets	1	0.044
		e	Rewarded individuals or teams involved in the successful introduction of digital technologies or processes	1	0.034
		g	Measured the contribution of digital activities to overall business performance	1	0.054
		h	Joint buying of digital technology or services	1	0.032
		i	Upgraded cybersecurity software, standards or protocols	1	0.195
		j	Other (please specify)	1	0.001
		k	None of the above	Exclude	
Total Average Digital Management Capability (DMC) Score					0.108*

Notes: * Average score based on use of ABS Microdata

Source: Australian Bureau of Statistics 2016, Management and Organisational Capabilities of Australian Business, 2015–16. Expanded Confidentialised Unit Record File (CURF), ABS DataLab.

C.4 Environmental management capability

Table C4: Environmental management capability score

Question in MCM	Structure Type	Question Part	Description	Weight	Question Score
11. What were the topics of focus for the Key Performance Indicators monitored by this business?	List	f	Environmental measures	1 (Yes)	0.135
				0 (No)	
20. How frequently were each of the following activities influenced by data analysis at this business?	Scaled	d	Environmental management - Not at all	0	0.422
			Environmental management - Daily	1	
			Environmental management - Weekly	3/4	
			Environmental management - Monthly	3/4	
			Environmental management - Quarterly	3/4	
			Environmental management - Annually	2/4	
			Environmental management - Ad hoc	1/4	
31. What areas were covered in this business's strategic plan or policy?	List	h	Environmental	1 (Yes)	0.126
				0 (No)	
46. Did this business undertake any of the following environmental management activities?	List	a	Measures to reduce material resource inputs and/or improve material resource efficiency	1	0.159
		b	Measures to reduce energy consumption and/or improve energy efficiency	1	0.284
		c	Measures to reduce water consumption and/or improve water efficiency	1	0.146
		d.1	Reduced environmental footprint through: research and development	1	0.049

Question in MCM	Structure Type	Question Part	Description	Weight	Question Score
		d.2	Reduced environmental footprint through: any new or improved good, service, operational process or management practice	1	0.088
		e	Measures to encourage environmental sustainability in customers and/or consumers	1	0.083
		f	Recycling or reuse of materials	1	0.361
		g	Environmental or green purchasing activities	1	0.097
		h	Environmental education and training of staff	1	0.111
		i	Environmental impact assessment/risk assessment	1	0.094
		j	Waste audit	1	0.083
		k	Measures to reduce pollution of soil, water and waterways	1	0.088
		l	Life cycle assessment, management or product stewardship	1	0.032
		m	Product design or reformulation to reduce environmental impacts	1	0.043
		n	Implemented or improved an environmental policy, plan or system	1	0.066
		o	Employment of staff with explicit responsibility for environmental management	1	0.052
		p	Measures to reduce air pollution including greenhouse gas emissions	1	0.048
		q	None of the above	Exclude	
Total Average Environmental Management Capability (EMC) Score					0.125

Notes: * Average score based on use of ABS Microdata

Source: Australian Bureau of Statistics 2016, Management and Organisational Capabilities of Australian Business, 2015–16. Expanded Confidentialised Unit Record File (CURF), ABS DataLab

Appendix D Methodology for developing comparative scores of structured management practices for Australian and US firms

Table D1: US MOPS and MCM comparison survey results

MCM Question Number	Response	Weight	AU per cent of respondents (%)	US per cent of respondents (%)
10	1 or 2	0.33	15.90	7.95
	3 to 9	0.67	24.30	47.97
	10 or more	1.00	10.70	34.65
	No Key Performance Indicators monitored	0.00	49.20	9.43
	Don't know	0.00	-	-
13 - Non-managers*	Annually / Biannually	0.17	4.49	14.31
	Quarterly	0.33	3.58	18.97
	Monthly	0.50	8.79	27.74
	Weekly	0.67	5.62	17.27
	Daily	0.83	7.24	17.74
	Hourly or more frequently	1.00	1.13	4.08
	Never	0.00	69.20	26.51
	Other review period(s)	0.00	-	-
13 - Managers*	Annually / Biannually	0.17	6.41	18.74
	Quarterly	0.33	7.09	22.19
	Monthly	0.50	20.80	39.97
	Weekly	0.67	9.99	27.99
	Daily	0.83	8.33	25.65
	Hourly or more frequently	1.00	0.87	3.51

MCM Question Number	Response	Weight	AU per cent of respondents (%)	US per cent of respondents (%)
	Never	0.00	46.50	9.64
	Other review period(s)	0.00	-	-
12	Short-term (up to one year) Key Performance Indicators	0.33	35.20	34.29
	Long-term (more than one year) Key Performance Indicators	0.67	8.89	2.92
	Combination of short-term and long-term Key Performance Indicators	1.00	46.40	50.85
	None of the above	0.00	9.52	11.94
	No response	0.00		
14 - Non-managers*	Based on their own performance as measured by KPIs	1.00	8.18	13.16
	Based on their team or shift performance as measured by the KPIs	0.67	1.77	6.84
	Based on the business's performance as measured by KPIs	0.33	5.32	38.99
	No performance bonus system	0.00	84.70	54.40
	Other	0.00	-	-
15- Non-managers	No performance bonus paid	0.00	86.20	58.02
	1-33% (up to one third)	0.25	5.84	8.23
	34-66% (up to two thirds)	0.50	1.58	2.52
	67-99% (more than two thirds to almost all)	0.75	2.30	7.87
	100% (all)	1.00	4.07	23.36
	No response	0.00	-	-

MCM Question Number	Response	Weight	AU per cent of respondents (%)	US per cent of respondents (%)
14-Managers*	Based on their own performance as measured by KPIs	1.00	9.84	17.64
	Based on their team or shift performance as measured by the KPIs	0.67	1.28	8.48
	Based on the business's performance as measured by KPIs	0.33	9.05	59.64
	No performance bonus system	0.00	79.80	41.06
	Other	0.00		
15 - Managers	No performance bonus paid	0.00	83.40	44.27
	1-33% (up to one third)	0.25	6.22	10.75
	34-66% (up to two thirds)	0.50	1.58	3.12
	67-99% (more than two thirds to almost all)	0.75	3.39	9.03
	100% (all)	1.00	5.43	32.84
	No response	0.00	-	-
16 - Non-managers	Promotions were based solely on performance and ability	1.00	23.90	68.33
	Promotions were based partly on performance and ability and partly on other factors (e.g. tenure/time-in-business)	0.67	11.50	13.50
	Promotions were based mainly on factors other than performance	0.33	1.51	1.86
	Staff were not promoted	0.00	63.20	16.31
	No response	0.00		

MCM Question Number	Response	Weight	AU per cent of respondents (%)	US per cent of respondents (%)
16 - Managers	Promotions were based solely on performance and ability	1.00	22.30	65.64
	Promotions were based partly on performance and ability and partly on other factors (e.g. tenure/time-in-business)	0.67	10.20	10.66
	Promotions were based mainly on factors other than performance	0.33	1.34	1.44
	Staff were not promoted	0.00	1.34	1.44
	No response	0.00	-	-
17 - Non-managers	Yes, demoted or dismissed within 6 months of identifying under-performance	1.00	13.00	46.62
	Yes, demoted or dismissed after 6 months of identifying under-performance	0.50	8.08	20.15
	No, not demoted or dismissed / No under-performance identified	0	79.00	33.23
17 - Managers	Yes, demoted or dismissed within 6 months of identifying under-performance	1.00	6.65	33.01
	Yes, demoted or dismissed after 6 months of identifying under-performance	0.50	6.47	24.19
	No, not demoted or dismissed / No under-performance identified	0	86.90	42.80

Notes: * Respondents instructed to "Select all that apply", response sum to greater than 100 per cent

Source: Australian Bureau of Statistics 2016, Management and Organisational Capabilities of Australian Business, 2015–16. Expanded Confidentialised Unit Record File (CURF), ABS DataLab.

U.S. Census Bureau, Massachusetts Institute of Technology, National Bureau of Economic Research, and Stanford University; 2015 Management and Organizational Practices Survey