



Supply chain learning

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Supply chain learning ¹

Innovation is a multi-player game and one of the ways in which it can arise is through various forms of co-operation and learning across supply chains and networks. In this case pack you can find a number of examples of supply chain learning in practice.

As you work through – and add your own insights and research – you might like to reflect on these core questions:

- How well do they manage this aspect of innovation? Although you might comment more generally about other aspects of their business try and keep the focus tight.
- What are the key ‘routines’ – embedded behaviour patterns – which help them do so?
- What do they do well and from which others might learn?
- What could they improve upon, where could they develop their innovation

management routines further?

- What lessons does this case offer to organizations wishing to improve

innovation management?

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1. [Supply chain learning – a deep dive report](#) (below)
2. [Toyota’s strategic use of supplier networks](#)
3. [Hype case study of OSRAM supply chain innovation programme](#)

¹ This Deep Dive is based on research carried out by Richard Lamming, Raphael Kaplinsky and John Bessant.

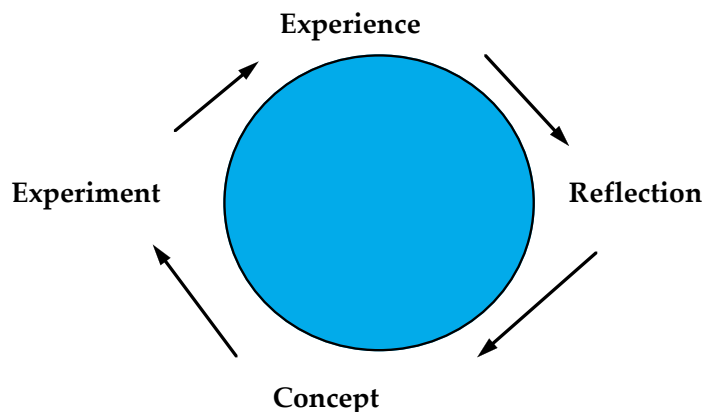
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How organisations learn

There is much discussion of how learning takes place in organisations, including the following:

- learning can be viewed as a cyclical process (see figure 1), involving a combination of experience, reflection, concept formation and experimentation
- learning is not automatic - there must be motivation to enter the cycle
- learning only takes place when the cycle is completed - thus much effort and activity in one or more quadrants may not lead to learning
- learning needs to be purposive and can be supported by structures, procedures, etc. to facilitate the operation of the learning cycle
- learning to learn - meta learning - is an important aspect of this - learning to design and operate learning systems
- learning involves the accumulation and connection of data into information and knowledge
- learning involves both tacit and formal components, with the task being to capture and codify, to make explicit
- learning may take place in 'adaptive' mode - learning to do what we do a little better - or it may involve reframing and radical change (what some writers term a 'paradigm shift') in which the perception of the problems to be solved and the potential set of solutions change

Figure 1: Kolb's cycle of experiential learning



Who does the learning?

The basis of most learning literature is in individual learning but recent years have seen a strong focus on the concept of 'learning organisations'. There is much debate about whether organisations themselves actually learn or whether it is simply the individuals within them which do. However it appears that learning organisations can exist, and key features of this discussion include the following:

- individuals carry out the learning processes but the organisation provides the context in which this takes place - and some environments are more conducive than others to enabling learning
- individuals interact and share knowledge and this can become part of the organisational culture - the pattern of shared concepts, values, beliefs, etc. This culture is an artifact of the organisation and, where strong, can survive the departure of individuals and the entry of new individuals who become socialised into it. Thus we can speak of an organisation learning and having some form of memory where its learning accumulates and which guides its subsequent behaviour
- much of the culture lies in the informal and tacit realm, but attempts can also be made to capture and formalise knowledge learned in this process. For example, formal programmes of directed experiment and reflection (R&D) can lead to increased codified and tacit knowledge - the technological competence of the firm. Equally programmes which attempt to capture tacit knowledge in exemplified procedures also contribute to making tacit knowledge explicit - e.g. in ISO 9000.
- several mechanisms appear to help with this process of sharing and making knowledge explicit; these include exchange of perspectives, shared experimentation, display, measurements, etc.. At their heart they represent ways of supporting and developing a shared learning cycle.

Problems with learning

Learning is not automatic and there are a number of points at which learning fails to happen unless a blockage is dealt with. This is as true for individuals as it is for firms working in isolation or as part of a supply chain. For example, many firms stumble at the first hurdle by failing to recognise the need to learn, or else by recognising the stimulus but choosing to ignore or discount it. Others may recognise the need for learning but become locked in an incomplete cycle of experiment and experience, with little or no time or space given to reflection or to the entry of new concepts. For others the difficulty lies in organising and mobilising learning skills, whilst in other cases the difficulty lies in making use of the rich resource of tacit knowledge - things people know about but are unable to describe or articulate. Table 1 summarises the key blocks to learning; we will return to this in our analysis of SCL below

Table 1: The key blocks to learning:

<i>Learning blocker ...</i>	<i>Underlying problem</i>
Lack of entry to the learning cycle	The motivation problem
Incomplete learning cycle	The completion problem - understanding and support for all phases
People don't know how to learn	The skills problem
Learning is tacit, hidden, informal	The elicitation problem
Search for new solutions is too localised	The parochial/ not invented here problem
Reflection is undemanding	The challenge problem
Learning is infrequent, sporadic	The reinforcement /reward problem
Learning is not shared but localised	The sharing problem
Learning is not sustained	The motivation problem....

Intra and inter-organisational learning - can networks help?

Most of the learning literature relates to intra-organisational processes but there is a strand concerned with inter-organisational learning - learning with or from others. The advantages associated with this approach are similar to those which relate to group/inter-personal learning, and can address the problems identified above.

The potential benefits of shared learning include the following:

- in shared learning there is the potential for challenge and structured critical reflection from different perspectives
- different perspectives can bring in new concepts (or old concepts which are new to the learner)
- shared experimentation can reduce risks and maximise opportunities for trying new things out
- shared experiences can be supportive, confirmational,
- shared learning helps explicate the systems principles, seeing the patterns - separating 'the wood from the trees'
- shared learning provides an environment for surfacing assumptions and exploring mental models outside of the normal experience of individual organisations - helps prevent 'not invented here' and other effects

Thus it is possible to argue that there may be value in designing and building networks which offer some form of additional traction on the learning process which organisations need to operate. One version of such networks is the supply chain.

The notion of a network or supply chain may be interpreted as hierarchical or flat. That is to say, a firm may see themselves as above a 'supply base' (hence the expression, to "go back down the supply chain") or as one player in a sequence of (value adding) steps that results in a product or service being brought to market. For a network, a firm might believe itself to be 'focal', i.e. in the centre with a commanding role, or just one player in a 'team' or firms, brought together for a specific purpose, e.g. to produce a product. In the first case there is a real danger of the firm believing its role is to teach its subordinate partners – a position that leaves it unprepared to learn. This represents 'waste' in the supply chain – the unexploited learning available to the customer in the supply process. We shall return to this problem later.

Supply chains as an option for enabling learning

There are a number of reasons for suggesting that supply chains could provide additional support for learning:

- They involve an identifiable group of firms with a common concern – the competitive performance of the entire chain will depend on the extent to which all members can learn best practice
- There is the potential to deal with the motivation problem highlighted in table 1. Here firms can be encouraged to enter the cycle by both reward (the potential of shared gains in the event of successful upgrading) and sanctions (with increasing emphasis on preferred suppliers, those unable to reach the mark may be dropped)
- There is potential scale economy, where learning can take place across many firms sharing the same concerns and needing the same type of learning inputs
- Major players in the chain – for example, supply chain 'owners' as end customers – are often near the 'best-practice' frontier in terms of their exposure to global standards and competition. They can act as teachers and examples.

In practice, however, there are important limitations to applying this concept:

- We need to be clear about the existence of different types of supply chains
- We need to recognise that learning is not a natural feature of supply chains. It is part of the emergent 'new' models for such inter-firm arrangements which stress trust, co-operation and mutual dependence, and without such underpinning values it is unlikely to happen
- We need to recognise that supply chain learning depends on active 'governance' of the supply chain – managing it as an entity
- We need to expose and solve the problem of the self appointed 'teacher' that is not prepared to learn from the interaction with supposedly subordinate firms.

For this reason we will look briefly at defining our terms more clearly.

Supply chains in the context of inter-firm networks.

Supply-chains represent a specific type of inter-firm cooperation. As can be seen from Figure 2, it is possible to distinguish between two elements of inter-firm cooperation - between single firms (bilateral links or 'dyads')/many firms (multilateral links or 'networks'), and between firms in the same sector (horizontal links)/firms in a supply chain (vertical links). Policies designed to promote inter-firm cooperation need to distinguish between these various forms of cooperation.

Figure 2: Modalities of inter-firm cooperation

	Horizontal	Vertical
Bilateral	Strategic alliances	Partnership sourcing
Multilateral	Industrial districts	Supply chains

Source: Adapted from Schmitz, 1997.

Passive and active participation in value chains

Except in the most simple cases, firms are linked in input-output relations, purchasing inputs from other firms, adding value, and then selling these products and services to other firms or to final customers. Traditionally, *these links were characterised by arms-length relations*, with no attempts to capture the potential advantages of systemic integration.

Then, with the development of new forms of obligational relations, there has been an increasing evolution of *various forms of purposive behaviour designed to enhance systemic efficiency along the chain* to achieve what Schmitz calls “collective efficiency”. In the early stages this was focussed on quality assurance and the integration of logistical scheduling, but as this supply-chain cooperation evolved, so the focus has changed to include cooperation in design. Until recently this has been the cutting-edge of supply-chain cooperation, but in very recent years supply-chains have also come to be seen as a mechanism to promote learning, including indirect suppliers – one or two positions removed from the protagonist in the supply chain (in hierarchical jargon, the second – and third – ‘tiers’ of suppliers. In fact tiers, with lateral as well as hierarchical positional links, do not appear to exist widely except in Japan and Korea).

Thus, over time, there has been a growing awareness of the advantages to be gained in moving from passive to increasingly active participation in supply-chains. The most active form of participation is where firms cooperate to promote the capacity to learn along the chain.

Value chain governance

As we have noted above, this active cooperation is usually *led by a dominant party, a function which is termed “supply-chain governance”*. There are, of course (as will be shown in the following section) various styles of governance, ranging from the dictatorial imposition of standards by the “governor” to softer forms of exhortation. To some extent these differences are a function of firm-style (see below), but in other cases they reflect the type of value chain which is involved.

It is possible to distinguish *three major types of value chains*:

1 Buyer-pulled chains. These are chains in which the coordinating function is performed by a large buyer directly serving a final market. In the UK context, leading buyer-driven chains include those led by supermarkets such as Tesco, and retailers such as Marks and Spencer and B&Q.

2 Supplier-pulled chains. In these chains, the coordination function is performed by a firm holding core designs or technology. The most well-known cases here are some of the automobile companies who coordinate logistics, quality, design and learning along their own supply chains, being themselves suppliers (i.e. of vehicles or ‘personal transportation’) to the eventual customer.

3 Supplier-pushed chains. Holders of core technologies and designs may also push change upwards to customers, both intermediate and final consumers of their products. An example of this is provided in the personal computing field with hardware producers such as Intel and software producers such as Microsoft seeing their customers (e.g. IBM) as parts of their ‘downstream’ supply chain – a distribution channel.

Types of ‘best practice’ learning – what has to be learned?

In considering the potential for supply chain learning we need to recognise the different components which make up apparent 'best practice' and which might be transferred via this mechanism. These range from relatively simple, incremental additions to a current knowledge set – for example, new regulations – through to complex new approaches which will involve experiment and adaptation.

Work by the Tavistock Institute examining 'learning networks' in the construction industry suggest a distinction between 'operational learning' and 'strategic learning', where:

- Operational learning is when an organisation tackles problems by applying established models or ways of thinking. This tends to give rise to incremental improvements to existing ways of doing things.
- Strategic learning is when an organisation approaches a problem with a completely new model or way of thinking. The learning is about a fundamentally different way of doing things.

The distinction is important in the context of 'best practice' since much of what needs to be transferred is often of a 'strategic' nature in these terms. The problem is exacerbated by the fact that not all the relevant knowledge will be available in codified or embodied form (as in a manual or a new piece of equipment). Instead much of it will be tacit in nature, something which is difficult to communicate and articulate and which often can only be learned through experience and practice.

If we look at the blocks to learning identified in table 1, many of these are manageable through existing intra-firm processes at the level of operational learning. However strategic learning is likely to pose problems – for example, the tendency to search for solutions within the existing frame of reference will act against the reframing necessary for radical change. In practice this gives rise to the well-known 'not invented here' effect.

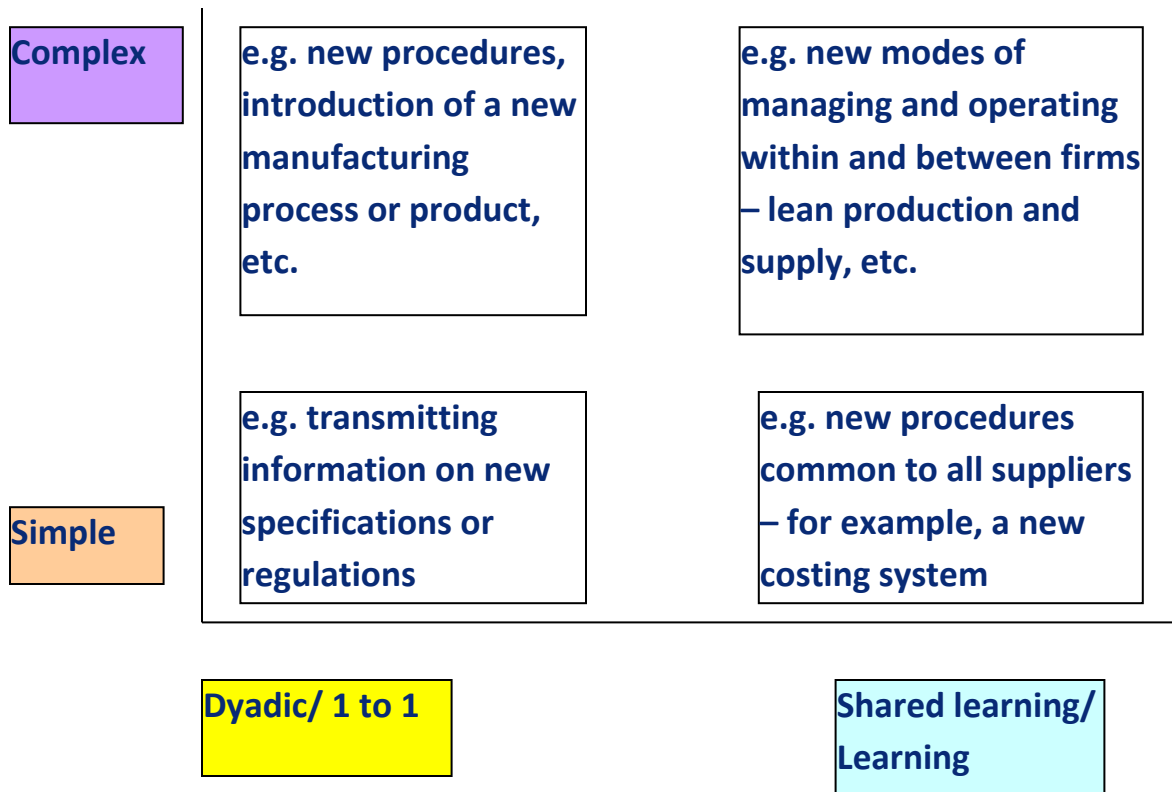
Arguably SCL can be applied to both types of learning but whereas much operational and codified learning can be transferred through simple and often one-way communication along the chain, strategic and tacit learning may require more active (and interactive) intervention.

Modes of supply chain learning – how it is learned

In similar fashion we need to recognise that there are different modes in which supply chain learning can be enabled. At one level it can involve a one-to-one relationship between two players in a chain – for example, a customer and a key supplier. At the other end of the spectrum from such dyadic relationships are multi-firm groupings – clusters or networks – where there is some element of shared learning - for example, a supplier club involving all or a large proportion of suppliers to a particular firm. In between we might have gradations – for example, into levels of multi-firm involvement (such as a customer firm working with a group of two or three suppliers to develop a new way of working. An example of this is provided by Guinness, who developed their 'real-time supply techniques, working with a bottle producer, label manufacturer and packaging suppliers).

Linking these two frameworks, we can construct a simple matrix (Figure 3) which highlights the different modalities under which different forms of SCL might be used. In this model simple dyadic relationships may be sufficient for operational learning but some form of learning network with shared learning features may be more important in more complex strategic learning.

Figure 3: Different learning types and modes in supply chains



Emergent themes

In this section we try to bring out some of the common themes in what is still a diverse set of experiments towards making use of supply chains and networks to facilitate learning. Key themes seem to be:

- supply chains do not automatically involve learning – and the ‘gap’ between what is claimed for supply chains and what actually happens is part of the bigger problem of rhetoric vs. reality in the emergence of new supplier relations
- different types of supply chains, as characterised by the prime function of governance (buyer-pulled, supplier-pushed and supplier-pulled) probably experience different pressures towards SCL, both in relation to the breadth and depth of learning capabilities.

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- supplier-pushed SCL appears to be the least-developed of these three forms of supply chain governance, and may be a particular area of market failure. the propensity for SCL is in part affected by the critical success factors prevailing in each industry, as well as by differences in corporate strategies amongst key “supply chain governors”.
 - where it does happen there are significant differences in approaches by different firms – even within the same sector. Some are clearly - and measurably - more effective than others.
 - there is no single model for a ‘learning supply chain’ but rather a need to adapt and design appropriate learning programmes. For example, some best practice learning is simply a matter of adopting a codified set of rules (for example ISO9000) whereas other aspects (e.g. kaizen) require extensive in-company experiment and practice. There are several influencing variables here, including timescale and type of learning involved.
 - whatever the configuration of a particular learning network or chain it is clear that it does not emerge by accident. Our cases suggests some emerging ‘design rules’, and a valuable further step in research would be to try and draw these out more systematically from particular case examples.

Blocks and enablers

Our initial review of experiences reported in the literature suggests that there are several factors which have an influence (positive or negative) of the successful design and operation of SCL.

Enabling factors

On the positive side, factors which appear to influence learning effectiveness within supply chains include:

- network design organisation and management (e.g. the SMMT Industry Forum)
- presence of a ‘strong buyer’ – for example, in the auto industry the role played by the buyer may be critical. Suppliers can do a great deal themselves in getting their own operations in order, but incoming materials are often a dominant proportion of costs, and this needs working with 2nd and 3rd tier suppliers. The “governance” activities of buyers – with their power to buy in bulk and to “knock heads together” where this is appropriate – are critical to value chain efficiency. The strong buyer, however, may need to examine its own attitudes to the exercise in order to ensure that it learns too
- active facilitation of learning (and the relevant skills and resources to support this)
- the role of external intermediaries (business associations, universities, Industry Forum, Regional Supply Networks, etc.)

- development of learning clubs and clusters which capitalise on the advantages of shared learning
- active intervention over a sustained period (not just the ‘honeymoon’ effect)
- targetting, monitoring and measurement of learning outcomes an extensive ‘learning agenda’ or ‘curriculum’ over an extended period of time (rather than a ‘one hit’ programme)
- interventions designed to address initial motivation and all four aspects of the learning cycle. For example, in the auto components sector, suppliers observe that they learn little from formal workshops and lectures, other than in the meal- and tea-breaks when they get the opportunity to talk to other suppliers. Instead, learning is maximised when five conditions are satisfied:
 1. when pedagogy is experiential and based on practical and tacit simulations, games and role-playing
 2. from visits to other plants when internal expertise is used rather than consultants
 3. from networks, but only when these are clearly focussed and when the right people attend
 4. when there is prior culture change in which work-cells “own” their work environments first; ‘parachuting-in’ changes (for example, in some of the Industry Forum interventions) do not lead to durable changes and degradation is frequent.
- multiple parallel approaches and support mechanisms

Blocks to effective supply chain learning

On the negative side, it is worth reminding ourselves of some of the key blocks to effective learning which were identified earlier in table 1:

<i>Learning blocker ...</i>	<i>Underlying problem</i>
Lack of entry to the learning cycle	The motivation problem
Incomplete learning cycle	The completion problem - understanding and support for all phases

People don't know how to learn	The skills problem
Learning is tacit, hidden, informal	The elicitation problem
Search for new solutions is too localised	The parochial/ not invented here problem
Reflection is undemanding	The challenge problem
Learning is infrequent, sporadic	The reinforcement /reward problem
Learning is not shared but localised	The sharing problem
Learning is not sustained	The motivation problem....

Applied to the problem of SCL we can see these have considerable relevance; for example:

- the motivation problem - the existence of a supply chain does not imply that it will exhibit learning behaviour – or even that relationships amongst members will be co-operative. There needs to be some 'ownership' of the problems (for example high costs, poor quality or other wastes) which require participating firms to learn new responses. Such collective motivation does not come by accident – nor does it come from 'beating suppliers over the head' with dire threats about the future of the industry. It requires a combination of shared motivation and active governance of the chain. Examples of successful SCL such as CRINE point strongly to the need to build a sense of crisis (the need to cut costs in order for all players in the industry to survive in a global industry) but also to the need for active management of the learning process.
- The completion problem - a second barrier is the emphasis on what might be termed partial learning – emphasising some aspects of the learning cycle but neglecting others with the result that learning is incomplete. There is a risk, for example, in well-intentioned programmes which build a sense of motivation (e.g. through construction of a crisis facing the industry) and which then promote the adoption of new concepts through expert consultants. Whilst such initiatives are valuable they need to be complemented by opportunities for individual firms to experiment and share experiences, otherwise the learning cycle may not be completed. (This might become an issue for the Industry Forum approach where the follow-up and internalisation of lessons taught by Japanese experts to 2nd and 3rd tier automotive component suppliers will be critical to the long-term success of the programme).
- The skills problem – we should also recognise that learning is a skill and that most supply chains do not yet operate to encourage or support learning. 'Learning to learn' is an issue of relevance here and SCL practice needs to evolve to support this. For example, early models appear to place emphasis on workshops and other formal concept transfer mechanisms; it may be necessary to extend the range of options to suit what may be different 'learning styles' amongst individual firms and across different supply chains.

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- The elicitation problem - for most organisations trying to get to grips with 'knowledge management' one of the major issues is the degree to which knowledge is held in tacit form. This is an even bigger issue in supply chains, not least because there are forces acting to maintain secrecy in key areas. The experience in trying to promote 'cost transparency' highlights the difficulties here and suggests that SCL will require a considerable degree of trust amongst participants.
 - The parochial problem -as we have noted, there are various activities around SCL distributed across different sectors and countries. Most supply chains tend to be sector-specific and to some extent inward looking and there is thus a risk that cross-sector learning may not take place. Given the experimental nature of work on SCL it will be important to try and avoid the 'not invented here' or lack of awareness problem and to ensure that experiences gained in, say, the energy or construction sector can transfer to others.
 - The challenge problem -many SCL experiments appear to have been motivated by a shared sense of crisis and the need for a sector or supply chain to achieve against some stretching goals (for example a 40% cost reduction in 5 years). The risk with such approaches is that, once the initial 'sprint' is over, the participants relax and learning dries up. Processes need to be put in place which enable continuing and challenging reflection and new target setting; some version of benchmarking may be valuable in this context. (The example of CRINE where phase 1 has now given way to a new set of stretch targets is helpful here).
 - The reinforcement problem - the risk with any learning activity is that it will not be maintained, especially in the face of other pressures. This places emphasis on mechanisms to reward and reinforce learning behaviour so that it becomes the norm. In the case of SCL this implies a need to look at mechanisms for 'gain-sharing' across the chain so that the benefits accruing from learning and continuous improvement provide reinforcement of the learning process.

The examples of SCL which we have been able to observe offer some solutions to these problems – for example, the 'motivation' barrier is effectively overcome by a mixture of 'stick and carrot' along the chain. Firms which learn can expect to share in the benefits accruing to a more successful supply chain and to develop enhanced capabilities themselves. Firms which fail to learn run the risk of being excluded from the chain since willingness to engage in learning and improvement is increasingly becoming a criterion for supplier selection.

In similar fashion many of the other blocks – such as the 'challenge' problem or the 'sharing' problem can be better dealt with through shared learning amongst a supportive but critical group of peer companies. However achieving effective SCL is not automatic and these benefits are only likely to flow in a supply chain whose governance explicitly recognises and manages the learning process.

Integrated design for supply chain learning

From the above discussion it appears that SCL will not take place without active intervention, and a conscious attempt to facilitate the learning process amongst participant firms. In particular many interventions fail because they only address part of the learning cycle – for example, promoting new concepts without allowing for experimentation or reflection, or introducing ‘guest stars’ who make significant changes but where the other participants in the firm are merely passive bystanders.

Reviewing the blocks to effective learning suggests that a number of inputs are needed to help sustain learning around the entire cycle. These could be mapped on to the cycle in such a way as to produce an integrated approach which could form part of a general design for SCL. Examples of such a programme mapped on to the learning cycle are given in table 2; however it should be stressed that further research would be needed to ‘flesh’ this model out.

Table 2: Outline framework for integrated learning mechanisms in supply chains

Motivation to enter and maintain the learning cycle	Experience	Reflection	Concept	Experiment
Development of shared sense of motivation – ‘we sink or swim together’ – for change	Opportunities to share and build on experiences of others as well as own	Structured and challenging feedback and analysis from others within the group	Introduction and absorption of new concepts	Opportunity to share risks and costs in trying new things out
Reward and reinforcement – for example, arrangements for ‘pain/gain sharing’ across the chain	Experience-sharing workshops Inter-company visits and working Secondments	Relevant Performance and conceptual benchmarking, audit and assessment within the supply chain and with reference to external frameworks	Books and training materials Reading circles Training courses Guest engineers	Identified pilots to achieve early success (even if minor)
Pump-priming support	Customers learn from suppliers, especially those with experience from other customers, technologies and sectors	Two way evaluation of experience, performance and knowledge base	A role for consultants, within a policy framework	
Active champions and high level support	Use of communications / Information technologies (e.g. common access intranets)			