Developing competencies of supply chain professionals in Australia: collaboration between businesses, universities and industry associations

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Abstract

Purpose – The purpose of this paper is to describe collaboration between businesses, universities and industry associations in Australia with the aim of developing an appropriate set of competencies for supply chain professionals.

Design/methodology/approach – Three related initiatives are described involving questionnaire surveys (Initiatives 1 and 3) and a series of meetings involving representatives from businesses, universities and industry associations (Initiative 2).

Findings – Initiative 1 identifies that although supply chain professionals in Australia are highly educated, they had limited training in relation to supply chain management. Initiative 2 developed a set of 20 competencies for supply chain professionals and their importance was then assessed in Initiative 3. Generally, high importance is highlighted for the set of competencies. Maintaining momentum of the collaboration is identified as a challenge.

Research limitations/implications – One specific limitation is the somewhat low response rates achieved for the two questionnaire surveys conducted: 15 per cent and 16 per cent, respectively. Australia is unique in many respects; hence generalisation of the findings is limited.

Practical implications – The paper identifies Australian industry needs reflected in the set of competencies developed. The paper highlights the value of collaboration between business, universities/colleges and industry associations.

Originality/value – This paper identifies a set of supply chain competencies considered highly important by supply chain professionals in Australia. These can be used by academic institutions in developing future programs, by businesses for assessing performance of supply chain professionals that they employ and by industry associations in developing appropriate services for their members.

Keywords Supply chain management, Competencies, Education, Australia, Economic cooperation, Universities, Business environment

Paper type Research paper

Introduction

With increasing supply chain activity across Australia's major cities located hundreds of kilometres from each other, many Australian businesses have been experiencing difficulties finding staff locally to fill the positions being created. This is especially the case for Australia's largest retailers that have been hiring middle and senior level supply chain professionals from overseas. Although the lack of appropriately qualified supply chain professionals in Australia has been recognised for many years, it is only over the past decade that collaboration between businesses, universities and industry associations have taken place to tackle the issues.

This paper presents details of a significant collaboration aimed at developing Australian supply chain professionals with the right set of competencies being able to tackle challenges of the future. Australian businesses are not immune to the global challenges being faced by their counterparts in other countries and hence Australian managers must have the necessary competencies and skills to deal with these in an effective manner.

In developing competent supply chain professionals for the future, three related initiatives have been undertaken in Australia – supported by businesses, universities and industry associations. These are:

1. A study of supply chain professionals focusing on their current education/training, areas of responsibility and future education/training needs. This study was commissioned by a leading, not-for-profit industry association.
2. The formation of the Supply Chain Management Futures Forum consisting of representatives from businesses,

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The author is grateful to a number of individuals who provided support in conducting the three initiatives reported in this paper, especially Steven Pereira (CIO at GS1 Australia) and senior officers from the Supply Chain and Logistics Association of Australia (SCLAA) and the Australian Food and Grocery Council (AFGC). Special thanks to the many executives who took part in the forum meetings and to Christine Alemao, Vikram Bhakoo, Daniel Prajogo and Marcia Perry for providing research support.

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universities and industry associations that met a number of times over a period of two years to discuss and agree on the set of competencies necessary for Australian supply chain professionals.

3 A second study to assess the importance of the set of competencies by the supply chain professionals themselves.

Collectively, these three initiatives have provided businesses, universities and industry associations with considerable insights relating to the development of future supply chain professionals. Initiative 1 was implemented in order to determine the current status of supply chain managers in Australia with respect to their areas of responsibility, their existing level of education and training and their future education and training needs. No previous study of this kind had previously been conducted in Australia and the not-for-profit industry association (GS1 Australia) supporting this study considered this to be an important step in the development of future supply chain professionals. Based on the results of the first initiative, Initiative 2 was implemented where five leading businesses, three industry associations and academics representing eleven institutions worked together to develop the set of competencies necessary for supply chain professionals – referred to as the "Supply Chain Management Graduate Knowledge Requirements Matrix". Finally, Initiative 3 was implemented to gauge the importance placed on the set of competencies by the professionals themselves.

A number of important lessons have been learnt with respect to collaboration between businesses, universities and industry associations. The key findings relating to the three initiatives mentioned above are presented in this paper as well as the key factors that facilitated collaboration.

The detailed findings from the two questionnaire surveys conducted (Initiative 1 and 2) are not presented in this paper as the main purpose here is to discuss how each of the three initiatives were developed and implemented and the outcomes leading to the changes adopted by businesses, universities and industry associations. The set of competencies developed has provided useful guidance to academic institutions in their design of relevant teaching programs. Students themselves are better informed in terms of the competencies that they need to possess as they complete their educational program so that they become more relevant to industry. Finally, senior managers are able to use the set of competencies to assess both new graduates and existing employees and to design appropriate in-house training programs. This paper provides valuable experiences to draw upon for managers, academics and officers of industry associations in other countries as they begin their journey towards the development of highly competent supply chain professionals for the future.

The remainder of this paper is structured as follows. The next section presents a brief review of related literature. This is then followed by a brief discussion of the findings from the three initiatives undertaken, as mentioned above, including aspects of the research methodology adopted. The final sections of the paper present the discussion and conclusions, including some recommendations for future.

Background

Cooper *et al.* (1997) have argued that the term supply chain differs from logistics along the dimensions of scope, inter-organisational integration and key objectives. Their conceptual model suggests that supply chains are much broader in scope than logistics as the business processes included in a supply chain range from customer relationship management to procurement and new product development. This means that the relationships between the supply chain entities becomes more crucial in a supply chain manager's role (van Hoek *et al.*, 2002; Maku *et al.*, 2005). For this reason, the focus of this paper, including the literature presented below and the findings from the three initiatives discussed in subsequent sections, is on supply chain management (SCM) and supply chain professionals.

Over the past two decades, there has been considerable effort by researchers addressing a variety of issues relating to supply chain management, including issues relating to people. Tracey and Smith-Doerflein (2001) have argued that there is a strong human dimension in SCM that needs to be taken into account. Some of the key articles relating to the development of supply chain professionals are presented in Table I. Mangan and Christopher's (2005) study identifies the need for further training of supply chain professionals in areas like finance, IT, management and Operations/SCM and they identify competencies such as analytical, interpersonal, leadership, change management and project management. Around the same time, on the other side of the Atlantic Ocean, McCarter *et al.* (2005) in the USA identify problem solving, teamwork, decision-making, written and oral communication and negotiation as important skills for supply chain professionals. Gowen and Tallon (2003), also in the USA, assessed the extent to which SCM success can be improved by human resource management factors and found that there is a high co-relation between SCM success and level of training.

Harland (1996) and Lamming *et al.* (2000) have examined the skills that supply chain managers require to function effectively in a supply network while Knight *et al.* (2005) have explored team building capabilities for individuals in a supply management role and operating within inter-organisational networks. These authors develop a list of skills required in areas like strategic supply management, network understanding, relationship management, strategy formulation and implementation and finally learning and knowledge management in a team environment. No previous studies of this nature have been conducted in Australia where lack of appropriately qualified supply chain professionals has been a major concern. The remainder of this paper presents the findings from the three initiatives undertaken in Australia to address this issue.

Initiative 1 – first survey of supply chain professionals

Study purpose and approach

The purpose of this initiative was to identify the status of supply chain professionals with respect to their current education/training, areas of responsibility and future education/training needs. This study was commissioned by GS1 Australia, a leading not-for-profit industry association and undertaken by one of the universities located in

Table I Studies relevant to developing supply chain professionals

Article	Summary
Bowersox *et al.* (2000)	In this paper the authors address the question: "How should a firm and its supportive supply chain be structured to create end-customer value as it moves into the 21st century?" They discuss the transformations associated with ten mega trends and how these should enhance supply chain performance over the next decade
Cooper *et al.* (1997)	The authors present a new conceptual framework of Supply Chain Management. Its three elements namely business processes, management components and structure of the supply chain are discussed in detail
Gowen *et al.* (2003)	Using survey data, the authors test the relationship between selected HRM factors and SCM practice success. Employee training and managerial/employee support are identified as key to enhancing SCM practice success
Lamming *et al.* (2005)	The authors develop a revised classification of supply networks using the type of product as a differentiator
Knight *et al.* (2005)	In this paper the authors developed a framework built on the competence requirements of teams engaged in strategic supply management
Maku *et al.* (2005)	The authors address the question: "What is the impact of human interaction on supply chain performance?" Based on their research, the authors develop a human interaction map
Mangan and Christopher (2005)	The authors identify key knowledge areas and competencies/skills required by logistics and supply chain managers as well as the preferred teaching and the optimum career development approaches
McCarter *et al.* (2005)	Using data collected from 51 in-depth case studies, the authors examine the role of an organization's culture and the education and training of employees on facilitating or hindering supply chain collaboration
van Hoek *et al.* (2002)	The authors discuss aspects of developing emotional capability and technical capability in supply chain managers. The changes necessary for supply chain professionals are presented

Melbourne. GS1 Australia is part of GS1 Global that supports companies in areas such as supply chain efficiency, traceability, inventory management, point of sale and collaborative planning.

The collaboration started with face-to-face discussion between academics involved in conducting this study and officers from the GS1 Australia. The specific objectives of this study and how the results were to be used and disseminated were agreed upon. A postal questionnaire was developed, tested and mailed to a random sample of 750 organisations in May 2005 that were randomly selected from the membership database of GS1 Australia made up of over 16,000 businesses. The survey questionnaire was divided into a number of sections that examined respondent's educational qualifications, areas of decision-making and responsibility and the knowledge they required from their trading partners. A copy of the questionnaire is available from the author on request. The survey resulted in 109 completed questionaries returned, with 27 questionnaires returned undelivered (a net response rate of 15 per cent). The data was entered into a Microsoft Access database and subsequently exported to a statistical analysis package for analysis. The results from this study have not previously been published.

A diverse range of manufacturing and services sectors were represented in the sample with Food and Beverage sector being the largest (38 per cent of the sample). In terms of size, the respondents represented micro businesses having less than five employees (15 per cent), small businesses having between 5 and 20 employees (25 per cent), medium businesses having between 20 and 200 employees (32 per cent) and large businesses having more than 200 employees (28 per cent). Almost two-thirds of the respondents had suppliers located overseas, while one-half of the respondents had customers located overseas. Almost 20 per cent of the respondents said that they had operations located overseas.

Previous employment

Figure 1 shows the functional areas in which respondents had previously worked in. Over one-half of the respondents (55 per cent) indicated that they had general management experience which means that these individuals would have gained valuable experience in dealing with more strategic issues in their organisation. Almost one-half (47 per cent) of the respondents had worked in purchasing and warehousing roles, while 41 per cent had prior experience in sales. However, respondents had least experience in areas such as design (15 per cent) and R&D (19 per cent).

Formal university education

The results show that Australian supply chain managers are fairly well educated. This is supported by the fact that overall 86 per cent of the respondents had a university education, obtaining a Bachelor's degree or equivalent (e.g. a Diploma). Drilling down further reveals that 19 per cent of the respondents had a Diploma, 41 per cent had a Bachelor's degree and around one-quarter (26 per cent) held a post-graduate qualification (e.g. a Master's degree). Respondents indicated that their formal university education was useful for their current jobs. Almost one-half found the education to be very useful or extremely useful to their job while close to one-third found it somewhat useful. This means that a majority of the supply chain managers were able to apply the formal university education they received in their current role.

Decision-making responsibility

Respondents were asked to indicate if they had "total" responsibility (i.e. they had sole responsibility) or "partial" responsibility (i.e. they shared responsibility with another manager/executive) for a number of functions/activities in their organisation. The results are presented in Figure 2 which shows that an overwhelming 86 per cent of the respondents

Figure 1 Previous areas of employment

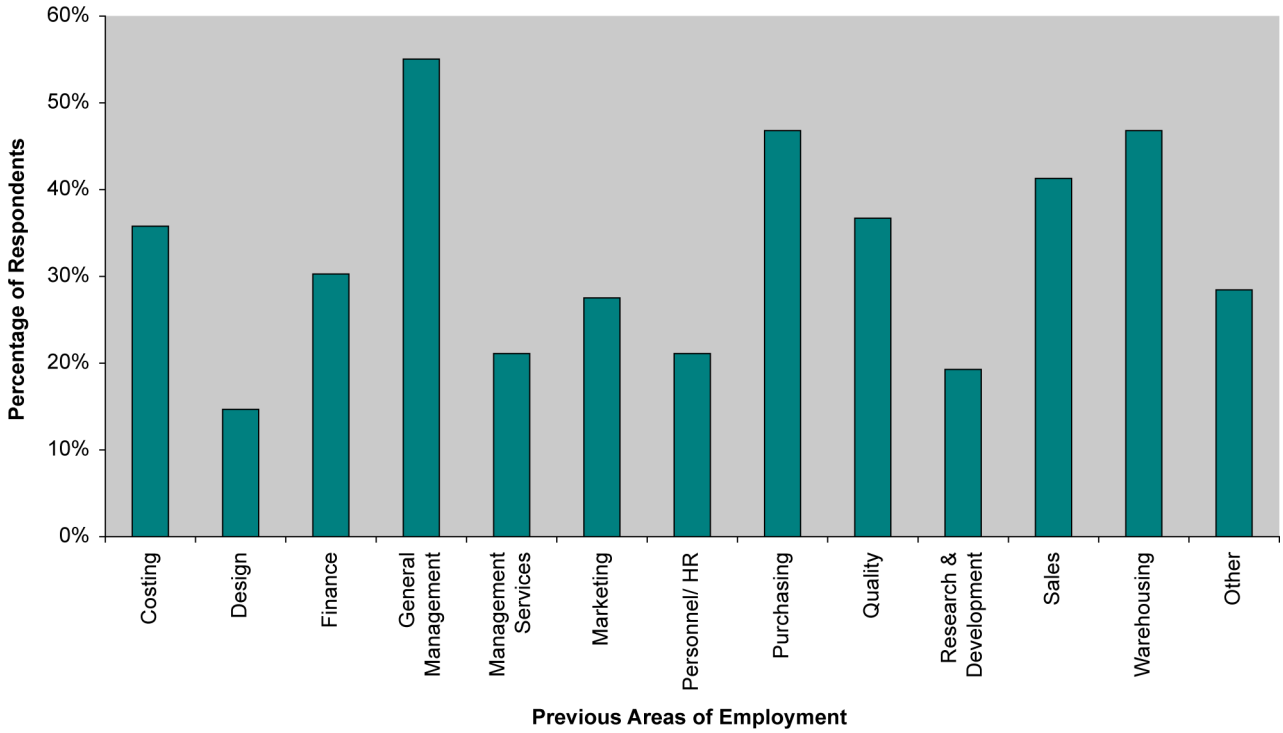
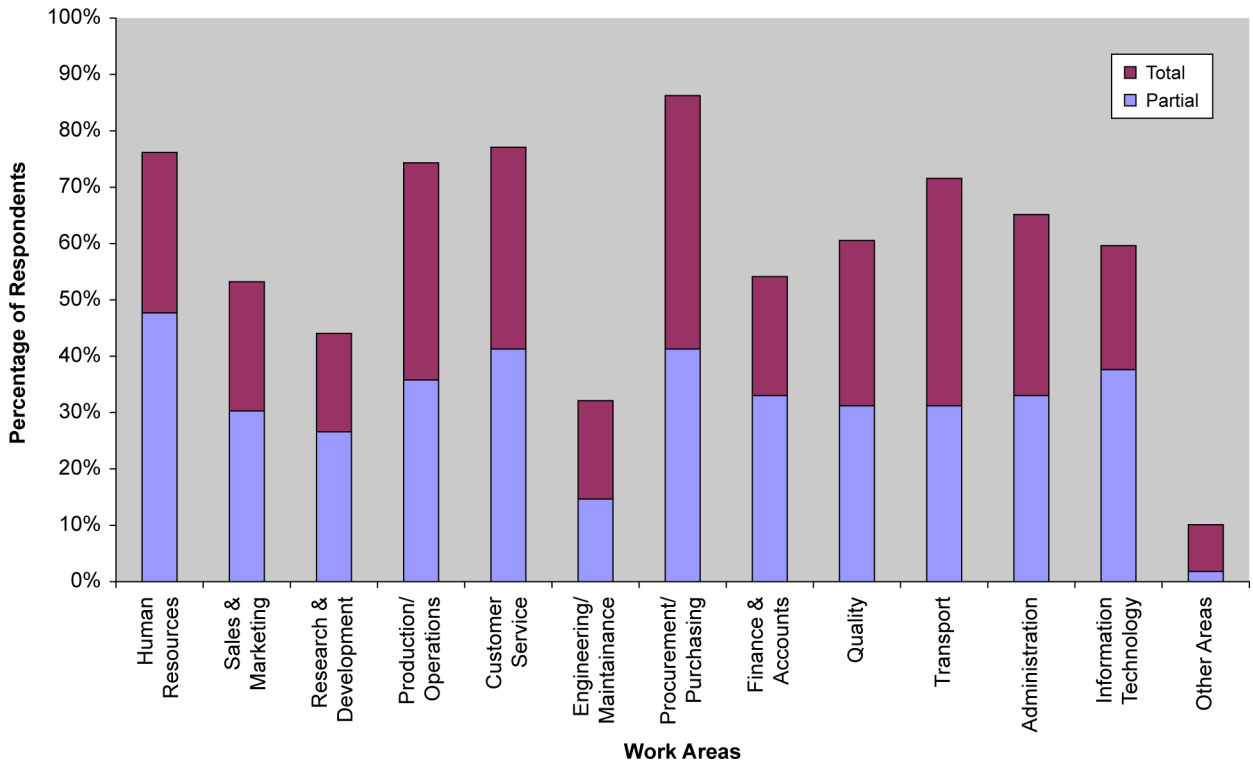


Figure 2 Decision-making responsibility



were responsible for procurement/purchasing and around three-quarters of the respondents were responsible for areas such as customer service (77 per cent), human resources (76 per cent) and production/operations (75 per cent). Around two-thirds of the respondents indicated that they were responsible for administration while just over one-half of the respondents indicated that they were responsible for areas like sales and marketing (53 per cent) and finance and accounts

(54 per cent). Examining Figure 2 in more detail shows that almost one-half of the respondents are "partially" responsible for human resources and around 45 per cent of the respondents had "total" decision-making responsibility for procurement/purchasing. The results show that the majority of the respondents were responsible for a variety of functions. As close to 75 per cent of the organisations are small to medium enterprises, the Supply Chain Manager is responsible for performing more generalist functions.

Types of training received and further training required

Respondents were asked to indicate if they had received "formal" training (i.e. they had attended a training course) or "informal" training (i.e. they had learnt on-the-job) in areas relating to their position. The results are presented in Figure 3 which shows that around 60 per cent of the respondents had received training in areas such as production/operations (59 per cent), procurement/purchasing (59 per cent) and human resources (56 per cent). Furthermore, almost one-half had received training in quality (48 per cent). There is consistency in the areas where the respondents have decision-making responsibility and the areas where they have received formal and informal training. A significant proportion of the respondents (27 per cent of the sample) had received on-the-job training and one could argue that this may not be adequate in developing the full set of competencies necessary for their position. Other sources of training mentioned by respondents included consultants (15 per cent), university/college (7 per cent) and 'other' (3 per cent).

Key areas that were identified for further training included procurement/purchasing (17 per cent of the respondents), production/operations (16 per cent), sales and marketing (16 per cent), information technology (16 per cent), finance and accounts (15 per cent) and human resources (14 per cent) (see Figure 4).

Only 9 per cent of the respondents claimed to have applied the training they had received to the benefit of their company to some extent while 19 per cent have applied it to a good extent and only 4 per cent have been able to apply it to a great extent. This reflects that a major proportion of the managers have not been able to utilise the training they had received to the benefit of their company, especially when one considers that 27 per cent of the respondents had received on-the-job training. This highlights the importance of professional training to be provided in the SCM domain and educational institutions are missing out on the opportunity to provide such training.

A report on this survey was published and widely distributed, including being made available through GS1 Australia's web site. The key findings of the survey were presented and discussed at workshops organised by GS1 Australia and the Supply Chain and Logistics Association of Australia (SCLAA). From these discussions it was recognised that a more concerted effort was needed to be taken jointly by industry (businesses), universities and industry associations to develop appropriately qualified supply chain professionals for the future. In particular, the need to establish a set of competencies (referred to later as the Supply Chain Management Graduate Knowledge Requirements Matrix) necessary for the future was established. This led to the formation of the Supply Chain Management Futures Forum which was tasked with the development of this set of competencies – see Initiative 2 below.

Figure 3 Formal and informal training received

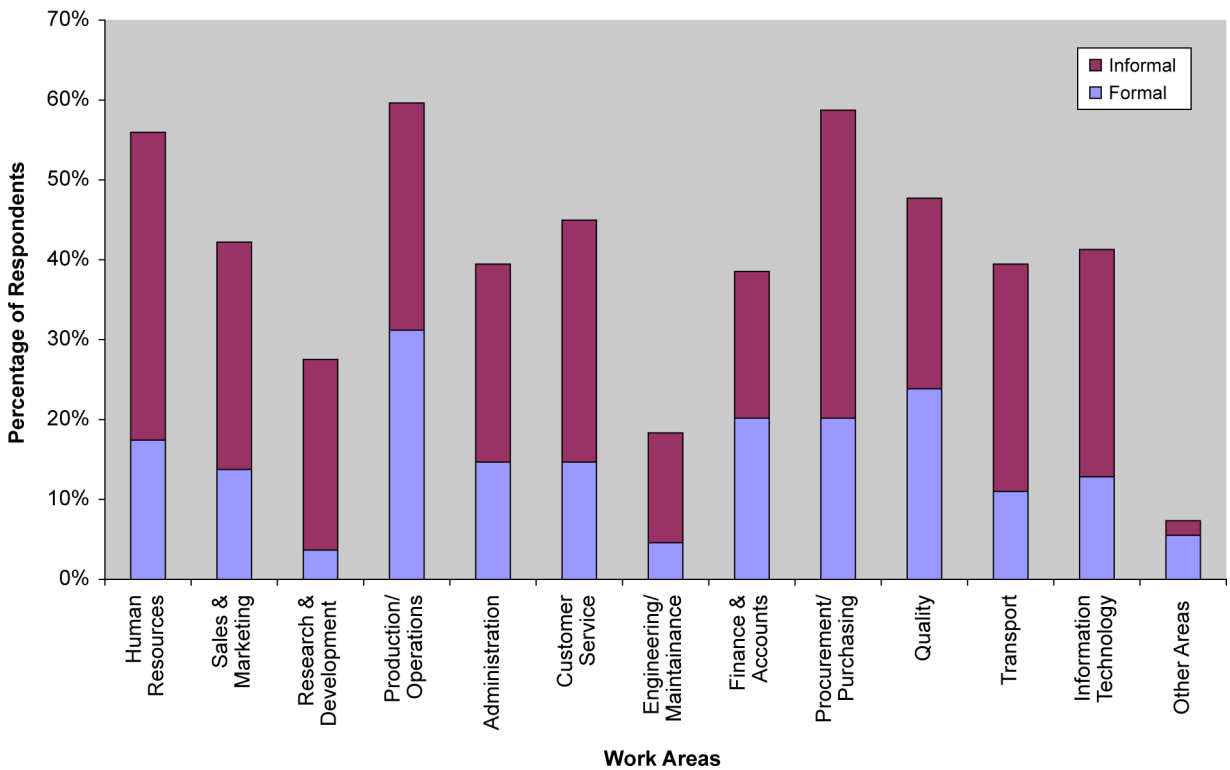
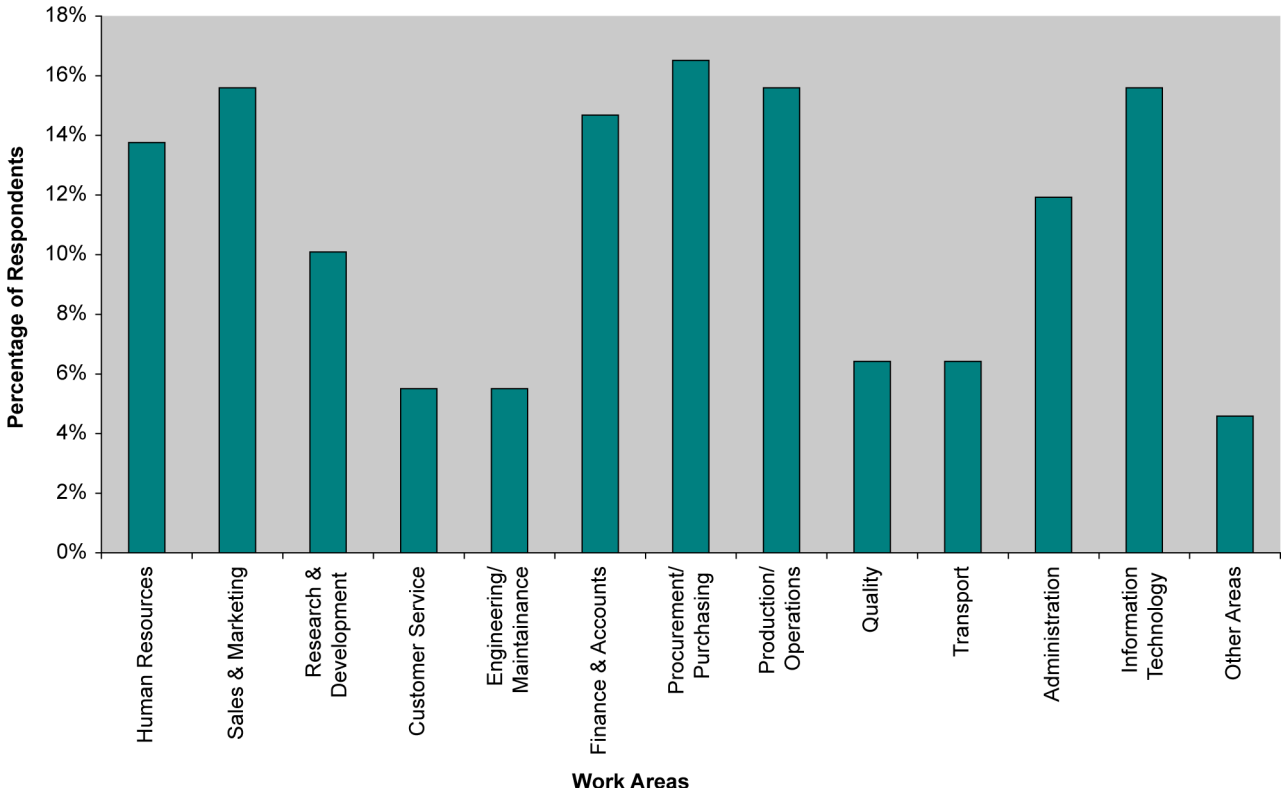


Figure 4 Further training areas identified



Initiative 2 – Supply Chain Management Futures Forum (SCM Futures Forum)

The SCM Futures Forum was created in August 2006 involving a group of Australian universities and teaching institutions, together with a number of businesses and key industry associations. All involved had a common objective; i.e. the development of future leaders in supply chain management in Australia.

The forum developed a set of "terms of reference" which included:

- To have significant participation from businesses in identifying and exploring ways industry can get involved with SCM training, education and research.
- To have strong academic commitment to review curriculum that is appropriate for the future.
- To have strong commitment from businesses and industry associations to facilitate and collaborate with universities on appropriate supply chain management projects and to disseminate relevant research findings for students and industry.
- Actively seek government involvement. The SCM Futures Forum would develop propositions and seek government participation and recognition.
- To help promote the profession widely, including to high school students. The SCM Futures Forum to develop appropriate strategies for doing this, endorsed by industry.

Staff representing three industry associations, five leading businesses and eleven academic institutions participated in the SCM Futures Forum (see Table II).The SCM Futures Forum meetings were held quarterly until early 2008, with GS1 Australia providing secretariat support. Representatives from businesses included senior managers responsible for supply chain operations while those representing universities and colleges were academics teaching and researching in the

Table II Organisations participating in the SCM Futures Forum

Organisation type	Name of organisation
Industry Associations	GS1 Australia
	Supply Chain and Logistics Association of Australia (SCLAA)
	Australian Food and Grocery Council
Businesses	Kimberley Clarke
	L'Oreal
	Nestle
	Toll Logistics
	Woolworths
Universities/Colleges	Chisholm College
	Deakin University
	Kangan College
	Monash University
	Queensland University of Technology
	RMIT University
	Swinburne University
	Sydney Business School (University of Wollongong)
	Victoria University
	University of Melbourne
	University of Western Sydney

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area of supply chain management. During the meetings, the results of the survey conducted as part of Initiative 1 were discussed, as well as research conducted overseas. Academics discussed content of their teaching programs following which business representatives made comments on the relevance of the programs for their organisation and the whole industry generally.The major outcome from the SCM Futures Forum was the development of the Supply Chain Management Graduate Knowledge Requirements Matrix. This emerged from the extensive discussions that took place during the Forum meetings. Industry representatives discussed in detail their challenges and their needs in terms of skills and competencies required in their businesses. Representatives from academia discussed the content of their current offerings and their future plans to develop new subjects and degree programs. Representatives from the industry associations pledged to provide the necessary support for positive change to occur.The purpose of the Supply Chain Management Graduate Knowledge Requirements Matrix is to provide a broad set of guidelines for students, who may come from a wide range of disciplines and backgrounds and have various levels of knowledge, especially in regards to supply chain management. As previously mentioned, students themselves are now better informed in terms of the competencies that they need to develop as they complete their educational program. They recognise that these are the competencies demanded by their future employers and are also recognised by the industry associations. This is important if they wish to become members of such associations in the future. This set of knowledge requirements can be used by educational institutions to review and develop their courses. Graduates should possess this knowledge set when entering the workforce and seeking employment in the areas of supply chain management. The Supply Chain Management Graduate Knowledge Requirements Matrix highlights what industry is expecting from new graduates.The Supply Chain Management Graduate Knowledge Requirements Matrix (see Appendix) identifies 20 specific knowledge sets categorised into generic (communication, social interaction, technology literacy, analysis and problem solving, leadership and teamwork, ethics and social responsibility, diversity management, change management, project management, procurement and contract management, continuous improvement, finance and budget management, and policy and governance) and supply chain management specific requirements (knowledge of SCM, strategic thinking in supply chains and logistics, related knowledge of SCM, contextualised knowledge of SCM, application of supply chain knowledge, knowledge and application of supply chain risk and sustainability, and enterprise systems and supply chain technologies).An Industry-Academic Breakfast event was held in early 2009 at which the Supply Chain Management Graduate Knowledge Requirements Matrix was presented. In addition, academics were provided with support by the Forum Secretariat (GS1 Australia) on how to go about incorporating the knowledge requirements into their courses. Over the past three years, a number of Australian academic institutions have used the Supply Chain Management Graduate Knowledge Requirements Matrix to design their programs.Completion of Initiative 2 led the SCM Futures Forum to ask the following question: What is the actual level of importance of the knowledge set (competencies) for managing supply chain activities? The SCM Futures Forum agreed that a second survey be conducted to answer this question. This became Initiative 3 and details relating to this are presented in the next section.

Initiative 3 – second survey of supply chain professionals

This was a large survey supported by GS1 Australia, the Supply Chain and Logistics Association of Australia (SCLAA) and the Australian Food and Grocery Council (AFGC) and conducted by one of the local universities. The survey addressed a number of issues, including the importance of the knowledge set (competencies) for managing supply chain activities. Supply chain professionals employed by organisations members of GS1 Australia were targeted as respondents. The design of the questionnaire was largely based on the Supply Chain Management Graduate Knowledge Requirements Matrix developed in Initiative 2 as well as supported by prior literature. The list of competencies are grouped as:

- communication and teamwork;
- technology skills;
- initiative and enterprise skills; and
- compliance and legal skills.

This decision was made based on content analysis and logical grouping of competencies. "Ability to apply continuous improvement and customer focus concepts" is listed under "Technology skills" since continuous improvements and customer focus requires the use of statistical techniques and other soft technologies as part of a quality improvement initiative. Also, "Understanding of the interconnection of SCM with other disciplines (e.g. information systems, industrial engineering and human resources)" is listed under "Technology skills" since integration requires some degree of technological knowledge/skills.

The survey instrument was reviewed by a number of industry experts with the purpose being to assess its readability, clarity, and feasibility. These individuals included three representatives of GS1 Australia, one senior executive from the AFGC and one senior executive from the SCLAA. A copy of the survey instrument is available on request from the author. A total of 921 organisations were sent the questionnaire by mail with a covering letter explaining the purpose of the survey. A total of 148 completed responses were received, providing a 16 per cent response rate.

Respondents to the survey represented manufacturing and service organisations with food and beverage accounting for 47 per cent, wholesale and retail accounting for 21 per cent and transport and distribution accounting for 5 per cent. Other sectors represented include construction, agriculture, medical and healthcare, IT and Telecommunications/ Electronics. In terms of size, the sample was roughly equally split between small, medium and large businesses. The scope of this paper does not allow presentation of the full results from this survey. Only the results relating to competencies are presented below.

Importance of the competencies for managing supply chain activities

Respondents were asked to indicate the level of importance of the competencies for managing supply chain activities on a

five-point scale, where 1 = "Not significant", 2 = "Low", 3 = "Medium", 4 = "High" and 5 = "Critical". From the responses provided, a mean score was calculated which range from 3.42 to 4.39 (see Table III).

The top three competencies identified are:

1 Ability to work effectively with individuals and groups/teams – cross culturally, intra and inter organisationally (mean = 4.39).
2 Ability to manage relationships in diverse contexts - cross culturally, intra and inter organisationally (mean = 4.23).
3 Ability to manage risks in supply chain and their associated issues (mean = 4.11).

The purpose of this paper is not to identify which competencies are significantly more important than others. Nevertheless, means testing for the top three competencies show that only the top one is significantly different from the rest (represented by the second and the third). This is confirmed by the non-significant difference between the second and the third (see Tables IV and V).

Overall, responses relating to "communication and teamwork" are identified as the most important and demonstrate the respondents' perception of the requirements for the successful integration of different businesses along the supply chain, both domestically and globally. With respect to "technology skills", the responses suggest that supply chain professionals require knowledge of a broad range of technologies to enable them to be effective in their roles. Without this knowledge they are unlikely to achieve a high level of integration along the supply chain. Results relating to "initiative and enterprise" skills suggest that respondents have not yet fully recognised the strategic importance of supply chain management in the overall success of the network of customers and suppliers.

Finally, respondents conferred a medium level of importance to the understanding of contractual and legal/regulatory aspects of the business; the awareness of ethical issues at the national and international level; and the respect for diversity, social justice principles, the environment and corporate governance. In many organisations these activities are the responsibility of specialists with a legal background and may explain the lower response obtained in this survey. Nevertheless, supply chain professionals of the future should be reasonably conversant in this area.

Findings from the second survey highlight the importance of a wide range of competencies necessary for supply chain professionals in Australia. In particular, with increasing trade between Australia and its Asian neighbours, it is critical for Australian supply chain managers to understand Asian culture and customs as well as local business practices.

The results of the second survey were published as a report and again widely distributed, including through the GS1 Australia web site. The findings were also presented at a national industry conference where favourable comments were received on the findings of the study.

Over the past two years, there has been considerable dialogue between the industry associations and many of the academic institutions involved in the SCM Futures Forum. Discussion has been focussed on curriculum development based around the set of competencies developed.

Table III Competencies and skills for supply chain professionals

Communication and teamwork	Mean
Ability to work effectively with individuals and groups/teams – cross culturally, intra and inter organisationally	4.39
Ability to manage relationships in diverse contexts – cross culturally, intra and inter organisationally	4.23
Communicate effectively through different media and styles	3.81
Technology skills	
Ability to make use of numerical techniques for decision making (e.g. forecasting and scheduling)	4.10
Project management skills and ability to lead major projects	4.09
Ability to apply continuous improvement and customer focus concepts	4.00
Ability to apply supply chain technologies and application software	3.92
Ability to solve complex and novel SCM problems (e.g. issues of tracking and tracing, product authentication)	3.85
Understanding of the interconnection of SCM with other disciplines (e.g. information systems, industrial engineering and human resources)	3.76
Initiative and enterprise skills	
Ability to manage risks in supply chain and their associated issues	4.11
Ability to manage change within the local context	4.00
Ability to develop and implement long term business strategies	3.93
Understand the importance and value of sustainable business practices (e.g. triple bottom line)	3.67
Understanding of basic accounting and budgeting	3.64
Ability to manage change within the global context	3.56
Advancing SCM knowledge through professional engagement	3.42
Compliance and legal knowledge	
Awareness of ethical issues at the national and international level	3.52
Respect for diversity, social justice principles, the environment and corporate governance	3.51
Understanding of contractual and legal / regulatory aspects of the business	3.77

Table IV Sample results for means testing – paired samples statistics

		Mean	*N*	Std deviation	Std error mean
Pair 1	Ability to work effectively with individuals and groups/teams – cross culturally, intra and inter organisationally	4.39	137	0.611	0.052
	Ability to manage relationships in diverse contexts - cross culturally, intra and inter organisationally	4.21	137	0.701	0.060
Pair 2	Ability to work effectively with individuals and groups/teams – cross culturally, intra and inter organisationally	4.39	137	0.611	0.052
	Ability to manage risks in supply chain and their associated issues	4.12	137	0.654	0.056
Pair 3	Ability to manage relationships in diverse contexts – cross culturally, intra and inter organisationally	4.21	137	0.701	0.060
	Ability to manage risks in supply chain and their associated issues	4.12	137	0.654	0.056

Table V Sample results for means testing – paired samples test

		Paired differences							
					95% confidence interval of the difference				
		Mean	Std deviation	Std error mean	Lower	Upper	*t*	df	Sig. (two-tailed)
Pair 1	Ability to work effectively with individuals and groups/ teams – cross culturally, intra and inter organisationally – Ability to manage relationships in diverse contexts – cross culturally, intra and inter organisationally	0.182	0.621	0.053	0.078	0.287	3.440	136	0.001
Pair 2	Ability to work effectively with individuals and groups/ teams – cross culturally, intra and inter organisationally – Ability to manage risks in supply chain and their associated issues	0.277	0.735	0.063	0.153	0.402	4.417	136	0.000
Pair 3	Ability to manage relationships in diverse contexts – cross culturally, intra and inter organisationally – Ability to manage risks in supply chain and their associated issues	0.095	0.873	0.075	−0.053	0.242	1.272	136	0.206

Conclusions

This paper has described three initiatives undertaken in Australia aimed at developing the nation's supply chain professionals. Support for these initiatives was willingly provided by three major industry associations (GS1 Australia, the Supply Chain and Logistics Association of Australia and the Australian Food and Grocery Council), a number of Australian universities and colleges and a number of the leading businesses. Initiative 1 involved a study of supply chain professionals focusing on their current education/training, areas of responsibility and future education/training needs. Initiative 2 involved the formation of the Supply Chain Management Futures Forum with representatives from businesses, universities and industry associations and development of a set of competencies (the Supply Chain Management Graduate Knowledge Requirements Matrix). Finally, Initiative 3 involved another survey to assess the importance of the set of competencies by the supply chain professionals themselves.

This collaborative effort has developed a set of 20 supply chain competencies that are regarded as essential for Australian professionals working in this area. These competencies relate to communication and teamwork skills, technology skills, initiative and enterprise skills, and compliance and legal skills. This research complements the earlier work by Murphy and Poist (1991, 2007). Their research involving executive search firms indicated that management skills were the most important, followed by logistics skills and business skills. Murphy and Poist suggest that "logisticians should be managers first and logisticians second".

Australian universities and colleges offering programs in supply chain management recognise the value of the Supply Chain Management Graduate Knowledge Requirements Matrix and GS1 Australia has itself worked closely with many of these institutions to ensure that relevant content is developed and delivered. Other outcomes mentioned in the introduction part of this paper includes increased awareness by students/ graduates as to the competencies that they need to possess for a successful career in supply chain management and the use of the competencies by industry itself to assess the performance and further development of supply chain professionals they employ.

However, the current global financial crisis has meant that many Australian businesses have not been able to spend as much as they would like to on developing their staff responsible for managing supply chains. Many businesses recognise the fact that the best learning happens when managers are in direct face-to-face contact with their Asian counterparts but this has not been possible for many

businesses because of the tough economic times. Businesses (especially small and medium-sized businesses), universities and industry associations are gearing up to respond to the challenge however, support from federal and state governments is necessary.

The on-going support provided by GS1 Australia has been vital in initiating the overall collaboration described in this paper. In particular, GS1 Australia acting as the secretariat for the meetings held as part of Initiative 2 was highly critical. It was through its effort that a number of senior executives became seriously involved in the overall collaboration. The Forum worked well with good attendance at meetings by individuals representing the businesses, universities/colleges and the industry associations. However, individuals representing businesses frequently showed their frustrations during the Forum meetings because of the time it takes for changes to be implemented in universities/colleges. Many businesses are focused on the short- to medium-term, wanting immediate impact or return. However, many universities/colleges are unable to respond quickly in changing their curriculum.

The most important lesson learnt from the Australian experience described in this paper is that it is hard to maintain momentum of an initiative and the interests of key players, especially senior executives. Immediate value to industry of an initiative needs to be demonstrated and academics need to learn how to do this in a more effective manner than is currently the case. It has been recognised that a mechanism such as the Forum meetings involving key stakeholders would be useful on an on-going basis. GS1 Australia has recently indicated its interest in being involved in this and steps are being taken to do this during 2013.

This paper provides valuable experiences to draw upon for managers, academics and officers of industry associations in other countries as they begin their journey towards the development of highly competent supply chain professionals for the future. Bringing together representatives from business, academia and industry associations in the form of a Forum or Symposium would be a good starting point. It is suggested that an appropriate industry association in the country should take the lead in organising such an event where future industry needs and barriers to collaboration can be discussed openly. The Australian experience presented in this paper demonstrates the value of such collaboration.

Industry associations and many businesses in Australia have a good track record of working with academic institutions with a number of them now involved in research projects funded through the Australian Research Council. This is a good sign that rigorous research in supply chain management is being recognised by the federal government in Australia. In addition, the Australian and New Zealand Academy of Management have established a special interest group focusing on supply chain management that is being strongly supported by academics and practitioners. Much has been achieved in Australia in developing supply chain professionals and raising the profile of the discipline generally. However, there is still much that needs to be done.

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Appendix. Supply Chain Management Graduate Knowledge Requirements Matrix

Generic competencies

- *Communication.* Communicates effectively through different media and different styles, in accordance with the audience, including the ability to listen and disseminate learning and information.
- *Social interaction.* Manages relationships in diverse contexts, cross culturally, intra- and inter-organisationally. Is a self-reliant communicator who works effectively with individuals, groups, teams and at an organisational level, and instilling confidence among all concerned.

- *Technology literacy.* Applies technology effectively at a personal and professional level and exhibits the ability to use application software commonly utilised in business.
- *Analysis and problem solving.* Applies appropriate numerical skills and techniques to understand, interpret and solve problems and undertake business analysis utilised in the supply chain management context.
- *Leadership and teamwork.* Contributes to increasing knowledge of peers and work colleagues through the clear and productive dissemination of information.
- *Ethics and social responsibility.* Engages responsibly in work and society with respect for diversity, social justice principles, the environment and corporate governance. Has an awareness of the ethical dimensions, issues and relevant guidelines as needed for working effectively with individuals, groups and organisations in a national and international context.
- *Diversity management.* Appreciates and respects individual differences such as generational interfaces, language, gender, cultural and technological diversity and embraces this diversity to enhance organisational performance.
- *Change management.* Identifies the change involved, its impact on the organisation, partners, systems and employees, to drive the change and manage the implementation of the change appropriate to all stakeholders.
- *Project management.* Understands how project management operates and is able to participate and/or lead projects.
- *Procurement and contract management.* Understands contractual and legal aspects of the overall business and supply chains in particular, its obligations and liabilities, issues of risk mitigation, including dealing with third parties and trading partners.
- *Continuous improvement.* Understands the concept of continuous improvements with a specific focus on customers, using various measuring techniques, e.g. surveys, and targeted feedback; including a focus on the environment i.e. evaluation of carbon footprint and waste reduction as part of continuous improvement. Is able to evaluate and assess global and local operations, through site visits, benchmarking and economic and scientific evaluation to determine appropriate best practice implementation techniques in set circumstances.
- *Finance and budget management.* Understands finance and accounting fundamentals in order to draw up a budget and manage the budget within resource, financial and capital constraints. Understands how to measure ROI, when to invest, outsource etc.
- *Policy and governance.* Understands that business strategies are linked to accountabilities coupled with control systems, across all aspects of the business, which are commensurate with a company's dependency on processes, systems and the acceptable risks involved.

Supply chain management specific requirements

- *Knowledge of SCM.* Demonstrates a comprehensive knowledge of supply chain and logistics management and its integration with other disciplines.
- *Strategic thinking in supply chains and logistics.* Is able to conceive and implement long term strategies for supply chain networks, when considering global, environmental, industrial, social and economic impacts to the business.
- *Related knowledge of SCM.* Understands the interconnection of supply chain and logistics management with other fields of knowledge. Specifically in the understanding of management in information science, physical science, industrial engineering, management science, including human resource, human behaviour and elements of emotional intelligence. Interfaces with other typical organisational functions of the business (e.g. HR, accounting, marketing and sales).
- *Contextualised knowledge of SCM.* Understands from a national and global context the applicability of supply chain and logistics management as a disciplinary field.
- *Application of supply chain knowledge.* Integrates theoretical and practical knowledge to analyse and solve complex and novel supply chain and logistics management problems, e.g. issues of tracking and tracing, product authentication. Demonstrates a professional practice of supply chain related learning (through business internships, practical case studies etc.
- *Knowledge and application of supply chain risk and sustainability.* Understands the importance and value of deploying business practices which are sustainable when considering the interplay of competing human, natural, technology, financial and time resources.
- *Enterprise systems and supply chain technologies.* Demonstrates knowledge in e-business and supply chain related technologies. Recognises and values that global standards, like the GS1 System, play in the coherent underpinning of technologies used in supply chain networks.

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