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Sustainability in Supply and Value Chain Management

Abstract

This chapter presents the case for integrating sustainability principles into supply and value chain management provision at higher education level as an urgent matter for consideration. It draws on the key declarations including Global Action Programme (GAP) of UNESCO that support the incorporation of sustainability values and practices into all aspects of learning to underscore the need for embedding supply and value chain management curriculum with sustainability. The shared experience and insights from scholarly engagement with integrating sustainability principles at three levels in higher education facilitates sustainability knowledge transfer. Grounded in the extant literature, a critical discussion of the integration process including pedagogical practices reveals prospects and challenges to scaling up of sustainable supply and value chain management education.

Keyword: sustainability, integration, supply and value chain management, higher education, curriculum

Introduction

Unlike other business and management disciplines, supply and value chain management has long related to sustainability discourse because of its direct impact on sustainable development. Overall, stakeholders agree that incorporating sustainability principles into supply and value chain management curriculum through education and business sector partnerships could transform supply and value chain processes (Walker and Brammer, 2009). An emerging viewpoint within supply and value chain sector is that ‘a company is no more sustainable than its supply and value chains’ (Krause et al., 2009). But there are many practical sustainability integration challenges.

Some researchers have highlighted the negative effects of supply and value chain operations on ecological footprint (King and Lenox, 2001, Melnyk et al., 2003) and social equity (Carter and Jennings, 2002). Many media reports have also canvassed for change and improvement (Vachon and Klassen, 2006). Several businesses have responded to these negative reports by adopting systems that pay attention to reduce waste and greenhouse gas emissions, use less non-renewables, and avoid pollution (Pullman et al., 2009, Sarkis, 2012). However, there is no doubt that a lot more need to be done for further improvement in supply and value chain management systems.

Efforts at embedding sustainability suffer from limited sustainability knowledge and skills (Figueiró and Raufflet, 2015). It is part of the reason why some corporate executives still do not place sustainability at the centre of their business strategy for fear of becoming less competitive in the 21st century. Thus, one would agree with Lans et al., (2014:1) that, to ensure optimum opportunity for sustainable development organisations require a pull of human resource that can envisage integrating sustainability as a cardinal business resource to foster ‘strategic renewal, innovation and venturing’.

The lack of sustainability expertise requires an ambitious effort to improve sustainability knowledge and skills among supply and value chain practitioners through higher education curriculum. Hence, the focus on higher education supply and value chain management provision to expose students to sustainability challenges so that they can cope creatively and successfully in their professional capacities (Rowe, 2007). Undoubtedly, higher education is known for its transformational solutions that are channelled through curriculum design, teaching and learning to resolve societal problems. Existing evidence show that some higher education institutions are actively finding solutions to address sustainability challenges posed by supply and value chain systems (Blanco-Portela et al., 2017). Despite these creditable attempts, Grindsted (2011) points to a limited success in integrating sustainability into higher education curriculum.

Continuous collaboration between academic institutions and business sector partners to co-create sustainability knowledge is not only important because of the need to address increasing environmental and social challenges but also being mindful of the fact that sustainable supply and value chain management is an important determinant of the future success of a business (Accenture, 2010). Although the challenge is big, teaching and learning provision on supply and value chain management is yet to be fully embedded with sustainability principles and practices in higher education curriculum.

Integrating sustainability into higher education supply and value chain provision in terms of programme design, teaching and learning is at best, at the periphery, where some selected sustainability topics are covered in a couple of sessions of the existing supply and value chain management course modules. Supply and value chain management like other business management disciplines treat teaching and learning materials on sustainability as a supplementary

topic that requires coverage to bring the course content in line with current momentum around education for sustainable education (Etse and Ingley, 2015).

Whilst supply and value chain has consistently been related to ecological and social issues the attention given to embedding sustainability into supply and value chain education has not adequately reflected the critical importance of curriculum to sustainable supply and value chain educational development and delivery process. AASHE (2014) pointed out that traditional higher education curriculum is not receptive to education for sustainability in general. Some of the efforts made so far to embed sustainability includes real-world learning based models that configure supply and value chain management curriculum with sustainability in a replicable stepwise process to facilitate sustainability knowledge transfer. To engender progressive engagement with sustainability, it beholds on us as supply and value chain scholars to adopt an interdisciplinary orientation to enable us to develop novel teaching materials and learning techniques that fully capture the essence of sustainable supply and value chain management. Regarding sustainability as a bolted-on matter to make supply and value chain management curriculum content aesthetically appealing will not deliver education for sustainability goals.

This chapter aims to re-echo the call for full integration of sustainability principles into supply and value chain management provision at higher education level as an urgent matter. It seeks to share with the community of practice personal experiences of attempts to integrate sustainability in supply and value chain modules at both undergraduate and post graduate levels. It will ground a critical discussion on the integration process including pedagogical practices on the extant literature to reveals prospects and challenges to scaling up of sustainable supply and value chain management education. The next section provides background that draws on UNESCO's Global Action Programme (GAP) on Education for Sustainable Development among other declarations as context.

Background

Negative ecological and social effects of business practices over many decades have been a major driver behind various declarations by international and national institutions to embed sustainability into educational curriculum. These calls for sustainability integration within the context of supply and value chain management can be described as a classic case of practice informing educational curriculum innovation. This is because the total effect of unsustainable supply and value chain systems and networks over decades is serving as the catalyst informing and questioning educational curriculum rational, content and delivery at present. Hence, negative environmental and social impact of corporate practices is driving the necessity to adapt existing educational curriculum which was not designed to promote education for sustainability (see, AASHE, 2010).

Brundtland report of 1987 and the proceedings from the United Nations Rio conference on sustainable development expressed concerns about existing educational provisions on sustainability for the lack of synergy between teaching and learning process and the need of society. Therefore, reforming and realigning the existing curriculum to fully integrate sustainability is an important task for educational institutions and academics. A number of declarations and initiatives of the United Nations have served as building blocks for the integration of sustainability knowledge and skills into curricula for future graduates. These declarations have in diverse ways also spurred support from stakeholders to promote collaborations and resources mobilisation towards fostering education for sustainable development (Shrivastava, 2010).

In summary, these declarations and initiatives seek to signal formal as well as informal education to be able to play a pivotal role in promoting curriculum that will help resolve sustainability challenges in the short, medium and long term. Scholarship on achievement so far is mixed. For example, Shephard (2008) commended efforts made at higher education level to resolve sustainability challenges through curriculum development and enrichment in the last three decades. Contrary, Grindsted (2011) was sceptical about higher education's commitment to incorporating sustainability principles beyond its receptiveness to signing declarations.

The UK government's March 2013 report on Education for Sustainable Development (ESD) UK, sets out its position on UNESCO's Decade of Education for Sustainable Development as follows: *'The UK Government and a wide range of national agencies believe that we need to foster, through education, the values, behaviour and lifestyles required for a sustainable future'* (United Kingdom National Commission on UNESCO report, 2013:5). The report makes key recommendations that acknowledge work done at the national level but points out that there was more work to be done in terms of educational policy and support systems to ensure that education for sustainable development succeed.

Policies and programmes of the United Nations and the UK government provide justification for developing supply and value chain management curriculum underpinned by sustainability principles and delivered with innovative pedagogy to train students. Higher Education Institutions (HEIs) in the UK have responded in diverse ways to these declarations. Of special interest to this background section is how higher education institutions have reacted to the Education for Sustainable Development declaration. Majority of Higher Education institutions in the UK have signed declarations or published statements of commitments to embed sustainability into their existing provisions (Karatzoglou, 2013 and Ramos et al., 2015). To give

meaning to these commitments, several HEIs have begun incorporating sustainability in their curricula (Wals, 2014; Ramos et al., 2015). Many follow up studies however found these efforts were limited in scope and form (Lozano et al., 2013 and Mulà et al., 2017). Fiselier et al., (2018) for example, confirmed earlier assertions by Grindsted (2011) that many HEIs make limited or no effort to influence curriculum change or redesign.

Drawing on the above background, a personal reflection and commentary on the subject will be presented in the proceeding sections of this chapter. As a sustainability and supply and value chain management scholar with over a decade of Higher Education experience in the UK, I have been engaged with various processes including module leadership, curriculum development on sustainability-related modules in four (4) UK universities. Therefore, it envisaged that this reflections and contribution to the discourse on integrating sustainability in Higher Education supply and value chain curriculum is not only timely but will meaningfully engage with readers.

Supply and Value Chain Management and Sustainability in Retrospect

Supply and value chain management activities do not only play a vital role in achieving business objectives but they also have the potential in addressing sustainability issues. The strategic role of supply and value chain management and its potential to contribute significantly to sustainable development is evident through the lenses of academic scholars who have published on the subject mostly from the 1990s to 2018 (see, Touboulic and Walker, 2015, Dubey et al., 2017 and Roy et al., 2018). This section maps the evolutionary pathway to sustainable supply and value chain management by drawing on comprehensive reviews of Roy et al., 2018; Dubey et al., 2017; Touboulic and Walker, 2015, Carter and Easton, 2011 and Seuring and Gold, 2012, to espouse the historical trajectory of the relationship; the ensemble of theories and concepts embraced along the pathway and the future of supply and value management within the emerging sustainability context. The mapping does not seek to offer a detailed critique

of the extant literature but to highlight significant phases of the relationship and interaction between supply and value chain management and sustainability concept.

A lot of interest has been shown in this subject area over the past two decades but there is no evidence supporting a view that scholars gravitated around a central theme at the onset of sustainability concept development. The reason for such a historical pathway could be attributed to the dual focus of scholarship on the subject; with one strand of research focussed on changes in supply and value chain to accommodate sustainability and the other anchoring scholarship on organisational level inference to sustainability, using organisational theories.

Despite the lack of an obvious common theme(s) from the 1990s, Touboulic and Walker (2015) teased out chronologically a set of themes that defined supply and value chain management and sustainability research from 1996 – 2010. Scholarship on the subject was expressed as descriptors or as an additional factor instead substantive definition. This was a key feature of most of the studies undertaken before the year 2000. One of the earlier descriptors was the green supply chain theme by Green et al., (1996). It aimed at drawing attention to a new way of thinking about supply and value chain management, especially industrial procurement from the perspective of environmental sustainability. The ‘green supply’ phase was followed by environmental supply chain dynamics (Hall, 2000). This was the era when the scope of environmental innovation and sustainability discourse had expanded to supplier firm. Hence, the need for customer facing organisations to be engaged with the issue of sustainability. The next phase – ‘green procurement or purchasing’ emphasised the need for supplier organisations to be actively engaged to reduce environmental impact.

Following the initial broadening of the scope of environmental innovation to embrace supplier organisations, the increasing notion for corporate responsibility had gathered momentum among

stakeholders. Consequently, supply and value chain management within environmental management context was viewed to be connected to sustainable development, for as long as businesses were made answerable for social and environmental impacts emanating from their respective supply and value chains. In line with the exigencies of the time emphasis was placed on the need for businesses to place ecological and social factors at the centre of their corporate strategy and extend it to their suppliers down the chain (Wolters, 2003). Two years after Wolters' (2003) recommendation for organisations to embed sustainability at the centre of its operations, Carter (2005) suggested five distinctive facets of procurement social responsibility as: 1) the environment, 2) diversity, 3) human rights, 4) philanthropy, and 5) safety.

By the mid-2000s, integrating environmental thinking into supply and value chain management had been established as a necessity. This trend was epitomised by the strand of literature that emerged from 2005 and beyond. For instance, Srivastava (2007) coined a definition for green supply chain management as the act of 'integrating environmental thinking into supply-chain management, including product design, material sourcing and selection, manufacturing processes, delivery of the final product to the consumer as well as end-of-life management of the product after its useful life'. Similarly, Carter and Rogers (2005) focussed on 'The strategic, transparent integration and achievement of an organisation's social, environmental, and economic goals in the systemic coordination of key interorganisational processes for improving the long-term economic performance of the individual company and its supply chains'.

Recalling the dual historical pathway that characterised integration of sustainability into supply and value chain management, scholars in the late 2000s provided a variety of definitions underpinned by single, dual or multiple sustainability themes (see examples by Eltantawy et al., 2009; Walker and Brammer, 2009 and Spence and Bourlakis, 2009, Tate et al., 2010). Carter and Easton (2011) suggested that sustainability thoughts involving proper management of social and

environmental issues have evolved from what they termed 'standalone' themes, through the notion of social responsibility, and finally to the concept of sustainability.

A middle phase of this uncoordinated evolution of supply and value chain thoughts was characterised by attempts to capture sustainability under the ambit of corporate social responsibility. Environmental and social issues such as diversity, philanthropy, human rights, and safety was positioned under the umbrella of corporate social responsibility portfolio of supply and value chain management research and practice. However, corporate executives perceived corporate social responsibility activities collectively did not yield financial rewards. This economic anxiety of the business sector appears to have been resolved with the inclusion of the triple bottom line of John Elkington (an author, advisor and serial entrepreneur) into developing sustainable supply and value chain thoughts.

It served as unique vehicle to convey the essence of sustainability knowledge and practice to the business sector in the language that businesses understood best – explicitly factoring economic performance. In practical terms factoring the triple bottom line opened many possibilities to organisations. These included cost savings connected to sustainable packaging, material reuse and recycling; lower health and safety costs; financial benefits associated with better working condition such as lower turnover; safer warehousing; reduced disposal costs accruing from the implementation of ISO 14000 standards, amongst many better cost-saving benefits. Carter and Easton (2011, pp. 48) expressed these sentiments as follows: *'Rather than suggesting that firms identify and engage in social and environmental activities which will hopefully help, or at least not harm, economic performance, the triple bottom line explicitly directs managers to identify those activities which improve economic performance and dictate the avoidance of social and environmental activities which fall outside of this intersection'*.

A major consolidation phase in the supply and value chain vis a vis sustainability discourse was

reached after the ground-breaking work of Carter and Rogers (2008) on the prerequisites for a sustainability embedded supply and value chain management. They described strategy, risk management, organisational culture and transparency as factors that could promote or inhibit decision making towards integrating sustainability into supply and value chain management. These earlier studies served as the basis for the current discourse around sustainable development that considers a concurrent consideration of social, environmental and economic factors.

The next generation of sustainability incorporated supply and value chain management studies focussed more on how the integration process can be done effectively. The work of Roy et al., (2018) for example captured the 'how' question quite well with the development of a 'landscape of the principal facets' of sustainable supply chain management. These themes offered a blueprint that is akin to a typical planning process stages which straddle across intention to transit from traditional to embedding sustainability phase, through implementation models, management systems for inter-organisational dynamics and performance to contingency programmes. It is the reason why some supply and value chain management scholars are actively accentuating the call for significant, comprehensive and endearing changes in our approach to supply and value chain management curriculum. It is presently expected that supply and value chain management thinking will effectively factor sustainability to engage current and future students with the requisite sustainability orientation and skills to enable them address successfully the complex economic, ecological and social issues posed by unsustainable supply and value chain management systems and networks. The need to quickly engage education curriculum is fundamentally aligned with the viewpoint that integrating sustainability into supply and value chain management is not a destination, but an on-going endeavour for business and society.

The review of the evolution and scaling-up pathways to sustainable supply and value chain management encourages learners to appreciate the dynamics of supply and value chain management discipline within the context of sustainability. It does prompt students to the fact that integrating sustainability into supply and value chain management curriculum has huge implications for business and society. It is critical for students to appreciate that getting engaged with sustainability discourse will foster resolving an old and growing problem that requires knowledge, passion and creativity. Several drivers have contributed to catapulting sustainability to prominence and key amongst them are the continuous need for raw materials and energy resources, climate change issues and stakeholder understanding and pressure for environmental and the social actions. The intricate nature of sustainability challenges students to recognise the urgency of capturing education for sustainable development scheme within supply and value chain management curriculum.

The Case for Integration: Supply and Value Chain Management Education and Sustainability

Sustainability has gained prominence in higher education and in business schools globally. It has become one of the topics covered in many supply and value chain management modules in higher education. However, it has not been fully integrated into supply and value chain management curriculum. Several reasons account for the lack of urgency on our part as supply and value chain management academics. Firstly, the inertia induced by the need to change a programme designed for a specific knowledge and skills provision in the specialised area of traditional supply and value chain management, to focus on shaping a sustainable business and society threatens scholars' sense of identity. Thus, the need for supply and value chain management curricula to be re-oriented to meet the goal of sustainable education as captured in the Bonn Declaration could be a source of anxiety for established academics in the field, particularly considering the time and resources required to foster multidisciplinary collaboration

with other faculties and industry.

Secondly, there seem to be lack of appreciation that the interrelationships and interdependence between business and society is a critical matter and our passive posture impedes momentum towards integration. Hence, the rather low presence of sustainability in the current supply and value chain management curriculum. Traditional supply and value chain networks have been associated with production oriented systems configured primarily towards achieving economic goals. Therefore, the ingrained assumptions for scholars and practitioners in this field regard economic imperatives for effective and efficient supply and value chain system as an overarching priority over other considerations such as environmental and social issues. Such a perspective impedes the ability and purpose to initiate and pursue business and educational curriculum innovations that captures environmental and social objectives. Therefore, there is the need to challenge our shared philosophical assumptions about the supply and value chains systems within the realities of our contemporary society. It cannot be overemphasised that sustainable supply and value chain management is underpinned by the believe and recognition that supply, value addition and purchasing activities are of strategic importance to corporate survival as well as resolving sustainability challenges.

Thirdly, the challenges associated with the process of sustainability integration across modules, programmes and departments as well as engaging business sector collaborators ought to be recognised. Admittedly, sustainability as an emerging academic field attempts to address a complex challenge with huge implications for business and society at local and global levels. Both Komiyama and Takeuchi (2006) and Blackstock and Carter, (2007) concede that incorporating sustainability into curricula generally is a new discipline that requires deployment of competencies such as ‘systems-thinking, anticipatory, normative, and strategy-building methods in participatory, deliberative, and adaptive settings’ to succeed. In terms of ontological,

epistemological, and methodological paradigms, Brundiers et al., (2010) suggested that the field of sustainability questions the underlying assumptions, values and ethos of established disciplines. Furthermore, internal barriers within educational and business organisations, be they faculties or departments, make it difficult to form and manage effectively partnerships required for curriculum development and its delivery.

Despite these challenges, the sheer level of the potential for positive or negative influence of supply and value chain management activities demands a sense of urgency for incorporation. If our students who are tomorrow's supply and value chain professionals are to subsist with the growing sustainability challenges, we need to appreciate the enormity of the challenge and identify innovative curriculum content and pedagogy to develop their capabilities, through a transformative learning experience.

Grounding Supply and Value Chain Management Curriculum in Sustainability

Beyond developing innovative curriculum content and adopting appropriate pedagogy it is essential to set the right context to engender interest and readiness of students to engage with sustainable supply and value chain management discourse. The public sphere is inundated with sustainability related news and information, and there is evidence of incorporation of sustainability principles into schools' practices and processes. However, students that we meet at higher education level have varied levels of interests and insights about the sustainability agenda. This ranges from very little or greater awareness and understanding of sustainability. The challenge is that students that are aware of the subject mostly do not appreciate the urgency and the implications on personal responsibility. Students tend to have a high preponderance to deny control to act and defer the responsibility for seeking solutions to others. This connotes reluctance to consider major lifestyle changes, even to the point where sustainability values may not influence students' actual behaviours as new professionals after graduation.

To establish the appropriate disposition of Higher Education Students to sustainability, it is important to explain from the onset that the business environment per International Standard Organisation's ISO 14001 consist of the surroundings in which a business operates, including air, water, land, natural resources, flora, fauna, humans and their interrelationships. This serves to raise sustainability discussion out of the domain of undertaken a behaviour change for the benefit of future generations. The shift from shareholder perspective to stakeholder theory is also an important discussion to have with students at the early stage. Drawing students' attention to the growing magnitude of ecological challenges at local, regional, national and global levels is also essential. Citing notable corporate visions that factored sustainability has been another effective means of drawing attention to business sector involvement with embedding sustainability in their operations. For example, John Kirkpatrick, Head of Sustainability, Lendlease Europe's, statement that *'Sustainability allows us to attract and keep talent. And it encourages the best suppliers to work with us'*. Apart from the cost factor, the need for stakeholder collaboration because sustainability is an issue that extends beyond the confines of a single business as far as supply and value chain management is concern, generates interesting debates for helpful deliberations among students.

Sustainable Supply and Value Chain Management Concept

There is a need to showcase to students the cardinal changes in theoretical approaches over two decades in the speciality and operations of traditional supply and value management due to the emergence of sustainability. Rightly capturing the trajectory of the strategic shift to sustainable supply and value chain management (SSCVM) will demonstrate to students the centrality of purchasing, supply and value addition activities to long-term business performance and resolving sustainability challenges. It is important to acknowledge that there is no consensus on definitions of sustainable supply and value chain management in the extant literature because of the

complicated nature of the subject and the inherent challenges associated with developing a common framework across different industries (Pullman et al., 2009). It is also important to explain to students that value chain concept builds on supply chain principles and both have sustainability implications.

An important distinguishing feature of the various conceptualisations on sustainable supply and value chain management that integrates the triple bottom line worth highlighting to students is the debate as to whether management's engaging in sustainability is discretionary or mandatory. It is prudent to encourage students to keep the meaning of sustainable supply and value chain management open and be receptive to new ideas that will emerge from areas yet to be explored.

Curriculum Development for Sustainable Supply and Value Chain Management

Higher education curriculum design and management is subject to programme development policies and procedures. Business schools in the UK must ensure compliance with the set policies and procedures crafted based on the Quality Assurance Agency (QAA) for Higher Education framework. The subject benchmark statement for business and management defines what can be expected of a graduate in the subject, in terms of what they might know, do and understand at the end of their studies. These are the guidelines that were followed in the three cases of embedding sustainability into supply and value chain management modules at undergraduate (year 1 and year 3 respectively) and postgraduate (MBA) levels, that is reflected upon in this section.

The first-year mandatory 'Introduction to Sustainable Logistics and Supply Chain Management' module captured the essence of sustainability as a central plank of today's supply and value chain management education and business management. As an integral part of a BSc Logistics and

Supply Chain Management programme, the module was designed to encourage students to be critical and engage with sustainability as they progressed along a pathway that expanded the scope of supply and value management topics beyond year one topics such as: Introduction to sustainable logistics and supply chain planning; sustainable purchasing principles and process; sustainable transport fundamentals; green facilities design and management, etc.

The third-year specialist pathway module 'Sustainability for Supply and Value Chain Management' was optional. The main import of the module was to emphasise employee, managerial and personal responsibility for sustainability across the supply and value chain management discipline. A conscious effort was made to derive practical sustainability implications cases from the topics covered as part of the module delivery. Industry stakeholder speakers were drafted in to deliver sustainable supply chain management and sustainability innovation topics. The guiding principle was to prepare students to appreciate the need to be involved with the sustainability agenda at the level of an employee, a manager or an individual after graduation. As an optional specialist module in year three, emphasis was placed on critical thinking and employability skills such as developing environmental management and social objectives for a supply chain facility and/or logistics schemes.

The Global Logistics and Supply Chain Management MBA pathway module 'Corporate Strategy and Sustainability' fully encapsulated the idea that the success of an organisation's supply and value chain management programmes is dependent on the extent of integration of sustainability into their systems. This MBA module was important to prompt students who were all professionals from different fields of endeavour about the urgency for sustainability intervention from corporate executives. It also factored the need for students to have professional and transferable skills to begin to make an impact even whilst on the programme. Part time MBA students were encouraged to integrate sustainability criteria into a familiar supply and value chain

process at work while full time students were provided an avenue to undertake a similar project with the University's procurement, human resource and operations departments. The real-world project to design a strategy for effective management of sustainable supply or value chain, from input supply to final consumption was supported by respective industry partners.

All the modules had preamble which typically read as follows (with slight changes depending on the module, the level and its unique focus):

This module (Introduction to Sustainable Logistics and Supply Chain Management / Sustainability for Supply and Value Chain Management / Corporate Strategy and Sustainability) is designed and delivered to ensure that students are enabled to examine the domain of supply and value chain management thoughts from sustainability perspective. It seeks also to develop students' capacity to adapt sustainability thinking to specific supply and value chain management contexts through interactive teaching and learning sessions, using study activities such as mind mapping, real-world learning projects, case studies, sustainability agility dairy completion, blended learning, etc to develop relevant and appropriate knowledge, competencies and skills for academic and professional careers in supply and value chain management. The module design, delivery and assessment promotes a strong knowledge and research skills acquisition by supporting individual and group learning during lectures, tutorials and group work sessions. The module topics are selected and systematically delivered to draw attention to resource limitation and increasing ecological and social challenges to encourage current and future supply and value chain management professionals, managers and staff to fully engage with sustainability. The overall purpose of the module is to promote concurrent consideration of economic, social and environmental factors (triple bottom line) to achieve effective, efficient and sustainable supply and value chain management.

Like other business and management modules these sustainability embedded modules were designed with knowledge and understanding as well as skills and attributes learning outcomes. Thus, typical learning outcomes among others set across the three modules, as presented below indicate a variety of outcomes with some more suitable of the introductory module, others

match the aim and objectives of the third-year undergraduate module and some suitable for corporate strategy and sustainability MBA module:

Examples of knowledge and understanding learning outcomes include:

By the end of the module, students should be able to:

1. *Define and explain sustainable supply and value chain management concepts,*
2. *Distinguish between traditional and sustainability embedded supply and value chain management,*
3. *Describe some of the fundamental elements of sustainability embedded logistics and supply and value chain management systems,*
4. *Provide critical awareness of the methodologies used to determine the extent to which a given logistics and supply and value chain system is sustainable.*
5. *Provide a basic understanding of the science of sustainability and its interphase with social discourse for policy intervention and regulation as it influences logistics and supply and value chain management.*
6. *Examine sustainability principles that underpin strategies to achieve sustainable supply and value chain management,*
7. *Identify the range of activities in logistic and supply chain and derive their sustainability implications,*
8. *To gain an understanding of sustainability innovation in logistics systems and supply and value chains and appreciate their usefulness in providing a competitive advantage to the business,*
9. *Understand the drivers for a strategic approach to sustainable supply and value chain management,*
10. *Appreciate the value of sustainable collaboration within supply and value chains*
11. *Identify strategies for partnerships and collaboration with industry, governmental and educational partners, etc*

Examples of skills and attributes learning outcomes include:

By the end of the module, students should be able to:

1. *Investigate the role and responsibilities of stakeholders including supply and value chain managers, entrepreneurs, international institutions, governments, consumers, educational scholars in promoting viable and successful sustainability embedded supply and value chain systems,*

2. *Become more critical in tackling complex sustainable logistical and supply and value chain decision problems,*
3. *Design a strategy for effective management of sustainable supply or value chain, from input supply to final consumption,*
4. *Plan and work individually and as a team member to resolve a real-world sustainability challenge associated with supply and value chain management,*
5. *Evaluate the management of a sustainable product's life cycle 'from cradle to grave' using reverse logistics principles,*
6. *Apply research skills to retrieve, review and critique sustainable supply and value chain management journal articles and industry reports and regulatory information on environmentally and socially sound strategies,*
7. *Demonstrate an ability to critically evaluate current supply and value chain management practices and recommend areas for potential sustainability principles integration,*
8. *Produce a well-written, referenced and supported academic report on contemporary supply and value chain management with the context of sustainability,*
9. *Gain a valuable experience at group work and oral presentation on selected sustainable supply and value chain management issues,*
10. *Take responsibility for active and personal engagement with sustainability activities on campus (year 1 and 3) or as a supply and value chain management professional (MBA level), etc.*

Pedagogy and Delivery Methods

The underlying rationale for integrating sustainability into supply and value chain curricula at higher education is to engage students with sustainability mind-set and influence positive actions

through the provision of a comprehensive array of sustainability competencies. The goal is to facilitate learning to ensure that module and programme aims are fully met. However, it is also essential to ignite a lifelong learning ethos to prepare students to pursue more sustainability knowledge and skills in their professional careers. To realise this vision and objectives our teams (in all the three cases for year 1, 3 and MBA level curricula), have followed a transformative, participatory and collaborative pedagogical paradigm with emphasis on critical thinking and analysis of the interphase between supply and value chain management and sustainability; drawing on real-world cases to engender strategic sustainability initiatives and to highlight the centrality of personal involvement.

To ensure that students are challenged to engage actively, think critically and reflect on their own and external perspectives, our teams used cohort group lectures and tutorials delivered by interdisciplinary teaching group, project and problem-based learning, mind mapping concept, case study and virtual learning environment (studynet, moodle, blackboard, etc). These were complemented by online materials, module updates, audio-visuals and the novel sustainability agility diary that encourages students to record industry news updates with sustainability implications. Students are encouraged to write their personal reflective commentary on the news items recorded to be presented at the end of the course. Invited guest lecturer provide understanding of the practical supply and value chain management context within which integrating sustainability principles occur.

Students at all levels have found the simple activity for meeting sustainability goals through partner or supplier selection exercise interesting and insightful. They are set a task to identify a real-world case for partner or suppliers' selection. The next step is for students to set the relevant economic, environmental and social objectives and use them as a benchmark to assess potential partners or suppliers using a scaling system. Final selection is done based on partner or supplier

ranking. Mind mapping about how to differentiate between traditional and sustainability embedded supply and value chain management systems has proven popular with undergraduates. Grant, David B., Alexander Trautrim, and Chee Yew Wong. 2013. *Sustainable logistics and supply chain management: Principles and practices for sustainable operations and management*. London; Philadelphia; Kogan Page Limited, has also been an important recommended reading for these modules.

A cardinal principle adhered to by the team is a commitment to continuous review of pedagogy and methods, particularly to reflect any higher education policy change, and factor feedback and recommendations from students, delivery team and external examiners. The next section covers how sustainability is integrated throughout the supply and value chain management curriculum.

Reframing Supply and Value Chain Management in Sustainability

The embedding process starts with an introductory session on sustainability as a general ‘new business’ concept to generate interest and map students’ previous knowledge and understanding on the issue. Subsequent sessions are tailored to reframe supply and value chain management curriculum in sustainability. This process normally commences with sustainability embedded definitions of supply and value chain management followed by a discussion on sustainability implications of the key motives behind supply and value chain management, such as value proposition as a competitive factor and responsiveness versus efficiency issues. Typical topics from which sustainability implications are derived include logistic systems, supply and value chain, facility location operations, distribution including transportation, inventory schemes, sourcing, procurement, technology, value chain design, organisational and governance structure, supplier and customer relationship management, demand management and supplier chain partnerships.

A key point that is emphasised to students is the need to take a strategic approach to have a comprehensive plan to integrate sustainability across the entire supply and value chain systems and networks to avoid partial efforts becoming counterproductive. While the supply and value chain management curriculum area is broad with multiple sustainability implications it does highlight the need for stakeholder engagement beyond a specific business to properly deal with sustainability challenges associated with supply and value chain management—a point that is emphasised to students.

Concluding Commentary

There are several factors driving the rise to prominence of sustainability - natural resource depletion, climate change issues, stakeholder interest amongst others. The evolutionary pathways to scaling up sustainable supply and value chain thoughts and management of social and environmental issues took a complex and unstructured route. Thus, arriving at a consensus to integrate sustainability was rather driven mostly by external pressures beyond scholarly ambition within the field. On the part of industry stakeholders there is the realisation that 'green' supply and value chain management is an important strategic objective for organisations looking for multiple benefits from sustainability embedded operations. These benefits could reflect in the form of cost savings, stronger brand recognition and competitor differentiation (Roehrich et al., 2014).

It is common knowledge that supply and value chain managers and professionals are critical actors with the potential to produce either positive or negative sustainability impacts through their supplier collaborations and selection, warehousing and plant operations, transportation and carrier services chosen and product package selection. But the requisite sustainability embedded curriculum to continuously provide the needed sustainability conscious human resource is lacking. Indeed, Silvestre (2015) opined that integrating sustainability into supply and value chain

management is not ‘a destination’, but an ‘endless journey characterized by trajectories of progress’ as a result of the complex, radical and evolving nature of the issues at play.

Higher education institutions as agents of change have in principle recognised the need to promote more sustainable futures through curriculum development and delivery. Indeed, higher education institutions are a major stakeholder toward the realisation of UNESCO’s Global Action Programme (GAP) on Education for sustainable. However, their commitment to implement the declared principles of sustainability into curriculum has been questioned because the integration process seems to lack momentum. A complete adoption of sustainability into management curricula (integration) has not been the popular option attempted in many higher education institutions. What has been done in most cases is the superficial bolted on approach that is characterised by the delivery of a set sustainability-related topics as supplementary information to the subject matter of a given business management discipline.

An effective supply and value chain management curriculum that provides a shared understanding of sustainability concept and its implications for current and future business practice, with the requisite knowledge and skills to challenge students and encourage critical approach to supply and value chain management discipline and practice is urgently required. The kind of curriculum that will foster ‘sustainability literacy’ (Stibbe, 2009), which entails applying interactive learning methods that are fundamentally different from traditional rote learning, to engage students in actual life problem solving projects needed in a resource finite and ecologically challenged world. It is the most potent vehicle to build the capacity of future business leaders who will go on to create sustainability innovations that will factor ecological and social goals that are viable and profitable.

Whereas, all stakeholders are convinced of the need for urgent accommodation of sustainability

in the curriculum, it is important to point out that higher education institutions particularly in the UK are also working to satisfy competing interests of meeting the immediate need of students and developing and delivering a curriculum that addresses the needs of the general society. The integration is also inhibited by the sheer diversity of the field of sustainability and the absence of tried and tested adaptable pedagogical models for curriculum design (Stephens and Graham, 2010). The lack of consistency in the application of the integration concept and the limited leveraging across the three domains of educational philosophy - curriculum design, teaching and learning (Figueiró and Raufflet, 2015) is another challenge.

Despite the prevailing challenges to integration, supply and value chain networks are still responsible for a greater proportion of the adverse ecological and social impacts from business operations. Again, the globalised nature of distribution channels has complicated the effects of supply and value chain networks on the environment and socio-economic development across the world. It thus highlights sustainability innovation as both a competitive factor and sustainable development variable. Higher education institutions are expected to equip students to be able as graduates to creatively and successfully navigate the complex sustainability challenges associated with supply and value chain management. Therefore, a set of clear, distinctive, deliberate efforts to fully embed sustainability into supply and value chain management curriculum for students' development is an urgent matter.

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