

briefing

Integration of industrial sustainability into business decision making using supply network design tools

Introduction

It is widely recognised that industrial systems have been a major driver in raising the standard of living around the world, however it is also understood that manufacturing systems are a major influence on the global environment. Businesses, governments and consumers are beginning to react but the complexity of the problem and diversity of views makes it difficult to identify acceptable courses of action to address these issues. In response to these concerns many organisations have increased their level of reporting on sustainability.

The challenge to industry

Industry has a myriad of external sustainability challenges arising from customers, suppliers, consumers, regulators, NGO's etc. Internally parts of its organisation may be at different stages of sustainability development, and may be subject to different sustainability pressures. Meanwhile there is a need to deliver against a common policy and have a clear strategy to deliver over time. How then to pull all these apparently conflicting requirements together to produce a coherent sustainability strategy and plan for the organisation?

Additionally, and assuming that the foregoing has been answered, how does one best integrate sustainability into supply network designs within the organisation such that sustainability becomes an integral part of the decisions that need to be taken and not merely a compliance reporting tool? The automotive industry in particular faces pressure on a number of regulatory and fiscal fronts globally to integrate the improvements in CSR metrics with not only new product specifications and production process technologies but also in the way in which the manufacturing and assembly plants are integrated in a way which gives the most sustainable and efficient configuration.

The key question which arises is how to fully integrate industrial sustainability into decision making related to those manufacturing systems. The Centre for International Manufacturing (CIM) has initiated a project designed to address this question, through the incorporation of energy, waste and recycling elements into the existing mapping tools used to understand the configuration and capabilities of global value chain and their supply networks. Currently we are working with a global automotive manufacturer and an equipment and service provider on projects to develop tools for industry, and will be developing cross-sector consortia in 2011.

Supply network design tools

The understanding of the importance of supply networks as a critical element of the industrial system has developed significantly from the original functional concepts of logistics and supply chain management. At the same time, changes in the industrial landscape arising from the twin impacts of globalisation and the dissolution of the vertically integrated value chain has led to the understanding that to be truly competitive, innovative and to operate in a sustainable manner, the supply network must be a key source of leverage. Numerous studies have shown how both competition and innovation are linked to a number of critical parameters of the supplier network configuration, for example in terms of its complexity and interactions with production dynamics. In contrast, the concept of the sustainable supply chain has traditionally been understood in terms of cradle to grave (or cradle to cradle in some more recent re-usable life cycle applications) operations management and life cycle analysis and not considered from the network perspective. Recent work in CIM has demonstrated how supply network configuration can influence the capability and performance of firms. Supply network configuration



may be described in terms of four primary constituent elements, namely the network structure (upstream and downstream); the relationships and governance between network partners; the dynamics of the flow of materials and information between firms; and the way in which the product itself is configured. Initial work examined the ways in which the configurations of these elements were linked to the relative performance of the firms involved, across a range of disparate industrial sectors. More recently, the applicability of supply network configuration theory analysis has been demonstrated in the domain of emerging industries, through exemplifying how successful industrial emergence can, in part, be understood through the ability of key focal firms to reconfigure their supply network to insert successfully into an emerging value chain. Additional work related to reviewing the capabilities allied to the use of maturity models required to support different supply networks has provided powerful tools for the academic or industrial practitioner to interrogate and analyse supply networks to deliver desired business goals.

Sustainability

The imperative to address the sustainability agenda over the coming decades has been described as one of the greatest challenges for the human race. The combined pressures of rapidly expanding population with increasing expectations of standard of living are at present mutually incompatible. This

is not a static situation - the population is increasing monotonically, as are people's expectation for increased standards of living.

In response to these concerns, many manufacturing businesses, in particular larger Multi National Corporations (MNC's), are on an ever increasing basis reporting their sustainability performance. Some reports go well beyond compliance reporting and an increasing number are using third party reporting structures e.g. the Global Reporting Initiative (GRI). The UK government's Carbon Trust Initiative, and support for Carbon Trading schemes, etc. are all beginning to shape the terrain over which business conduct themselves to addresses the sustainability agenda. National initiatives such as the PAS 2050 footprinting specification have been derived and gained international validity. Recent years have also witnessed an increasing body of literature dedicated to the sustainable supply chain. One of the key ideas which have come to the forefront of corporate thinking in the last decade is that of the triple-bottom line (TBL). This concept is designed to act as a mechanism for integrating the environmental, economic and societal impacts of the industrial system. There is however still debate on how this can be implemented and measured in practical terms by industrial practitioners. A fully integrated TBL reporting framework would be the desired goal of most companies, however at a practical level focussing on a particular element of the industrial system, such as energy utilisation or carbon footprint, may be a more accessible option, the successful execution of which would form a robust basis for approaching full TBL reporting.

Methodology

The questions posed from Industry guide the methodology being developed by CIM. To address the question of developing a sustainability strategy and plan, a meaningful segmentation of the focal organisation is considered, according to the business and sustainability challenges being faced.

Secondly the application of a maturity approach to carefully evaluate present sustainability performance and identify the preferred future performance is being evaluated. Gaps, together with practical plans can then be identified. Maturity modelling is a well establish technique widely used in the IfM e.g. supply chain networks, engineering networks etc. Through these two approaches it is anticipated that meaningful sustainability strategies can be evolved in complex scenarios.

Turning to the second industrial question concerning integration of sustainability into supply network designs we will adopt



an approach based upon IfM tools to map the supply network configuration and capabilities of nominated networks. We will then use an Energy (E), Resources (R), Waste (W), and Carbon (C) approach progressively to build sustainability into the supply network design. We will extend the use of the ERWC approach at the plant level to cover the network, starting with the Energy dimension.

Projected programme outputs

The anticipated outputs from the project will firstly be based upon segmentation and maturity modelling, to define a sustainability strategy in complex scenarios. Secondly we will define how to integrate sustainability parameters into decision making about supply network design such that sustainability is fully considered at the design phase.

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