

A.2.3 “The Challenges for Sustainable Skills Development
in the UK Automotive Supply Sector: Policy and
Implementation”, Turin, June 2008

The Challenges for Sustainable Skills Development in the UK Automotive Supply Sector: Policy and Implementation

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Abstract

At the Lisbon Council in March 2000, European government leaders set themselves the target of making the European Union the “most competitive and dynamic knowledge-based economy in the world, capable of sustained economic growth ...” within ten years. Human resources are central to the creation and exploitation of knowledge and a determining factor in the European automotive industry's potential for innovation. This paper discusses how public policy has promoted the development of new skills across the supply chain and asks whether they can support a sustainable level of in company learning.

A survey of SMEs in the automotive supply chain based in the East of England region has demonstrated that the outcomes of training across this segment of the industry were mostly unknown, unmeasured and often unpredictable. This result was in keeping with wider research which has indicated that even in large enterprises some 60% of training budgets lack quantifiable targets to achieve.

Decisions about training are supported by three sources: public policy and funding initiatives, the promotional drive from the training providers themselves, both public and private, and management drivers including customers.

In the UK, the automotive supply sector's policy drivers have been Government sponsored reports in 1995, 2002 and 2006. To represent the public funding initiatives the three UK schemes pertinent to the automotive industry were chosen. These were the Automotive Academy, the newly launched National Skills Academy for Manufacturing and the national “Train to Gain” Scheme. Interviews with senior managers questioned the strategic objectives for these nationally funded programmes. The key driver for the first two was the concept of a nationally agreed view of “World Class Manufacturing” which, coming largely from the perspective of Automotive OEMs, was based on Lean Manufacturing. For “Train to Gain” the strategic objective at present is to raise the base level of qualification of the UK workforce. Within manufacturing this has been interpreted as basic operations or lean principles.

The providers sampled in this research have a track record of servicing the needs of the automotive and advanced engineering industry. Within this sector the connection between funding initiative and training provider has polarised the training available to SMEs to be either business focused management development or workplace lean manufacturing. This supports the industry sector as a whole in line with the American experience of rolling out process innovation (in this case lean manufacturing) across company and supply chain.

Insight into the SME management views on training requirements has been collected from a number of surveys aimed at manufacturing SMEs in general and the automotive and advanced engineering SMEs in particular.

Four distinct themes emerge from the data: specialist technical training is a key requirement, but peculiar to each individual SME; supervisory training is the closest match with the two Academies' agendas and in the context of a stable manufacturing environment there is evidence of commercial benefits; breadth of experience for apprenticeships and marketing. The latter being strongest amongst the micro and small enterprises.

Based on this research into the state of training amongst the automotive supply SME community and their training needs, a model has been presented that can support sustainable training. Within the model we have identified specific criteria that could be used to target training resources more selectively. If an enterprise is ready, motivated and receptive; if training is only given to selected suitable staff whose achievement is subsequently recognised; if the training relevant and focused; then there should be measured outcomes that relate to the enterprise's goals.

The companies most likely to meet these criteria will be the competitive and innovative companies. Training targeted on these companies will be sustainable. It will provide measurable performance benefits to them and be cost effective to implement, thus satisfying both business and political criteria. To develop the sector, support must be focused on these companies.

1. Introduction and background

1.1 Background to the UK automotive industry

The European Automotive industry is a key strategic player in the European Union with an estimated 10 million workers. The majority of these work in the supply chain (CLEPA 2005). As a major employer, the sector must work to maintain its competitive edge if it is to keep that workforce engaged.

Nearly 250,000 people in Britain work in the automotive manufacturing sector which contributes around 1.1% of GDP, with around £9-billion of added value, representing 6.1% of UK manufacturing. But, there is still a significant productivity gap between UK and its major European rivals, France and Germany. The National Institute of Economic and Social Research attributes up to 20% of this to the UK's lower skill levels and poor demand for higher-level skills from employers (Whiteman 2005; Whiteman(SEMTA) 2005).

Even earlier the UK's Department of Trade and Industry, DTI, had repeatedly highlighted the lack of competitiveness in the UK Automotive Components Sector (Andersen 1995). This study had concluded that UK firms were being put at a competitive disadvantage by a shortage of suitably qualified engineers. That need has been reiterated time and again. The skills shortages and skill gaps at all levels within companies are a major factor in the UK's lack of competitiveness. Even the methods of tackling these shortages have been criticised. The Japanese component firms surveyed in 1998 (DTI 1998) criticised UK companies for a lack of emphasis on practical skills, the use of old-fashioned equipment and teaching methods.

The beginning of the twenty first century has found parts of the UK Automotive Supply sector in a fragile and nervous state. Vauxhall and Rover have been the two most recent examples of upheaval amongst the vehicle builders. There already was overcapacity in the market. Financially the sector was under pressure both from the distant markets and from within Euroland. Not only had globalisation brought more companies into the market, it had broken the tie between the customer and the natural local suppliers.

For small to medium sized companies, SMEs¹, in this crowded market to sustain their operations and survive, they must plan to grow. The Federations of Small Businesses' own member survey in 2006, found the aspiration for moderate growth amongst 48% of the East of England sample and the aspiration for rapid growth in 11% (FSB 2007). However, 10% of these companies quoted lack of skills as a barrier to growth, highlighting the link from training to sustainability.

This barrier is not a simple one. From our own earlier research “Not only did the evidence show a need for training; it also showed a reluctance on the part of the Small to Medium sized Enterprises within the supply chain to engage in training. Whilst the main disincentive might be seen as finance, it was not the only one. For an SME, the burden of having to manage training or rather to manage and sustain the business whilst engaging in training can be too much. For these disincentives to be overcome the benefits to the business have to be very clear and measurable.” (Bevis 2001)

At the Lisbon Council in March 2000, European government leaders set themselves the target of making the European Union the “most competitive and dynamic knowledge-based economy in the world, capable of sustained economic growth ...” within ten years (Leitch 2005). Human resources are central to the creation and exploitation of knowledge and a determining factor in the European automotive industry's potential for innovation. Employees in most industries are increasingly required to demonstrate significant judgement and flexibility, whilst maximising performance and improving productivity. But to become more efficient and competitive, people need the right skills and therefore to be better trained, more innovative, more customer focused and more determined (Leitch 2006).

Leitch goes on to describe skills as a derived demand, “employers’ skills needs are a consequence both of their product strategy and the firm’s characteristics” (Leitch 2006). It is the managers of a business who must decide strategically how skills are deployed and on the level of training investment required.

Stepping back and taking a transnational view, there is wider evidence to support the Leitch Report. Looking at employment and economic performance, Leney argues that the European Union is weak on competitiveness and performance and that the Lisbon goals cannot be reached without significant action and innovation (Leney 2005). On the same scale the view of the Automotive manufacturers themselves is one of losing competitiveness due to the lack of skilled labour to fill open positions (CLEPA 2005).

¹ The European Commission defines a Small to Medium sized Enterprise as an enterprise that employs fewer than 250 persons, has an annual turnover not exceeding EUR 25 million and/or a balance sheet total not exceeding EUR 43 million. For a small business these limits are 50 employees and EUR 10 million. A micro business employs fewer than ten people and has a turnover or balance sheet not exceeding EUR 2 million.

In 2002 the Automotive Industry Growth Team, AIGT, report recognised that the UK was on the one hand achieving record car production levels, but on the other hemorrhaging profits and becoming less dependant on a UK supply base (Gibson 2002). Whilst the work of SMMT² Industry Forum³ was held up as an example of good practice, its penetration into the automotive supply chain has, to date, only reached 450 companies.

"The SMMT Industry Forum model should be extended to create an Automotive Academy of international standing to provide a comprehensive range of support to greatly enhance process improvement activities right across the industry."(Gibson 2002)

McKinsey (McKinseyGlobalInstitute 2005) found that for the automotive industry the leading productivity process innovations centred around "Lean Manufacturing"⁴. The real starting point for them was their weak financial position. Ford started after its serious financial performance around the 1981-82 recession. General Motors, being financially more stable at that time did not engage with "Lean Manufacturing" until 1992 when the Gulf War recession hit. It took 10 to 15 years for the "Big Three" (Chrysler, General Motors and Ford) to catch up with foreign competition.

From 1987 to 2002 GM managed a 38% drop in hours per vehicle. 59% of this change was produced by the introduction, learning and adoption of Lean Manufacturing. The remaining 41% included new product introduction (13%), a new common platform (3%), and outsourcing of assembly tasks to suppliers (17%). The introduction of new features cost 2% of the benefits from these changes. Finally plant closures secured 10% of the change. The challenge of lean manufacturing is that it brings a substantial benefit, far out-weighing a number of other initiatives, but at a much slower rate. Each of the "Big Three" has taken over fifteen years to roll out these changes across the whole of their organisations (McKinseyGlobalInstitute 2005). Womack sets "Lean" in the context of automotive manufacture (Womack et al. 1990). "Lean is seen as specifically supporting the company's ambition to be competitive" (Lewis 2000).

1.2 The purpose of this paper

The introduction has provided a regional and international background to the issue of training. The research is focused on developing a model of sustainable learning appropriate to SMEs in the automotive supply sector.

The first part of this paper seeks to look at current training and gain an understanding of the effectiveness of in-company training as experienced by the automotive supply sector. The basic premise has been to investigate companies a year after a training experience and measure the extent to which that training is currently having an impact on the business. As

² SMMT: The Society of Motor Manufacturers and Traders

³ The Industry Forum, a division of the Society of Motor Manufacturers and Traders, SMMT, was established in 1996 with the aim of achieving sustainable world leading competitiveness in the UK based vehicle and components industry. Its engineers were trained by Master Engineers from the major players in the industry. These Industry Forum engineers would then transfer the skills, knowledge and delivery techniques of the tools of process improvement into the companies with whom they worked. This was the essence of the "**Learning by doing**" programmes developed by the Industry Forum. (SMMT Industry Forum website)

⁴ Lean Manufacturing is a key focus in this paper. A case study presented later in this paper (section 2.3) provides a convenient amplification of the concept of "Lean" and shows how it is the target of process improvement.

mentioned above, the particular training that is most pertinent to the automotive industry is training in elements of “Lean”.

The second stage has aimed to determine the potential for current training initiatives in the UK to meet the requirements of the automotive industry SMEs. It has highlighted the drivers for policy.

Based on these findings the final stage proposes a model for sustainable learning. The model questions the extent to which the current provision of learning experiences can provide sustainable outcomes. The conclusions of this research will be relevant to the wider manufacturing sector.

1.3 The training focus

If we are to assess the sustainability of training, we must look at the methods of evaluation. Human Resource Development professionals will talk of evaluation levels, nominally one to four, although some will concede a fifth. These numbers refer to work introduced by Kirkpatrick in 1959, built on by Hamblin and Whitelaw in the 1970s and restated by Kirkpatrick in 1994.

Kirkpatrick had identified four levels of evaluation as emotional, mental, physical and financial. The emotional level represented the learner's attitude toward the course. The mental level covered the tests that might be carried out in the class. The physical level looked at how the learning might have been transferred to the on-the-job environment. Were skills being implemented? Finally the financial level was concerned with the additional perceivable changes in the organisation as a result of the training.

Hamblin and Whitelaw discussed this notion of evaluation levels in the 1970s. In his final writing on the subject, Kirkpatrick introduces a division in this last level into two, one for performance and one for financial outcomes.(Kirkpatrick 1994) Despite the frequency of use of Kirkpatrick's four levels in the training industry, there is little evidence of a firm correlation between the four levels. Alliger (1989) argued that Kirkpatrick's model may never have been meant to be more than a first, global heuristic for training evaluation and he questions the underlying assumptions.

The earlier discussion points to an opinion in both political and media circles that productivity and competitiveness can be improved by further investment in training and developing skills. In a review of the existing research on the Return on Investment, ROI, in this area in 2002, Keep, Mayhew and Corney compared the relationship between Europe and the UK with that between the USA and the UK. Workforce skill might contribute to the UK's poor performance compared with mainland Europe, America also has higher productivity than the UK whilst its workforce is no more highly skilled than our own (Keep 2002). Their second pertinent point concerned two studies in the UK that linked training with profitability. One showed a positive link between IiP⁵ and profitability. The other found no link between training and profits in SMEs (Keep 2002).

⁵ **IiP** represents the **Investors in People Standard** which provides a framework for staff development within an organisation. Companies attaining an IiP accreditation have demonstrated that they have systems in place to train and develop their staff.

From detailed research across a set of over three hundred companies, Amos was unable to find a direct causal link between investment in training and company performance. In fact he puts it quite bluntly, “what is apparent from this study is that currently the relationship between education, training and development is not blindingly apparent”(Amos 1997).

2. Research objectives

2.1 Objectives

Five separate objectives are brought to bear:

- 1) Using a controlled group within an OEM and the experience of a number of SMEs who have taken part in the training find common themes in the current state of training.
- 2) Determine national policy on skills development for the Automotive Industry’s SME community.
- 3) Determine the level of provision of skills development amongst both the private and public providers and the drivers for that provision.
- 4) From sources of data on SMEs in the East of England determine their declared skills development needs.
- 5) Propose a training model that supports sustainable development for SMEs.

2.2 Research questions

In researching the current state of training, a number of questions come to mind. How do companies decide on their training needs? How committed are managements to the notion of training? Is there a strategy? How important are cost, location, time? How well is training performance and its sustainability measured? It is this last question that is at the core of this project. The context can be set by the CIPD’s⁶ own reviews of training and development. In its 2004 survey, under the heading of coaching its respondents indicated that

- 75% used coach’s evaluation of the programme
- 37% assessed programme against its objectives
- 25% assessed programme against business performance

(Kearns 2005)

A survey in People Management, reported by Reid (2004) suggested that over 60% of the Human Resources Directors in the UK’s top 100 companies do not have any realistic measures of the return on investment that they are expecting from their training. Similarly, Wigham (2003) reported that only 36 per cent of HR departments in the public sector bother to map training effectiveness against job performance. This concurs with earlier work in the USA where Olsen (1999)commenting on a 1996 survey concluded that 60% of training does not transfer to the job. With all the available training technology it is estimated 80%-90% of the training and development interventions that are applied within business and industry have no measurable impact on organisational objectives (CET 2005). It is this lack of clear evidence amongst large enterprises that raises further questions about what can be expected from SMEs that engage in training.

Within the broad spectrum of training, we have already identified that for the automotive industry and its supply base “Lean Manufacturing” is a key feature. Having been developed by

⁶ CIPD is the Chartered Institute of Personnel and Development, which is the professional body for Human Resources and Training in the UK.

Toyota over a period of some thirty years, lean manufacturing is widely considered as the best performing production paradigm. The term “Lean” was first coined by John F. Krafcik at MIT⁷ as a contrast to buffered systems (Westkämper E.; Barthel 2007). Now the term is more closely associated with the Toyota Production System described by Taiichi Ohno and Shingo Shigeo, (Ohno 1988), (Shigeo 1985). For Western manufacturers Womack has set “Lean” in the context of automotive manufacture (Womack et al. 1990). Despite the doubt he raises about companies becoming less innovative Lewis still reports that “Lean is seen as specifically supporting the company’s ambition to be competitive” (Lewis 2000). Care must be taken to prevent too great an emphasis being placed on lean manufacturing to the detriment of SMEs that need support for innovation and development. Lewis highlights cases where companies can become less innovative as they become more lean (Lewis 2000). Dankbaar compared the basic elements of lean production with the traditional Fordist system of mass production and argued that despite its benefits, lean production is just extending the life of Taylorist mass production control (Dankbaar 1997).

2.3 Lean case study

Given its importance to the discussion in this paper, it is worth including a case study to demonstrate the usefulness of Lean manufacturing training. Methods of training in Lean Manufacturing vary, from classroom theory to active intervention. To gain an understanding of how Lean can be inculcated into a company, we interviewed an Automotive Academy manager who, as a practitioner, had worked in Industry and then closely with both public and private providers and so arrived with a history of Lean implementation. The interviewee had spent fifteen years in the Aerospace industry. His final position with his company had been “Lean Co-ordinator”. (Wells 2006).

Within his role he saw three key pillars for a sustainable implementation of lean practices. The first was his position as an advocate within the organisation. For a company to take on lean there has to be a champion within the organisation who is prepared to campaign and support the development.

The second pillar is management commitment. He described this as a passionate group who want to see change. The final pillar is an understanding of the fundamentals of lean. These include the “Five Ss”⁸, “Standard Operations” and “Seven Wastes”⁹, the basic lean principles that can be taught in the classroom, but underpin every activity in the lean armoury.

Central to the implementation process is the manufacturing cell. Here a cell means a sub-unit of a manufacturing organisation that can be isolated in terms of its membership, goals, resources and performance. Typically, when a manufacturing organisation develops a “cellular manufacturing” culture, the cells become semi-autonomous working groups able to tune their own performance to better serve the objectives and targets of the whole organisation.

⁷ Massachusetts Institute of Technology

⁸ 5S is a set of techniques providing a standard approach to housekeeping within Lean Manufacturing. Showing its Japanese origin the “Ss” stand for **Seiri** (整理) – Sort, tidy; **Seiton** (整頓) – Set, order; **Seiso** (清掃) Shine, clean; **Seiketsu** (清潔) Standardisation and **Shitsuke** (躰) Sustain, sustaining discipline.

⁹ Taiichi Ohno defined the **Seven Wastes** as the Unnecessary **Transport** of materials **Inventories** beyond the absolute minimum, **Motion** of employees, **Waiting** for the next process step, **Overproduction** ahead of demand, **Overprocessing** of parts and producing **Defective** parts.

The process that he employed was to engage just one cell within the case study company. The whole cell was extracted from the company for a week. As well as teaching the fundamentals he helped the group to understand how to justify the necessary changes to get from their current position to a targeted future position. At the end of the week, the group members themselves gave a thirty-minute presentation to senior management and colleagues.

A second cell was trained four weeks later and then the same process repeated until all 120 staff of the shop floor had been involved. As a reflective practitioner (Schön 1983) he determined that the four-week implementation cycle was too short for the new ways of working to be thoroughly embedded. On reflection the four-week cycle should have been six weeks to allow changes to bed-in before introducing more.

Despite a reluctant shop floor supervisor the outcomes from the work in this case study company were a 75% reduction in overtime, machine utilisation up by 300% and absenteeism down by 25 – 30%. (Wells, 2006) The improved maintenance reduced stores inventory by two thirds and the Finance Director could see that costs were down. Further case studies were available to demonstrate the benefits of including Lean training in a wider intervention to support participating companies.

This has been provided as a case study setting out the clear benefits from introducing lean manufacturing.

3. Methodology

Whilst the majority of the literature on training, skills and the transfer of training is generic, this paper focuses on specific training. In the first section the training is specific to lean manufacturing. In order to investigate the effectiveness of training in this area, two sources of primary data have been chosen, one to suggest a benchmark and the second to test that experience.

Given the perceived weakness of Kirkpatrick's four levels, the methodology has been to identify from the literature a set of characteristics of good training practice and using those characteristics to select a single instance of training where there is sufficient data to provide a benchmark reference when looking at the East of England's recent experience with SMEs.

3.1 Benchmarking reference

We have used a reference organisation as a benchmark. Here *"Benchmarking is simply about making comparisons with other organisations and then learning the lessons that those comparisons throw up"* (The European Benchmarking Code of Conduct) explains the purpose of selecting a benchmarking reference.

The choice of benchmarking reference has been based on selecting an instance of training that has the characteristics to support a transfer of skill. Olsen (1999) listed a supportive culture, reinforcement and coaching, skills practice and the need for the design of the training to simulate the job conditions. Others mention employee intention, organisational acceptance and supervisory support (CET 2005). Alzalabani (2005) identifies the desire to learn, the conviction about the importance of the training, the perceived opportunity to practise what has been learnt and management support. From these desirable attributes the following have been chosen to provide a minimum set for the reference benchmark:

- Management commitment to the importance of the training.

- Training that simulates the job environment and tasks.
- Ability of trainees to practise the skills.
- Supportive culture in the organisation.

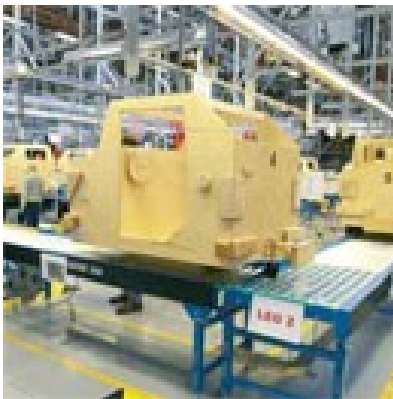
To this list is added the expertise and track record of the trainers. The one feature omitted which appears in the literature is the intention or desire of the employees to learn. This feature will be revisited in the paper. A programme that fits these selection criteria is the Simulated Work Environment, at IBC Vehicles Limited, Luton.

3.2. The simulated work experience

IBC is part of the GM organisation and as such benefits from a long and established training regime focused on lean manufacturing. With international experience dating back to 1987, the internal experience within GM should provide a reasonable basis for a benchmark reference.

Whilst separate from the Vauxhall operations in Luton, IBC is part of the GM organisation.

Fig 1 The SWE Workshop



In common with many other sites across the world, IBC, in 2004, installed a Simulated Work Environment, SWE, with which to train staff in the common practices of their automotive production line. These practices are underpinned by the principles of Lean manufacture and in particular continuous improvement.

The SWE features two parallel production lines kitted out just as the main line on the factory floor. The product passing along these lines is a plywood vehicle onto which the workforce must add particular ancillary components such as lighting clusters and steering wheel (Fig. 1). The simulation provides staff an opportunity to gain an understanding of the way in which IBC's production lines are run. The training introduces the concepts of standardised work, visual management and the Andon¹⁰ system, to give staff the confidence to act as full members of their teams back on the shop floor.

The training runs for a full shift and all staff complete a pre-training and post-training evaluation form as part of the exercise. From this early measurement, it is clear that staff are gaining knowledge and feeling more confident to engage in the workplace. The training started in July 2004 and the logical next step is to see whether the training is having an impact on the performance of the factory as a whole.

Comparing this activity with the criteria set out in section 3.1. above the SWE training at IBC satisfies the conditions to be used as a benchmark reference. The management commitment is demonstrated by the investment in the training facility and the allocation of staff time to the training. From a tour of the factory it is evident that the facility is identical to the factory environment, with the obvious exception of the simulated product. The structure of working cells within the factory provide the learners with further experience to practise what they have learnt when they return to their normal activities. All supervisory staff have been through the

¹⁰ On the production line the Andon system provides a direct connection between the operator, the production line automation, the conveyor systems and the factory wide enunciator. When a problem manifests itself, the operator can stop the line and call for support. This is a vital communications system for management of the human/machine interface.

same training and so can be expected to be supportive to new members of their cells. The trainers are experienced both in their training and their knowledge of the General Motors ethos.

By contrast to the focus of this research the training at IBC runs across an OEM; however, the scenario provides an insight into training for members of small teams for the following reasons:

- There is a strong emphasis on “Lean” throughout IBC’s training programmes.
- The same training regime was in use across all participants in IBC.
- There were pre- and post-training checks
- The post experience check involved implementation within a manufacturing cell.

The number of similar programmes run by the same staff has allowed the comparison of experience of a number of staff and their ability/willingness to take that training back into the small working environment of the cell. The intention has been that this should develop a useful benchmark reference for studying the SMEs in the second part of the research.

The method has been to collect data from two sources. The first source is the original pre- and post- training evaluations for the first 200 employees to pass through the SWE training. A third evaluation was distributed to those same people. This picked up on the original questions and the comments were used as an indication of the level of transfer. The questionnaire is presented in Appendix 1.

3.3 The SME group

By contrast the second source of primary data was a small sample of companies chosen from within those who participated in ASPEN¹¹, the European Social Fund funded support project for automotive companies in the East of England during 2003 to 2005. This has ensured that the companies all had identified training needs at the beginning and that there was a reasonable baseline for the level of training provided.

The common features for the companies that make up this second data source are that they

- are SMEs based in the East of England region of the UK.
- are suppliers to the automotive industry.
- have been identified through their relationship, in the past, to either IBC or another major vehicle manufacturer.

For the ASPEN project each engagement began with a diagnostic activity – a questionnaire, a visit, a facilitated discussion; these three forming the basis of a report which was presented to the senior management to gain commitment. No training intervention was commissioned without this vital element of management commitment.

To complete the questionnaire, a representative sample of staff was brought together and briefed on the process. They were introduced to the EFQM¹² Business Excellence Model and asked to complete its associated Rapidscore questionnaire (BQF 1999). Rapidscore is a software package for conducting a Business Excellence Model assessment. The software had

¹¹ “ASPEN, Automotive Support Programme for the East of England, evolved out of work instigated by the Luton Vauxhall Partnership, a group of public sector bodies that co-operated to support activities for workers and supply companies affected by General Motor’s decision to cease car production at their Luton plant.” (Cranfield 2004)

¹² EFQM – European Foundation of Quality Management

been selected and funded by the Regional Supply Network but the researcher designed the implementation process to suit the ASPEN project, reducing the intended one week workshop to two manageable half day sessions.

During this initial meeting, members of the project team toured the site to gain a qualitative view of the company. Where possible this was to be augmented by any of the seven measures¹³ (DTI 2000).

The second of the two half day sessions was used to present the staff group with their aggregated questionnaire results. The facilitated discussion was used to tease out the specific reasons for any wide differences in responses. A final report based on the consensus view and the project team's own impressions was presented to management to select the most appropriate training and gain commitment for any following training intervention.

Initial feedback, of a more general nature, has been gleaned from the "end of project" report that marked the official end of the ASPEN project (Cranfield 2004). This was conducted independently and its purpose was to determine whether the project had delivered value for money.

More focused telephone interviews were conducted with companies' senior management. The purpose of these structured interviews was to unearth the reasons why particular training experiences in the SME environment have differing outcomes, i.e. to determine the contributory factors for successful training. The starting point for structuring this outline was Kirkpatrick's four levels, i.e. reaction, learning, behaviour and results. This has been further informed by work with companies, survey results and reading in the areas of Government initiatives, learning organisations and motivation.

Within each interview there was to be a certain amount of basic data collection. This included sources of funding, the timing, the provider, and details about the trainees. The intention was to gain from the interviewee an understanding of the organisation's reasons for training, both strategic and practical, its commitment to the training, a sense of the ethos within the organisation and a sense of the external environment in which it is operating. The selected companies were all involved in some form of Lean manufacturing training, but it was still important to determine exactly what type of training was employed and whether there had been any need for further Basic Skills training to support the activity. The key intended outcome of the interviews was to understand the extent to which the organisations had employed any of Kirkpatrick's Levels. A lower key measure of acceptable training would be the organisation's willingness to engage in any repeat exercise. The question structure used to hit all elements of the investigation is outlined in the Appendix 1.

3.4 Policy Indicators

To understand how training can affect the automotive industry, it is necessary to collect views from a number of different perspectives. Decisions about training are supported by three sources: funding initiatives driven by Government policy, the promotional drive from the training providers themselves, both public and private, and management drivers including customers and in some instances human resource professionals. The method has been to interview key players

¹³ The seven measures are a series of standardised measures which can be applied to a manufacturing operation, in order to express its efficiency in a meaningful way. A brief description is available at <http://www.autoindustry.co.uk/features/qcd>.

in the training arena and review data from a number of surveys of manufacturers' training needs. In both the interviews and the reviews the primary research question has been about what training would be the most appropriate in order to develop the competitiveness of the sector.

For the funding initiatives, we met with representatives of the three main sources of Government funding for industrial training. These are the Department of Trade and Industry, DTI, which was transformed during 2007 into the Department for Business, Enterprise & Regulatory Reform, BERR, the Department for Education and Science, DfES, and the East of England Regional Development Agency, EEDA. For the automotive sector direct government funding has been channelled through DTI and BERR into first the Automotive Academy and then into the National Skills Academy for Manufacturing, NSA-M. Hence the selected interviewees were the CEO of Automotive Academy and the executive responsible for training design at NSA-M. Under the DfES, the primary organisation responsible for training is the Learning and Skills Council. Its major thrust into the training associated with the workplace has been through the Train to Gain initiative. Since at this level the programme is nation wide and spread across the whole working spectrum, attention for this project has been focused on managers of local (regional) schemes and particularly those with an automotive sector focus. The selection of interviewees has been determined to ensure that a knowledgeable source had been chosen with access to the necessary policy information.

Training is provided to the sector through public training providers, e.g. Further Education Colleges and in a limited number of cases by Universities, private training providers and through schemes run by the larger companies for their own internal consumption. In this instance the regional colleges did not engage despite invitation. The research chose one particular private provider that had a strong background in all three routes to provision. The Outsourced Training Company was, prior to its disassociation, the training arm of the Ford Motor Company in the UK.

The third perspective was that of the manufacturers themselves. The selected method here is to review the output of a number of different surveys, each of which give some space to questions about training. Although the primary research question focuses on training and competitiveness within the sector, as these surveys present pre-existing data, the review must reflect the extent to which the surveys consider training needs and the effect of training deficiencies on competitiveness.

4. Findings and analysis

4.1 Findings from the benchmarking study at a vehicle manufacturer

IBC are training between 100 and 200 staff per month on their one day SWE programme. Three hundred and twenty sets of results were available for analysis. Before analysing the results as presented by IBC, it is important to recognise the inherent problem posed by the scoring method. In the questionnaire the numbers 1 to 4 are used to codify the level of understanding achieved:

- 1 = No Knowledge
- 2 = Basic Knowledge
- 3 = Good Knowledge
- 4 = Fully Competent

Here calculating the mean scores is only of limited use (Reid 2003). Despite this problem of definition, individuals have been classified on the basis of their mean scores (maximum = 4.0) and the difference between the three stages. To make sense of the scoring, only high or low scores should be considered.

The first conclusion, again recognising the problem with “scoring” has been that even though 94% gain some knowledge during the course, approximately 60% of test scores fall after two months. Of most use has been a study of the comments made by the individuals on the “after two month” questionnaire. These particular respondents were first grouped by change in score across the course and then by the change from course end to the post experience two months point.

An initial review of the results showed that at one extreme where the individuals’ scores had not changed significantly as a result of the course, the later comments were weak regardless of the final score. At the other extreme people whose scores had changed during the course, had more to say after two months regardless of whether their score had moved again. Weak comments included “good” and “interesting”. More informative comments included “actions highlighted problems” and “gained better understanding of production”.

The first of the two benchmarking conclusions is that in areas where training is imposed and not chosen, more than half the attendees may not achieve a degree of implementation. The second tentative conclusion is that training is likely to be more effective if it is set at a level that is increasing the knowledge of participants, but this needed further testing.

Of the 527 employees who took part in the training during June, September and October 2004, 322 responded to the request to complete the delayed questionnaire. The more useful results came from the 131 of these questionnaires which included comments on the use of the techniques learnt in their workplace. These comments were classified under three headings:

Superficial - These comments were bland and gave no indication of the degree to which the respondent was engaging in the techniques or understanding their usefulness in the workplace – **33 responses**

Relevant – These comments showed that the respondent was relating the learning to the workplace, but not going further than that – **70 responses**

Engaged – These respondents showed that they could use their learning and reflection on the Simulated Work Environment to form the basis of their comments on conditions and activities in the workplace. These comments included both action comments and commentary on the efficiency or efficacy of the activities in their environment – **28 responses**

These results were then segmented in three ways, firstly as the numbers in each group receiving certain scores, secondly the average scores recorded for each group and finally as the frequency of scores appearing in each group. Table 1 shows the numbers in each group classified by their final score only.

Table 1 Groups of comments segmented by final test scores

“Final”	number	No comment	Superficial	Relevant	Engaged
4	30	18	3	5	3
3-3.9	212	124	25	46	17
2-2.9	8	48	4	17	8
1-1.9	4	1	1	2	0

A χ^2 approach was used to analyse the figures in Table 1 and confirmed the initial impression that segmenting the results in terms of final score made little impact on the distribution of the comments.

An alternative view was to segment the sample by comment group and record the average scores within each group. These are shown in table 2. The almost constant values from each set of questionnaires agree with the χ^2 result on table 1.

Table 2 Average scores and changes in scores segmented by comment group

Group	“Pre”	“Post”-“Pre”	“Post”	“Final”- “Post”	“Final”
No comment	2.4	1.0	3.3	-0.1	3.2
Superficial	2.4	1.0	3.5	-0.1	3.3
Relevant	2.3	1.0	3.3	-0.1	3.2
Engaged	2.6	0.7	2.8	0.0	3.2
All	2.4	1.0	3.3	-0.1	3.6

The final comment is being used as an indicator of learning being embedded in operational activity. Using this “implied measurement” there is no indication that those who seemed to gain the most from the training have gone on to contribute more into the operational setting. The proportion of learners who show evidence of engagement in the workplace is similarly distributed across each scoring band. The small changes that are evident are ruled out by the χ^2 test.

These two analyses suggest that the effectiveness of the training that is evident from the factory performance is less dependant on the individual’s own learning achievement and more on other issues such as the organisational culture.

4.2 Findings from the SME study based on companies in the East of England

Sixty-four companies took part in the ASPEN project. Of these, thirteen engaged in some form of lean manufacture training. The post project report particularly notes:

“13 companies undertook training activities that were focused upon taking cost and time out of their production processes, mainly delivered by MAS staff [*Manufacturing Advisory Service*] and the University of Hertfordshire’s Automotive College personnel. This activity generated considerably the greatest proportionate number of beneficiaries as the training activities typically involved groups of shop floor personnel who where given the skills to understand “lean principles” and then supported as they implemented appropriate activities within their own specific work environment designed to cut out non-value added activity.” (Cranfield 2004)

The reason for including this quote is that it represents the equivalent of the “pre-post” comparison of the IBC experience as an independent researcher working on behalf of EEDA collected this information from company participants. Looking deeper into the company reactions at this point, eleven of the sixteen companies surveyed acknowledged directly that they had experienced business changes or improvements as a result of the training. This positive view is supported by some of the recorded comments:

“We’re getting through jobs more quickly and effectively. Reduced turnaround times for each job and we do a better job.”

“Increased abilities and awareness. People can do something they couldn’t do before. Staff confidence and the way they look at things has improved. The time spent in management meetings greatly reduced – process flow and productivity improved.”

“Our deliveries on time are higher and our levels of rejects are lower. Positive impact. Part of the whole package of business improvements and the general trend has gone the way we wanted it to go.”

Quotes taken directly from the post project report (Cranfield 2004)

More recent telephone interviews with the owner managers or directors of these companies reveals a wider range of post training experience. These include:

- *“In company groups there were often members of staff who felt they had already had the training and did not need a repeat. There would also be novices in the group.”* This relates partly to staff turnover.
- *“Training had identified members of staff who were not up to the training nor the company’s longer term plans for their development.”* The intervention had been used as a substitute for Human Resource planning.
- *“In the SME environment, the outcomes of the training may need to be adapted to the actual situation in the company to complement other development activities.”* This was a good example of double loop learning (Lewin 2005).
- *“The evidence of implementation and company benefit is poor.”*
- *“Outcomes of the training were not directly measurable simply from a lack of measurement or appreciation of measurement prior to the training.”* This affects use of Kirkpatrick’s level four evaluation. Outputs tended towards being “better tracking” of defects.

In the worst-case example, it had been noted that peer pressure had inhibited any staff engagement. Even the trainer had reported unproductive sessions. However, the research revealed that the staff had absorbed the underlying knowledge. When other initiatives in the company introduced elements of lean manufacturing, the staff were more supportive of the changes than expected. This is similar to the “interesting/informative” comments in the IBC programme.

4.3 Analysis

It is useful to set the IBC experience in the context of the SME questionnaire used after the ASPEN project. This analysis is structured to mirror the areas of discussion used with the SMEs.

Why training

GM and consequently IBC has a tradition of Lean Manufacturing training and implementation, which for GM goes back to 1987 (McKinsey Global Institute 2005). Many of the tools and concepts introduced in the SWE workshop can be found throughout the IBC site and not only on the shopfloor.

The ASPEN project was itself a response to a number of Government sponsored reports that identified the lack of training as a significant inhibitor to the UK's competitiveness. (Andersen 1995), (DTI 1998) and (Gibson 2002). It was also a specific response to the imbalance in training support funding across the UK.

The environment

IBC's commitment to training was evidenced in the capital investment required for the SWE workshop and the provision of dedicated full time staff.

SMEs, typically, are individual concerns with little shared purpose. However, all thirteen of the companies that received Lean Manufacturing training had undertaken the same diagnostic process. Lean Manufacturing training was only offered to companies with recognised operational weakness, highlighted by both the visit and the facilitated discussion, and where the senior management made a commitment to support the training initiative.

The training

IBC were using full time subject experts as the trainers. Having taken part in an SWE workshop the researcher can confirm that the trainers were, as a group, a proficient and encouraging training team. Individual members had different strengths, but the SWE required different roles during the workshop.

For ASPEN, trainers were selected mainly on proven track record and their commitment to train rather than subcontract to a further level of unknown trainers. The type of training varied between classroom presentation for large groups to coaching for smaller groups or individuals. In all cases the learners were tasked to complete their learning during their normal working day.

Neither IBC nor the managers engaged in the ASPEN project made any specific request for a formal qualification to recognise the training. In each case the objective was improved performance in the organisation's operations.

The outcomes

The transnational application of SWE workshops in General Motors would only be countenanced if the training were perceived to be delivering a benefit to GM. In the light of the earlier evidence about the understanding of training outcomes in major companies, the emphasis has to be on "perception". Amongst the ASPEN SMEs, the initial perception again is that the training delivered the required outcomes.

The longer term finding from the research in both cases is that the optimistic perception is not supported by evidence and that, moreover, there are a number of noise factors that would mask such evidence if it were to exist. In the case of IBC, less than half the respondents to the

final survey made any comment about the usefulness of the training to their workplace environment. For the SMEs it was the training itself that generated an understanding of the usefulness of measurement. The volatile nature of their markets meant that any longitudinal measurement would be disrupted by noise.

In the cases reviewed, the trainers used various forms of Kirkpatrick level 1 and 2 evaluation. There was no evidence of any level 3 or 4 evaluation – no objective evidence that trainees had acquired new knowledge that could be recalled at the end of the course and certainly none that any implementation had been either successful or effective after a settling time had elapsed.

4.4 Training policies

Public policy on training

To represent the public funding initiatives the three UK schemes pertinent to the automotive industry were chosen. These were the Automotive Academy, the newly launched National Manufacturing Skills Academy and the national “Train to Gain” Scheme. Interviews with senior managers questioned the strategic objectives for these nationally funded programmes.

The key driver for the first two was the concept of a nationally agreed view of “World Class Manufacturing” which, coming largely from the perspective of Automotive OEMs, was based on Lean Manufacturing.

Working with the Automotive Academy since its inception in 2003 and interviewing its CEO, Professor Alan Begg, has provided an insight to its vision and its actions in the industry. The drive from the board, which included senior representatives of Toyota, Jaguar, General Motors, GKN and SMMT, has been for the highest quality of training. These major industrial players saw Lean Manufacturing as key to their success and therefore the starting point for Automotive Academy Activity. This led to the Academy’s “Team Leader Programme”¹⁴ and a substantial Train the Trainer scheme including NVQ assessment. The main concentration of the Academy’s staff across the country has been in the assessment and upskilling of trainers to deliver Level 2 and 3 training to support lean manufacturing.

The other major policy step in 2003 was the publication of the UK Government’s white paper “Realising our Potential” (DfES 2003). This reinforced the notion that skills development needed to be “Demand Led” and set out a structure for Sector Skills Councils and Sector Skills Agreements. These would be the tools for encapsulating that demand.

Industry was then drawn into this “demand led” strategy at a senior level. Whilst AIGT gave various stakeholders a better understanding of what Government was seeking to do, the appointment of a number of significant industry players to the Board of the Automotive Academy and of the CEO of Jaguar to its chair was a first step.

The next major step was the appointment of a former CEO of Toyota, as chair of SEMTA, the Sector Skills Council for the Engineering, Manufacturing, Technology and associated

¹⁴ The Team Leaders Programme is an extension to the NVQ Level 3 in Business Improvement Techniques. See the central column in the table set out in Appendix 1.

professions. This brought in Toyota as a role model and emphasises the relevance of SEMTA to manufacturing industry in a way that was not previously evident (Bates 2008).

The National Skills Academy for Manufacturing, NSA-M, has been set up as a division of SEMTA, with its chair being the chair of SEMTA. At the time of this research it was still in a state of flux having been set up during 2006 and with its chief executive only being appointed in late 2007. It has been developed against a background of 600 providers of manufacturing training receiving public funding to deliver nearly 800 approved qualifications and other types of programme (Whiteman 2005), Whiteman also reports employers' views that the manufacturing sector's training provision is characterised by a lack of consistent quality and a range of qualifications which meet only some aspects of the employers' needs. With 8% of their workforce leaving annually, they need upskilling and multiskilling with progression to higher levels of skills, particularly at Levels 3 and 4, for their existing staff.

Whiteman quotes a SEMTA consultation report from January 2005 that states "There are marked differences between the training and qualifications supported through the public purse and that which companies either buy directly or provide for themselves. In general terms, the public purse supports training programmes that are large in terms of hours of training, that lead to nationally recognised qualifications, that are scheduled around the academic year, are generally delivered off the job with the majority (in excess of 90%) of the trainees being between the ages of 16 and 19."

At the same time the Engineering Survey Report from the Adult Learning Inspectorate highlights that Further Education provision for manufacturing work based learning was significantly poorer than that supplied by private and company providers. "Outstanding Grades" were limited to in-company schemes (Whiteman 2005)

The involvement of industry in training choices is tied into the developments that spring from the White Paper (DfES 2003). The key element at a policy level is the Sector Skills Agreements. These have been developed by Sector Skills Groups made up of representatives from industry. The initial model was the Industry Forum Advisory Group, IFAG. This had been the focus behind training choices within Industry Forum and Automotive Academy. SEMTA used a set of four Sector Skills Groups. These covered automotive, aerospace, electrical and marine. The common elements of their deliberations were brought together as four themes within SEMTA's Sector Skills Agreement (Bates 2008). These are:

- Productivity and Competitiveness
- Management and Leadership
- Technical Workforce Development
- Manpower and Resource Planning.

Planning for Automotive Academy and NSA-M has focused broadly on the first three of these. The early development of training products and activities has focused more specifically in productivity and competitiveness. To understand the reasoning we have to go back to earlier development activity. Prior to Automotive Academy, there had already been discussions at Industry Forum on the plethora of qualifications that tend to confuse manufacturers. There are at least 17000 NVQ courses available (Bates 2008). The first step was to partition the applicable training programmes into the various phases of the production cycle. From the table below it, we can see that the two areas which would support manufacturing and deliver on the Government's

agenda of increasing skills in the workforce are Business Improvement Techniques and Performing Manufacturing Operations.

		Engineering Management (Mainly NPD)	Project Management	POLEMICS Logistics & Purchasing	Engineering Supply Chain Mgt	Business Improvement Techniques	Operational Management	Performing Manufacturing Operations
NVQ LEVELS COVERED	5	*	✓		*	*	✓	
	4	✓	✓	✓	*	✓	*	
	3	*		✓	*	✓		
	2			✓	*	✓		✓
	1							✓
'OWNER'		SEMTA	ECITB (Process Plant Industry)	CIPS + ILT + IOM + IoE	SEMTA	SEMTA	CMI + Others In Consortium	SEMTA

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* Standard currently in development ✓ Standard fully defined

Table 3 Framework of National Vocational Qualifications (Source: Industry Forum, 2004)

The mission of NSA-M is clearly defined by its owner SEMTA. Based on the intelligence from its Sector Strategy Group, SEMTA has set NSA-M’s role to focus initially on Technical Workforce Development at levels 2, 3 and 4 through the consistent implementation of Business Improvement Techniques qualifications and on Management and Leadership. This follows on directly from the work started by the Automotive Academy. The full array of elemental modules of the NVQ programme entitled “Business Improvement Techniques” is set out in Appendix 2.

The initial documentation on NSA-M acknowledges that productivity improvement is about more than just having a better-qualified workforce. There is other research to show that to achieve the maximum improvement there must also be the practical application of the new skills and an introduction to the techniques at all levels of the organisation (Whiteman 2005).

For “Train to Gain” the strategic objective at present is to raise the base level of qualification of the UK workforce. Within manufacturing this has been interpreted as basic operations or lean principles. Brokerage Teams for the Train to Gain programme are distributed across the country. Each team has both a regional and sectoral focus. For the purpose of this research, we identified the teams that have a sectoral focus on automotive and where their operation territory is the East of England or an adjacent region. Interviews were set up to establish the type of training that was being fully funded through the scheme.

Separate interviews with three “Train to Gain” brokerage team leaders revealed an inadvertent focus on NVQ Level 2 qualifications. The concept is for the brokers to engage directly with the owner managers of “hard to reach” SMEs (DfES 2005). These are the companies that are eligible for support but consistently fall outside State funded provision. The broker is to work with the

company to determine skills needs and to direct the company to suitable training providers. The brokerage service is free. The very first level of training is free to staff who have no other training already. Whilst the range of training could be wide, “Performing Manufacturing Operations” and “Business Improvement Techniques”, which covers Lean Manufacturing, are the key courses being delivered to companies in the automotive sector.

Public and private provision

To gain the provider’s perspective, we interviewed a director of one particular private provider that had a strong background in all three routes to provision. The offices of the Outsourced Training Company, TOTC, are co-located with Thames Gateway FE College. Hence a director of the company was chosen as a strong reference for the providers’ perspective. The company delivers training on behalf of the public sector. In this way the role of Lean Manufacturing in company development and its effectiveness in certain situations will be presented.

TOTC has a turnover of €9M of which less than 30% is State funding. Having started its operation with automotive manufacturing, it has now grown beyond that sector, but manufacturing still equates to 83% of its business.

National Vocational Qualifications are less than 10% of its work. The Business Improvement Techniques Levels 2 and 3 constitute only half of that. It is the other manufacturing skills that make up 40% with computer aided engineering, CAE, adding another 10%. Basic Skills are 15% and the softer management behavioural skills make up another 20%. The remainder of its business is not direct training.

5.3 Training needs for SMEs

Insight into the SME management views on training requirements has been collected from a number of surveys aimed at manufacturing SMEs in general and automotive and advanced engineering SMEs in particular. These have included region and sub-region cohorts of manufacturers. Whilst the companies surveyed all reside in one European region and work in the same sector, for the most part they cannot be represented as members of a cluster or network. This current project looks at two localised surveys and a region wide interactive survey. It starts however, with the conclusions presented by SEMTA on publication of its 2004-2005 national consultation:

“SMEs and other small organisations reported that they find it difficult to engage in training offered by many of the existing providers, as they were unable to afford to release employees from their operational role in order to undertake training, as was required by most training providers and colleges. There is a need therefore for provision which is flexible in delivery model, mode and length, in order to minimise time away from work and to ensure that SMEs have equal access to training for their workforce.” (Whiteman 2005)

The Breckland Survey concentrated on small manufacturing companies in the North East of the Region, namely Norfolk and Suffolk (Bevis 2005). Here it was found that there are skills gaps in nearly half the companies and these gaps and training needs reflect the experience across the region with a strong emphasis on general engineering and machine shop skills.

Forty-four SMEs were surveyed within a forty-mile radius of Thetford, Norfolk. Twenty-eight would class themselves as being in advanced engineering. The other sixteen are all in the automotive sector and predominately in motorsport. Just nineteen had more than ten employees. There were no guidelines provided setting out any exact criterion for “advanced engineering”. Anecdotally those companies involved in high precision engineering, e.g. using five axis machining and computer aided engineering would see themselves as “advanced” compared to companies using single axis turning and hand welding. The criteria used here are the perceptions of the respondents not the researchers.

Earlier regional research amongst employers in 2003 (EEDA 2003) identified generic skills needs that appeared to a greater or lesser extent across most sectors in the areas of

- management and business (some of which will be Level 3)
- ICT for non-professionals
- customer service
- multi-skilling – particularly for manual workers/trades people
- teamworking/flexibility

“Within the automotive sector itself that research had identified technical and operative level engineering skills ...” (EEDA).

Much of this is borne out by the Breckland survey with 45% of the sample companies experiencing skills shortages. Actual listed shortages included: general engineering, CNC, CAD, machine shop skills, pattern makers and welding. 80% of the companies do invest in skills training for their employees. Amongst the companies the level of participation in specific training has been:

Technical skills training.	80%
Health & Safety.	64%
IT Skills.	49%
Management / Supervision.	40%
Finance.	22%
Personnel Issues / legislation.	18%

The next survey looks particularly at an urban area to the South of the Region. As part of the Luton City Growth project, during 2005, the senior executives of eighty nine small companies across Luton were interviewed (Philpott 2005). Of these, eighteen could be classed as manufacturing companies. The interviews covered a number of aspects that impinge on the companies from local crime to recruitment, skills and the market environment. The interviewers were providing the executives or owner managers the opportunity to present their case without restricting them to a particular agenda. Skills could then be reviewed as a subset of the whole survey.

On the skills issue 32 of the 89 companies indicated that they had skills needs. Amongst the manufacturers the fraction was higher; nine out of the eighteen. The range of skills mentioned included design engineers, senior marketing positions, sales people, skilled metal workers, millers, machinists, aerospace structures assembly technicians, senior and qualified finance staff, trained mechanics, fabrication, merchandising, technical design, business & financial skills, business/finance manager, electronic component repair, food process-millers, food marketers, food packing machine and specialist engineers.

Notably it is the practical skills, finance and management skills that have been identified. There was no mention amongst these companies of the supervisory role seen as a requirement within larger companies.

Finally a more wide ranging survey based on regional responses (Philpott 2006). From this population of 231 companies, five distinct themes emerge from the data (Newman 2004). These are

- Specialist technical subjects,
- Supervision,
- Lean manufacturing,
- Apprenticeships,
- Marketing.

Specialist technical training is a key requirement, is peculiar to each individual SME and has to be seen outside any provision of generic training.

Supervisory training is the closest match with the two Academies’ agendas; highly skilled supervisors are needed to support the implementation of product and process innovation. There are records of good commercial benefits accruing from Lean Manufacturing and supervisory training, but these appear within a stable manufacturing environment. With the smaller companies the need for supervisory training becomes a need for management training. These two differences are well illustrated in Figure 2, drawn from that report. It shows a clear differentiation of skills needs between the small and medium sized companies.

The next two themes move away from the comfort of stable manufacturing environments. Apprenticeships which need a breadth of experience – staff need a range of knowledge and experience to engage in innovation. Marketing has been the strongest amongst the micro and small enterprises – again a skill required when a company produces a new product or service or attempts to penetrate a new market.

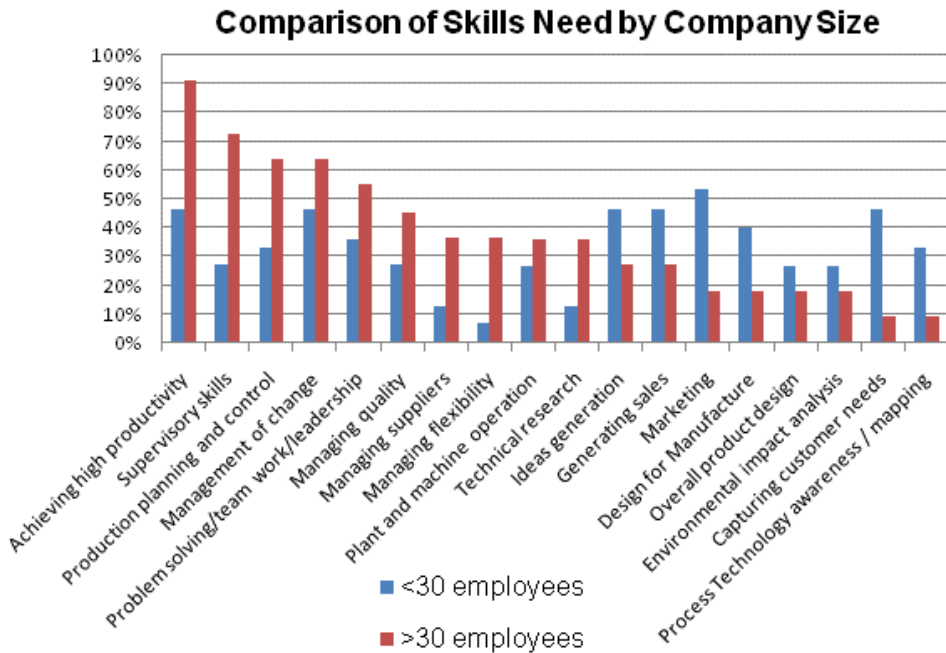


Figure 2 Comparison of Skills Needs by company size (Newman 2004)

The findings here concur with those of Tether et al in their review of skills and innovation (Tether 2005). Reporting on the UK SMEs – Cambridge Survey of SMEs, 2002 they highlighted that amongst innovating SMEs the view that the lack of marketing and sales skills and management skills is an impediment to growth was significantly higher than amongst the non-innovating ones.

6. Synthesis of a model of sustainable training

For training to be sustainable, it needs to provide measurable performance benefits to the organisation and be cost effective to implement, thus satisfying both business and political criteria. Here we set out a model for sustainable training that builds on the research and the associated secondary research in the training literature. The model sets out eight key aspects that impact on the sustainability of any training activity (Figure 3). The first three concern the state of the organisation itself. These are “*Company readiness*” which is more than a state of health or maturity - it implies a culture of training and development, “*Organisational Motivation*” which is focused on the appetite for training and development at a particular time and in a particular environment and “*Receptive Organisation*” which considers the organisation’s ability to support learning.

The next two aspects relate specifically to the learners involved. There is “*Learner Readiness*” which concerns whether the right learners have been selected at the right stage in their own development and there is “*Recognised Achievement*” - whether by qualification, money or prestige, appropriate recognition can create a virtuous circle to promote further learning by the learner and colleagues.

The final three aspects relate more specifically to organisational goals and the appropriateness of the training activity itself. “*Relevance*” is about precisely how relevant any training is to organisation’s goals and objectives. In this discussion “*Measured Outcomes*”, the metrics that are possibly related to the learning activity need to be aligned to the organisation’s goals and activities. Perhaps the most obvious and therefore included at this point to show that it is relevant in this model, is “*Focused content and delivery*”. This focus on subject has to be as seen firstly within the organisation’s training and development requirements and secondly within the operational needs of the company.

Whilst relevance and focus might be self-evident, some deeper explanation is required of the other aspects.

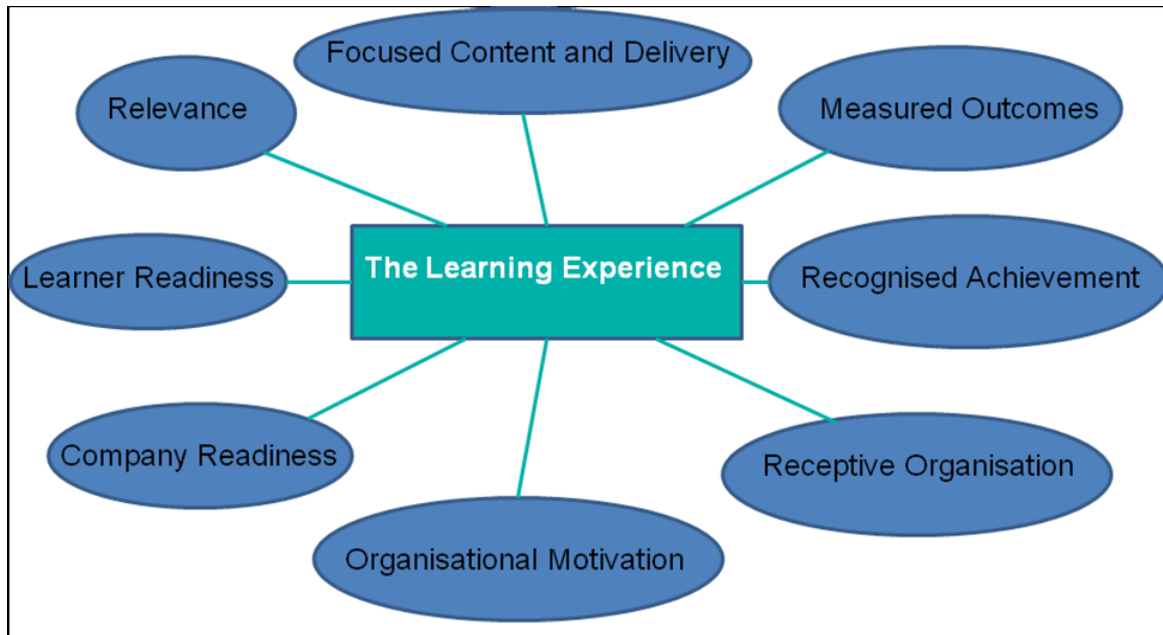


Figure 3 Learning Experience

6.1 Company readiness

For SMEs to be encouraged to grow, to be innovative and so be truly competitive, they need training support. Even if the training is designed just to tackle short term skills needs, our contention here is that evidence of growth and innovation is a prerequisite for effective training. Given the difficulty of defining “competitiveness” I have opted for “strongly innovative” based on previous research showing innovative companies to be more likely to be growing)

6.2 Organisational Motivation

Training needs to be within the priorities set by senior management, line management and client base. In automotive industry, supply chain relationships are crucial.

This research has shown that there is a clear national policy on training for the SME community and that this has been implemented in part through the two Academies. Whilst this policy is developing further, it is impacting on the wider manufacturing SME community. The primary links to policy are the promotion of Lean manufacturing, (Lewis 2000) (Womack et al. 1990), and the raising of the minimum skills level of all workers.

The organisation needs to be motivated to develop within its supply chain.

6.3 Receptive Organisation

The main thrust of the research effort into workplace learning has been to identify the characteristics of workplace learning as experienced by the learner. The impact of the wider organisational process in which that learning is embedded has been played down. Ashton, building on the work of Koike and Darrah, has used research conducted in a major multinational corporation (MNC) in South-East Asia, to explore the impact of the wider organisational structures on the process of learning (Ashton 2004). The model he has developed not only shows how these processes impact on workplace learning but also helps

explain why workers acquire different levels of skill. Ashton's model is only looking at the impact the organisation has on the learner. Given the size of organisation represented in his case study, it was less necessary to consider any impact that the learner or even the learning might have on the organisation. Where we consider SMEs there is greater potential for learner and organisation to interact.

From the initial comparison of OEM and SME training we found that when training is based within a supportive regime with an in-company champion at hand, there is the potential for double loop learning. (Schön and Argyris 1978) This also requires the training provider to be very aware of the company situation. We also found that there is a need for follow-on training to refresh knowledge and keep the subject alive. However, the engagement at this point may be more difficult and hence the need to determine whether the organisation is receptive to training in this wider sense.

6.4 Learner readiness

From the initial study of training outcomes in an OEM and a group of SMEs, we found that when training was imposed there was a strong possibility that at least half of the participants would not engage. This suggests the risk that a major proportion of an SME's training budget, or even Governmental funding to support SME training is likely to be wasted, unless other specific safeguards are brought in. The general safeguards common to the use of Public Funds are only sufficient to ensure open and transparent financial dealings. Any definitions of "Value for money" are short term. The careful selection of learners and their support during and after the training exercise again increases effectiveness.

SMEs may be using third party training as an independent staff appraisal tool. This points to the need for support for Human Resources not just training needs analysis based on Company need.

6.5 Recognised Achievement

The second objective of this project has been to determine what is the national policy on skills development for the automotive industry's SME community. The primary thrust of policy has been the promotion of lean manufacturing using NVQ in Business Improvement Techniques and the raising of the minimum skills level of all workers. Beyond just qualification, money or prestige also support a virtuous circle to promote further learning by the learner and colleagues. It also supports retention.

6.6 Relevance

Training must be relevant to organisation's goals and activity. There are a number of diagnostic tools available for determining the state of a company and assisting in the selection of appropriate interventions including training. These range from the EFQM Business Excellence Model to BusinessLink's Gross Value Added Model. Some interviewees in the research have identified their need of a Human Resources view of the company to enable them to optimise their training budgets. This links with "Learner Readiness". It is also clear that relevance is defined by the companies' demand pull of training and not Policy promotion.

6.7 Measured Outcome

At the very beginning of this paper we raised the issue of the empirical use of Kirkpatrick's level 4 criterion for training (Bevis 2006). Alliger questions whether his Levels were meant for anything other than a guide to evaluation (Alliger 1989). We found a reluctance to engage

in meaningful measurement of longer-term outcomes. This is due, in part, to a lack of understanding of what could be obtained from quantitative measurement and lack of knowledge of measurement systems. Perhaps more importantly, the volatile nature of the business environment makes the accuracy or meaning of any measurements suspect. This suggests that any training is less effective than advertised. At best SME managements were recognising the need for performance measures in their companies which were more than just the routine financial reports.

Within the automotive industry with support from the DTI¹⁵ and SMMT – Industry Forum, the use of the seven measures of Quality Cost and Delivery, QCD, have been promoted (DTI 2000). The mapping of the individual measures to quality, cost and delivery are set out in table 4.

	Quality	Cost	Delivery
Not Right First Time	●	●	●
People Productivity		●	
Stock Turns	●	●	●
Delivery Schedule Achievement	●	●	●
Overall Equipment Effectiveness	●	●	●
Value Added Per Person		●	
Floor Space Utilisation		●	

Primary ● or secondary ● impact on the process.

Table 4 Relationship between Seven Measures and QCD

According to SMMT – Industry Forum, QCD is a robust production tool which has a measurable effect on manufacturing efficiency, which can help to improve competitiveness, develop business and increase profit. The measures can highlight the priorities for improvement in production management with clarity and focus. They simplify even a complex manufacturing process and identify straightforward routes to gain performance improvements. The seven QCD measures can be used to quantify the results of any changes to the process (IndustryForum 2008). An increase in “lean” skill levels in a manufacturing environment becomes an incremental change to the manufacturing process itself.

¹⁵ As part of his reorganisation of Whitehall, when he became Prime Minister in 2007, Gordon Brown replaced the UK’s Department of Trade and Industry, DTI, with a new Department for Business, Enterprise and Regulatory Reform, BERR.

The implementation of these very specific measures prescribed by DTI to support competitiveness in manufacturing was limited to the larger SMEs in the sector. But, given the poor correlation between spend on training and measured benefit, an appropriate measure should be found. If neither the prescription of Kirkpatrick nor that of the manufacturing experts in the late DTI is seen to be in use, then a sensible condition for sustainable training is that the commissioning employer considers and agrees an appropriate measure before commencement.

6.8 Focused content and delivery

Focus is seen within company's training and development requirements. This relates partly to organisational motivation, but also to the more important issue of training content. There must also be a secondary focus on the operational needs of the company to ensure that the structure and delivery of any training is sufficiently flexible.

A recent Federation of Small Business Survey included training within its scope. Amongst the companies who responded in this area, "28% would like better advice and guidance about appropriate training, 23% wanted tailored training packages aimed at their business needs, and 22% would be encouraged to undertake more training if it could be delivered in the workplace."(FSB 2007)

7. Conclusions and recommendations

This paper has considered the challenges for sustainable skills development in the UK automotive supply sector, by focusing on how policy is being implemented. By first looking at how training is experienced in the sector, principally in the East of England and how public policy drives and supports training, it has moved on to present a learning model that could be used to improve the sustainability of training investment.

For businesses to sustain their operations, they must develop and grow. Training is an integral part of that process. Our initial research confirmed that there was little objective evidence on the effectiveness of much training. Using a controlled group within an OEM and the experience of a number of SMEs who have taken part in the training we found no evidence of measured outputs, e.g. Kirkpatrick's level 4/5 except where lean manufacturing training has been applied in a specific interventionist approach. Here it has been specifically within the automotive supply chain development initiatives. There were mixed outcomes very dependant on inclination/motivation of learners.

With regard to national policy on skills development for the Automotive Industry's SME community, the investigation has shown that there is a clear national policy for the SME community and that this has been implemented in part through the two Academies. With the changes of Academies from "Automotive Academy" to "National Skills Academy for Manufacturing" is developing further and impacting on the wider manufacturing SME community. The primary links to policy are the promotion of Lean manufacturing and the raising of the minimum skills level of all workers.

The culmination of a number of Government policies and initiatives has meant that publicly funded provision of training has been focused on lean manufacturing or its equivalent, business improvement techniques at NVQ levels 2 and 3, with most funding targeting the lower level. This clearly benefits the productivity aims of the medium sized companies. With the smaller SMEs there were found to be distinct differences between their perceived skills

needs and the skills needs determined at a National level from consultations that have fed into SEMTA. This has highlighted a weakness in National policy. Smaller enterprises do not have the same level of access to the training that most suits their needs.

Based on this research into the state of training amongst the automotive supply SME community and their training needs, a model has been presented that can support sustainable training. Within the model we have identified specific criteria that could be used to target training resources more selectively. If an enterprise is ready, motivated and receptive; if training is only given to selected suitable staff whose achievement is subsequently recognised; if the training relevant and focused; then there should be measured outcomes that relate to the enterprise's goals.

The companies most likely to meet these criteria will be the competitive and innovative companies. It is our contention that training targeted on these companies will be sustainable. It will provide measurable performance benefits to them and be cost effective to implement, thus satisfying both business and political criteria.

“The success of the Lisbon process hinges more than ever on the optimal formation and usage of the stock of human capital. Human resources are the main engine for the creation, dissemination and application of knowledge essential for the increase in productivity and creation of jobs necessary for the sustainability of the European economic and social model.”
(Dion 2005)

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Appendix 1

Table 1 Questions used in structured interviews

Question Areas	Potential individual questions
Why training?	<p>What were the strategic reasons for embarking on this particular training activity? Were the roots in any form of company wide internal or external audit? Business Excellence Model, IiP, Skills audit or Training Needs analysis. What particular training needs were identified? What information was to hand to link particular training provision to that need?</p>
The Environment?	<p>What was your commitment to this training? What was the commitment of the management team?</p> <p>Was the organisation's trading environment conducive to training then and is it still so now?</p> <p>Was there any external funding available to support your training?</p> <p>Was effect did the training have on the effectiveness of your organisation whilst the training was in progress and how did you cope with any adverse effects?</p> <p>What is your understanding of the peer pressures on the trainees and do you recognise these pressures as support or inhibition to the training's effectiveness?</p>
The Training	<p>What type of provider was used to deliver the training and where? (Learning centre, hotel or company site)</p> <p>Were your trainees treated separately or with those of other organisations? Was that separation or mixing beneficial?</p> <p>Was there a qualification available at the end? Did your trainees achieve it and do you see that as a desirable outcome?</p> <p>Was the training suitable to your particular needs?</p>
The Trainees	<p>What was the level of training of your staff before the exercise?</p> <p>Were there any staff with basic skills needs, which would require the training to be handled in a substantially different way?</p> <p>Would it be possible to sample the staff involved to test their own recollections of the training?</p>
The Outcomes?	<p>What were the trainees' reactions to the training itself? Did they indicate initially that they had found it useful? Was this fed back to the trainer?</p> <p>What measures were used to determine whether the trainees had absorbed the information from the training?</p> <p>What evidence is available now that they have put into practice what they had learnt?</p> <p>Given the changing economic environment, is there any way in which you can see whether the training has had any long-term effect on your business? How does that effect compare with the actual cost of providing the training?</p> <p>Of the measures that were undertaken, to what extent were the results passed to the trainer/provider, the funder or your own HR/Training managers?</p> <p>Would you consider more of the same training and/ more training from the same provider?</p>

Appendix 2

BUSINESS IMPROVEMENT TECHNIQUES PROCESS PATHWAY			
NVQ2	NVQ3	NVQ4	
Stat. regs and org. safety reqs.	Stat. regs and org. safety reqs.	Stat. regs and org. safety reqs.	
Effective team working	Effective team working	Effective team working	
Workplace organisation	Leading effective teams	Leading effective teams	
Continuous Improvement (Kaizen)	Workplace organisation	Workplace organisation	
	Continuous Improvement (Kaizen)	Continuous Improvement (Kaizen)	
	Flexible Production & Manpower Systems	Flexible Production & Manpower Systems	
Analysing & Selecting Parts for Improvement		Project Management Activities	
Lead Time Analysis	Analysing & Selecting Parts for Improvement		
Visual management systems	Lead Time Analysis		
SMED	Visual management systems	Analysing & Selecting Parts for Improvement	
TPM	SMED	Lead Time Analysis	
Problem solving	TPM	Visual management systems	
Flow process analysis	Problem solving	SMED	
<i>Mandatory + 2 optional</i>	Flow process analysis	TPM	
	Policy Deployment	Problem solving	
	Value Engineering & Value Analysis	Flow process analysis	
	Poka Yoke	Policy Deployment	
	<i>Mandatory + 2 optional</i>	Value Engineering & Value Analysis	Value Engineering & Value Analysis
		Poka Yoke	Poka Yoke
		<i>Mandatory + 2 optional</i>	

Mandatory modules
 Optional modules

Fig.1 Business Improvement Techniques – Process pathway