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ENCOURAGING SMALL FIRM UP-TAKE OF SCM USING EDUCATION: A FUTURE RESEARCH AGENDA

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Abstract
The success of supply chain management (SCM) practices often depends on small firms in the supply chain adopting these practices, yet they are often reluctant to do so. The existing literature mostly explores SCM adoption barriers rather than approaches to encourage adoption. This paper argues that an educational perspective has promise, and proposes a research agenda which should guide future studies by all researchers studying small firm SCM up-take. The agenda encompasses the diversity of small firms, the major educational players, appropriate types of education approaches and the theoretical framework to underpin this research. The paper then gives an example of how this research agenda can be applied to a specific research project which will explore the impact of the Supply Chain Knowledge Centre (SCKC), a state of the art SCM education facility developed by GS1 Australia, on small firm SCM up-take.

Key Words: supply chain management; small firms; adoption; education; research agenda

1. Introduction

Research into IS and eBusiness enabled supply chain management (SCM) has been ongoing for decades, where the term SCM in this paper will encompass all strategies, practices and technologies unless otherwise specified. The range of technologies to aid with SCM have included Electronic Data Interchange (EDI), more recent incarnations (such as web-EDI, gateways, XML), electronic marketplaces and more recently Radio Frequency Identification (RFID). Successful implementation of SCM models such as Quick Response (QR) or Collaborative Planning, Forecasting and Replenishment (CPFR)
continues to be a major objective of large businesses worldwide (especially with increased globalisation). However, one significant hurdle remains convincing smaller trading partners to adopt new SCM [1, 2]. Indeed, the theory of network externalities suggests that full benefits from SCM, as with all communication-based innovations, are only achievable when the majority of members of a supply chain adopt the practices and technologies because the benefits are proportional to the number of users [see 3, 4].

Empirical investigations aimed at encouraging small firms to adopt SCM (and eBusiness generally) tends to be of three forms:

- focusing on large enterprises and how they need to exert pressure on their small suppliers to adopt [for descriptions of this perspective of SCM adoption see 5, 6, 7];
- identifying and exploring the relationships between barriers/drivers and the up-take of SCM by small firms [for a comprehensive overview see 8, 9]; and
- examining the role of third-party services which aim to reduce the complexity of SCM adoption for small firms, such as centralised Web-EDI solutions and Application Service Providers (ASPs) [see 10, 11, 12].

The main problem with the first two trends in the literature is that this research does not, of itself, produce practical solutions to encourage proactive adoption of SCM by small firms which, by contrast, is the primary goal of the third research trend. The adoption factor research does, however, suggest that the factors can be grouped as either “too difficult” or “unsuitable” for a small firm [see 13]. While the third stream of research specifically aims to address the “too difficult” barriers (eg, cost), it does not (directly at least) convince small firm decision-makers that SCM is suitable to their business.

We believe that an important area of future research which the SCM research community needs to engage in should be investigating the role of education to change the perception of small firm decision-makers who see SCM as unsuitable. The research needed includes investigating the role of various types of education, and the contexts in which different education approaches might be effective. The literature suggests the need for an education focus to the SCM adoption issue. For example, many small firm managers [see 14, 15] or their staff lack [16, 17] knowledge about or have negative attitudes toward SCM, and their perception is that SCM will not reduce costs or produce benefits [16, 17]. This implies that an important role of education is to address these knowledge and perception issues.

However there has been limited research in this area of SCM education of small firms. The most notable research is now quite dated [see for instance 18, 19, 20]. More recent literature with an educational dimension to eBusiness (not specifically SCM) adoption by small firms is Ihlstrom and Nilsson [21], McGovern and Hicks [22] and Ray and Ray’s [23] action research studies in which they provided firms with eBusiness knowledge and project support. Some research looks at online learning design principles or participation barriers [24, 25, 26, 27], but not the role of education and learning in the context of encouraging adoption of SCM by small firms.

The objective of this paper is to propose a future research agenda which can be used by the SCM research community as the basis for education research aimed at encouraging small firm up-take of SCM – especially those firms perceiving SCM as unsuitable. The research agenda has been formulated holistically by considering: (i) the unique context of small firms and their business goals which must be addressed by SCM; (ii) the theoretical framework which should guide or underpin this research by the SCM academic
community; (iii) the major players who are likely to have varying SCM educational roles; and (iv) the categories of education which could be used. It is on the basis of these areas that we also structure the paper. We finally provide an example of a research project we have devised which uses the broader research agenda, in which we will examine the short- and medium-term effectiveness of the Supply Chain Knowledge Centre (SCKC) – a state of the art SCM education facility developed by GS1 Australia.

2. Small firms and their business goals

For a research agenda aimed at encouraging small firm up-take of SCM to be successful, we must have a sophisticated understanding of small firms, their contexts and business goals. Unfortunately, we found in the literature that existing small firm research in the SCM (and broader eBusiness) area tends to have quite a narrow view of small firms. More specifically, it tends to treat small firms as a homogeneous group differing primarily by industry and number of employees [8] and has an implicit assumption that all small firms have entrepreneurial business goals. A small minority of authors, however, point out that individual small firms vary widely from one another [eg, 15, 28, 29, 30, 31, 32, 33]. We argue in this section that the suitability of SCM will vary depending on the diverse motivations and goals of small firms.

Firstly, small firms differ depending on a multitude of owner characteristics overlooked by the majority of literature such as their: age; educational level [34, 35, 36]; gender [36]; management experience [34]; attitude toward change [36]; creativity, attitude toward risk and innovativeness [9, 14, 36]; degree of cosmopolitanism or outward-looking [35]; and years of management and industry experience [37, 38]. Combinations of these (and other) characteristics will result in different business goals and decisions. Further, much of the literature assumes (implicitly) that all small firms are entrepreneurial and driven by economic rationalist business goals such as growth and competitive advantage. Castleman [29], however, argues that this is not always so and points out, for instance, that some small firm owners want to achieve leisure, enjoyment and social goals at the expense of growth and competitive advantage.

Secondly, small firms vary depending on the influence exerted by senior management, family and employees. For example, Castleman [29] argues that family issues (such as work-family balance issues) can govern owner decisions at the expense of goals such as the expense of profit, growth, etc. Management in small firms can often comprise family members [39, 40], which further raises the potential for business goals to be based more on family rather than entrepreneurial goals. The influence of family on small firm SCM adoption is rarely considered in the literature. More commonly considered is employee influence which can depend on, for instance, the SCM knowledge of employees [9, 14, 16, 41, 42, 43, 44, 45, 46]; and employee resistance to change [16, 47]. But influence of employees on SCM adoption decisions can also depend on whether small firm management encourages employee contributions to decisions [40].

Thirdly, small firms vary widely from one another depending on the industry in which they trade. The SCM literature recognises the influence of industry on adoption, which is typically viewed as perceived pressure from competitors [9, 14, 16, 35, 36, 38, 48, 49]. This pressure alone, however, does not guarantee adoption. For example, SCM technology suitability depends on the intensity of use within the industry and on whether it is the norm or increasing [48, 50]. An issue often neglected by the literature is that many small firms trade across industries and that each industry can have different (even...
contradictory) expectations (eg, business processes, government regulations, standards, etc). Non-adoption of SCM technologies might be the only cost effective option [51].

Fourthly, small firms also vary based on the extent of perceived pressure from customers and suppliers, and whether they are SCM (or eBusiness) ready [9, 14, 16, 35, 42, 45, 49, 50, 52]. This too does not of itself guarantee SCM adoption. For example, Zheng et al. [1] argue that some firms with a small customer base and low transaction volumes might find paper systems more viable than SCM technology. Also, some firms see face-to-face communication and associated trust with customers (and suppliers) as their primary competitive advantage over larger firms. If SCM adoption risks impersonalising or even damaging relationships with trading partners, then small firm managers will often not adopt [1, 16, 29]. For other firms, this social aspect of running the business might be more important than attracting new customers [see 29].

Fifthly, small firms can have varying geographical foci [see 1], which will also impact on their business goals and eBusiness suitability. For example, Egan et al. [53] found (unsurprisingly) a much higher level of website (and marginally higher email) use by internationally-focused firms when compared to domestic-focused firms [see also 49].

An education-based research agenda which helps small firm decision-makers view SCM as suitable must understand the diverse motivations and goals of small firms. The goal of this research should not be to change small firms (e.g. make them entrepreneurial) or to view their lack of adoption as their failure [29]. Instead the SCM research and practitioner communities must recognise that these firms may have business goals driven by social and interpersonal motivations, not entrepreneurial goals. Additionally, we must recognise, as a community, that small firms will perceive non-technological solutions as being equally applicable at achieving their business goals [51].

This gives rise to a number of questions which comprise the proposed agenda which we believe the SCM community should use to focus its education-based research efforts:

- What are the various business goals of small firms and the motivations driving them?
- To what extent can SCM education programmes for small firms be generic, or must they all be tailored to each firm given their diverse goals and motivations?
- How should educators evaluate the business goals of small firms, and the motivation for these goals, in order to develop programmes to address their needs?
- What training do SCM educators need so that they can better appreciate the diversity among small firms, the business goals, motivations, etc?
- Can business cases for specific SCM practices/technologies be developed which will convince small firm decision-makers with each business goal and motivation? What tangible and intangibles should these business cases include? What non-technological solutions for each business goal are the SCM practices competing with?
- How or on what basis should educators determine the person(s) within a small firm who should be targeted?

3. Theoretical framework for the SCM education research agenda

From a theoretical perspective, the diversity of business goals and motivations among small firms gives rise to two questions. What theoretical lens should we use to examine the up-take of SCM by small firms? Can education change the perceptions of small firm decision-makers about the value of SCM? We explore this conceptually in this section.
SCM and eBusiness researchers investigating small firm adoption most commonly use Rogers’ [54] diffusion of innovation theory framework. It is interesting to note that the literature tends to use primarily the innovation characteristics to explain (in part) the barriers to adoption [eg, see 35, 55, 56]. The more useful part of Rogers’ framework, in the context of SCM education, is likely to be his innovation-decision process. The process initially involves the potential adopter gaining knowledge about an innovation (such as awareness, know-how), then developing an attitude toward it and then making a decision about adoption. Education of small firm decision-makers could potentially help them through this process by helping them to gain quality knowledge (eg, business cases) which might result in a positive attitude if they are convinced SCM is suitable.

But there has been criticism of Rogers’ theoretical framework, including that it focuses on innovation demand rather than on supply [57, 58]. The underlying assumption of the demand view is that adoption will occur at a rate governed by the spread of knowledge about the innovation and by the time it takes for adopters to hear about the benefits of adoption [57]. Attewell [57] argues that innovation suppliers can influence diffusion because they focus their marketing and educational initiatives to particular types of businesses, so not all firms have equal chances to adopt. In addition, with complex innovations knowledge of the innovation and its benefits can be widespread but adoption still does not occur. We therefore need a theoretical framework which includes complex innovations such as SCM and the role of innovation suppliers.

Furthermore, the apparent social nature of small firm SCM adoption implies that using individual-based theories and models such as the Technology Acceptance Model and the Theory of Planned Behaviour might be inappropriate. This is because these theories or models assume there is a single decision-maker [59, 60] when this might not always be so, and because they focus on individual perceptions and downplay the social processes.

Attewell explains that adoption in this case involves gaining detailed know-how on the use of complex innovations before adoption will occur, not just knowledge of its existence and benefits. He argues that this process is not about knowledge transfer from the innovation originator to potential adopters. This is because such know-how is gained more as a result of “learning by using” and is therefore difficult to transfer to another organisation. This know-how can arise from adapting the innovation to the firm’s specific circumstances and from modifying the firm’s practices and procedures to accommodate the innovation. This theoretical view suggests that SCM education is not just about providing know-how which addresses a business goal, but would ideally involve decision-makers using the tools in their workplace or, alternatively, in a realistic setting mirroring their unique context. Educators would also need to provide know-how which presents a convincing business case so that decision-makers can develop an informed attitude toward an SCM solution and its suitability to their firm.

This “learning by using” view of adoption also underpins adult learning theory, which is also based on learning by doing. Adult learning theorists argue that adults tend to learn more effectively from experience than from passive exposure to concepts [61, 62, 63]. They describe this experiential learning as a cyclic process involving reflection on one’s experiences, generalising from these experiences, testing the implications of the newly developed concepts in new situations, and reflecting on these new concrete experiences [63, 64]. This suggests that adult learning theory supports the notion that education, broadly speaking, can change the attitudes of participants such as small firm decision-makers. But the challenge in this respect would be encouraging these decision-makers to reflect on their current experiences so that they will agree to gain concrete experiences
with new SCM practices. Section 2 suggests that this could be achieved by communicating to the decision-makers that the education programme is specifically tailored to their business goals, motivations and problems. While on the surface this is common-sense, we argue that many education approaches are highly generic in nature. More significantly, the programmes are typically not developed with the appreciation that many small firms have business goals which, on the surface, appear to contradict the goals of more entrepreneurial firms. So unless suitable education programmes and approaches are developed, the learning cycle will not be completed.

Central to Attewell’s theory of complex innovation adoption is the role of mediating institutions between innovation originators and potential adopters. They create and accumulate the know-how as a result of implementing on behalf of many adopters, and thus achieving economies of scale. Mediating institutions in the SCM context could include educators, vendors, consultants, advisers and experts who gain additional know-how with each client they serve. Attewell also suggests that with such innovations that an alternative to adoption is to use a third party service (including ASPs which we mentioned in Section 1), so that the small firms can develop their know-how progressively, with less risk, prior to in-house adoption.

Adult learning theory and Attewell’s theory suggests that education can change the attitudes of small firm decision-makers to SCM. It would also appear that these theories are suitable lenses through which to research this area. They imply that education aimed at helping small firm decision-makers view SCM as suitable will therefore need to:

- incorporate a strong experiential element where the decision-makers can trial new SCM practices and technologies in their workplace or in a setting which accurately mirrors their workplace;
- include a problem-based (or business goal based) view, where the education is tailored to the small firm’s unique context and business motivations or where it helps them to identify problems so that the learning cycle can begin; and
- encourage decision-makers to adopt SCM solutions which require minimal know-how or expertise, which solve a specific business problem or goal – they can then develop initial expertise to form the basis for adopting more complex SCM solutions.

4. Major players in small firm SCM education

The important role of mediating institutions for promoting small firm up-take of SCM raises the issue of who will be the major players in SCM education. Central to this issue for the research agenda is also consideration of which players from which different small firms might prefer to receive education.

Section 2 implies that trading partners (especially large ones) are likely to be potential players in SCM education, either in terms of providing education or perhaps encouraging their smaller partners to undertake education. Lawson et al. [44] also suggests that industry associations might have a role to play by addressing the knowledge needs of small firms through dissemination of information and conducting seminars focusing on the specific needs of small firms. While it is clear that these parties have an important role, there has been little if any research exploring the educational approaches they use, whether these parties are providing education which meets the needs of small firms, or whether small firms prefer these parties for their SCM education over other parties.
Attewell’s theory suggests that vendors and consultants might also play an educational role, but here too there has been limited research and contrasting findings. For example, de Guinea et al. [59] found a positive link between vendor support against organisational impact of IS and overall IS effectiveness in Canadian small firms, but no significant findings concerning consultants. Other research has found that some small firms did not feel that vendors/consultants understood their business [43, 44, 45, 55, 65, 66], vendors were unable (or unwilling) to provide eBusiness “know-how” [43], did not demonstrate the ability to use eBusiness [66], or were learning about eBusiness with their clients [44]. These findings imply, perhaps, that these types of mediating institutions do not see themselves as educators who should provide know-how, but this needs further study.

There is also very little research into the role of external business advisers to small firms and their educational role. Simpson and Docherty’s [67] study of government-supported business advisors found that some small firms did not feel the advisors understood their business [see also 17]. Wagner et al [17] also reports that Local Enterprise Councils (LECs) in the UK were helpful in the early stages of website development by providing funding and assistance, but small firms were expected to develop beyond this on their own with more complex implementations. Similarly, the action research of Ihlstrom and Nilsson [21], McGovern and Hicks [22] and Ray and Ray [23] suggests that higher education institutions can also perform an educational role in the form of business advice, and possibly even broader roles. It is clear that further research is needed into the role of business advisers, whether their education approaches are effective, and what types of business advisers small firms prefer and why.

The issue of which advisers small firms prefer is significant because there is limited, but relevant, existing research in other disciplines suggesting that small firms prefer banks, accountants, other businesses and family for general business advice [68, 69]. Other parties such as lawyers, government agencies, industry associations (including chambers of commerce), business consultants and business development centres were also used but to a much lesser degree [68]. The value small firms place on the advice from other businesses adds support for the emerging body of recent work into the role of formal and informal business networks in eBusiness adoption [eg, 13, 28, 65]. Indeed, Macpherson et al. [70] found that such business networks can be central to small firm learning.

This gives rise to a number of questions which comprise the proposed agenda which we believe the SCM community should use to focus its education-based research efforts:

- Which players do small firm decision-makers prefer and trust most when it comes to receiving SCM education? Which players do small-firm decision-makers believe “understand” them (eg, their business goals, motivations, problems)?
- How do the various types of players perceive their SCM educational role with respect to small firms, if indeed they believe they have such an educational role at all?
- What types of SCM know-how do the various types of players have? Is there a knowledge gap between the players from which small firm decision-makers prefer to gain their SCM know-how and the know-how of these preferred players?

5. Small firm SCM education approaches

The theoretical framework discussed in Section 3 also suggests that not all education approaches are likely to be suitable for encouraging small firm up-take of SCM. More specifically, the adult learning theory and Attewell’s theory of complex innovation adoption suggests that it will be primarily experiential learning approaches which are
likely to have the most potential. Parker [18] provides a particularly useful categorisation of experiential education approaches: natural experiential approaches which occur within the workplace (such as mentoring, coaching/counselling, action learning and business networks); and synthetic experiential approaches outside the workplace which substitute for the natural setting, such as case studies, role playing, laboratory training, problem-solving workshops, and business simulations.

Section 4 suggests that coaching/counselling (in terms of business advice) and business networks are already approaches which are being used by some major players in the context of SCM adoption by small firms. Similarly, in Section 1 we explained that there has been limited research regarding SCM education approaches, with some studies exploring the potential of business simulations aimed at small firms [eg, 18, 19]. But it is clear that in light of the limited research in this area that further work is needed to compare the impact of these approaches with other experiential approaches.

This gives rise to a number of questions which comprise the proposed agenda which we believe the SCM community should use to focus its education-based research efforts:

- What is the current level of SCM awareness by small firms?
- Which educational approaches are preferred by small firms, and which educational players have the desire, resources and expertise to offer specific approaches?
- On what basis should the “effectiveness” or “impact” of the approaches be evaluated and compared? Which stakeholders should be considered in this evaluation?

In the preceding sections we have provided a comprehensive future research agenda which should guide the SCM academic community in pursuing projects aimed at encouraging greater up-take of SCM by small firms. In the next section we provide an example of a planned research project which arises from this broader research agenda.

6. Applying the research agenda to GS1 Australia’s Supply Chain Knowledge Centre

GS1 Australia (GS1 for brevity) is a non-profit organisation which sees as one of its key services to Australian businesses (large through to small) the provision of classroom-based, onsite and online education about the GS1 System and the benefits it offers. This education service ranges from the technologies and standards underpinning the GS1 System (eg, product numbering, electronic messaging, barcode scanning) to business and industry best practice and processes in SCM. A number of the innovative education approaches which GS1 uses include: self-paced online SCM courses which participants can undertake online; “webinars” in which a GS1 educator leads a real-time, web-based presentation with a simultaneous telephone conference call; a simulation theatre with networked computers, each representing a company in a graphically simulation supply chain showing the messaging between them; and an interactive supply chain model (the Supply Chain Knowledge Centre) which has life-size, operational technologies such as barcode printers and scanners, a fork-lift, retail store, warehouse space.

An important objective with the design of these various educational environments, and the programmes built around them, is that they can be tailored to suit the needs of individual businesses and learners, including small firm decision-makers and employees. More importantly, the GS1 educators spend time talking with participants before the programme even starts so that they develop an understanding of the expectations, business problems and needs of the firms. Based on this discussion, the educator will
decide which components (if any) of the simulation theatre, interactive supply chain model and other educational resources will be needed to address those needs.

It is therefore clear that the educational environment and programmes offered by GS1 satisfy many of the theoretical and practical elements of our broader research agenda. For example, it is highly experiential and it has the ability to be tailored to the specific needs and business goals of small firm participants. For this reason, GS1’s education services provide an ideal opportunity to explore some aspects of the research agenda outlined in the previous sections.

One of the first elements of the GS1 research project will involve entry surveys of the small firm participants to gain insights into the role of the participant(s), the business goal(s) of the firm (eg, relating to customers, suppliers, growth, productivity, service, etc), the specific business problem(s) if any and recognised, and their expectations with regards to the education. This will either be completed by the participant or by the GS1 educator filling out a checklist while talking with the participant(s). Another element of the research project will be capturing the way in which the GS1 education resources were tailored to address the educational needs of the participant(s). A final element of the programme will involve conducting an exit survey when the programme is finished to explore the extent to which the participant(s) felt the programme met their needs, if they have been convinced of the benefits of the SCM solution(s) explored, etc.

We also anticipate that the entry and exit surveys alone will be insufficient for examining the impact of GS1’s education programmes on the up-take of SCM by small firms. For this reason, the research project will also involve short- and medium-term follow-up interviews with participants to explore what happened. This will give us the opportunity to explore a range of issues, such as the participant’s preferences for parties when it comes to education, the impact of social/interpersonal issues on adoption, etc.

7. Summary

In this paper we proposed and justified the need for a research agenda for use by the SCM academic community which should form the basis for investigations into the role of education to encourage small firm up-take of SCM. The agenda includes suggestions on the theoretical lens(es) through which to conduct education-based SCM research. The paper also justified the rationale behind a range of research questions, largely based on gaps in existing SCM (and broader eBusiness) research, which various members of the SCM academic community can focus their future research. The paper also argued that small firms have a diverse set of business goals, not necessarily driven by entrepreneurial economic rationality, which needs to be an essential considering in the conduct of small firm research. Finally, the paper gave an example of how this research agenda can be used as the basis for a specific research project aimed at investigating the impact of GS1 Australia’s Supply Chain Knowledge Centre on small firm up-take of SCM. This example illustrates that the research agenda is comprehensive and can guide useful applied research in this area. Further, the research agenda can be used by the SCM practitioner community to guide its own education programme development, by highlighting important issues and considerations which need to be addressed.

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