KEF eLean Project

"e" DELIVERY MECHANISMS FOR LEAN TRAINING - RESEARCH REPORT

September 2006

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Summary

Small and medium-sized enterprises (SMEs), defined as firms employing up to 250 people [1], represent over 99% of Welsh businesses and are both socially and economically vital to Wales [2]. It is therefore extremely important that SMEs continue to remain competitive, profitable and sustainable in business.

The application of lean thinking has made a significant impact both in academic and industrial circles over the last decade [5]. Lean Manufacture has proven to be a vital tool for successfully achieving growth and sustainability in business. Extended learning (e-learning) experiences on the other hand take advantage of an enriched environment where classroom instruction is supplemented by an interactive component facilitated by technology tools [3].

Adoption of Lean through E-learning (ELean) in this research is being considered as a key driver of economic growth, sustainability and increased productivity within the SME community in Wales.

The research is sponsored by the WAG's Knowledge Exploitation Fund (KEF). KEF main objective is to deliver high value-transfer of knowledge, skills and idea from academia to industry within SMEs in Wales and hence achieve economic growth and sustainability.

Aims and Objectives

This report represents findings from a research study of Welsh SMEs used to measure their progress in imbibing the use of the technology (in this case, the web) in business, as well as their knowledge of Lean Manufacturing tool. This will enable development of e-learning support that will aid in successful implementation of Lean principles within Welsh SMEs.

The main aims of the research are as follows:

- To benchmark the current state of web usage within SMEs in Wales and assess the applicability of the web for training purposes within Welsh SMEs.
- To assess and benchmark the present role of Lean Thinking in business.
- To analyse the Welsh SME Market

Methodology and main findings

Research objectives were addressed by means of a self-administered postal questionnaire sent to a selected sample of about 1000 small and medium-sized enterprises (SMEs) across Wales. This yielded about 9% response rate.

The questions covered a range of issues relating to business, the web and Lean Thinking. This helped to identify the key drivers for implementing e-lean, current adoption levels of web usage and lean thinking in business, what the web is currently being used for and intentions regarding future implementations.

The study was commissioned to investigate web and Lean Thinking adaptation and use within SMEs only, therefore businesses with more than 249 employees were excluded [1].

Key conclusions

With respect to Web Usage,

- The study showed that the web is significantly being used within Welsh SMEs during business hours and by a significant volume of staff.
- Distance learning as a form of training is significantly being used by a number of SMEs already using the web for training purposes.

- Majority of companies already using the web for training are private limited companies and a majority of companies that think the web is not applicable for training are also private limited companies.

With respect to Lean Thinking,

- Results show that a majority of companies implementing Lean Thinking also already use the web for the purpose of training. This is significant to the implementation of eLean.
- Impact on SMEs implementing Lean Thinking showed a positive and encouraging result.

With respect to Welsh SME Market Analysis,

- Manufacturing represented the largest sector and analysing the area's manufacturing business profile of companies showed that industrial and commercial machinery dominated.

Implications

Main implications are highlighted as followings:

- A lot of work is still needed with respect to increasing awareness of the advantages of using the web for training.
- Results show that inadequate web skill and knowledge among staff, lack of professional web training and support remains a significant barrier.
- Lean Thinking is currently being applied by very few SMEs in Wales.

Background

SMEs are now realizing that in order to remain competitive in an increasingly complex and demanding global market, they must discover innovative ways in which to manage their production operations effectively and efficiently [4]. Lean Manufacturing strategy has successfully allowed companies to deliver bottom-line savings in production and achieve sustainability in business [5].

The Lean Enterprise Research Centre in Cardiff Business School, well known for its research in Lean Thinking is jointly carrying out a research project called eLean with the Centre for Enterprise Planning, Operations and Control Systems at University of Wales, Newport.

This research, sponsored by the WAG's Knowledge Exploitation Fund (KEF), aims to increase the number of added, innovative products and services through the manufacturing Welsh companies delivering high value-transfer of knowledge, skills and ideas from academia to industry. It aims to develop a web based training programme to transfer to employees the knowledge and competences required to develop and implement sustainable business improvement strategies and techniques, based on Lean Thinking.

The research is specifically targeted at small and medium (SME) sized Manufacturing companies in Wales. An SME as defined by The European Union is an independent business consisting of less than 250 employees with an annual turnover not exceeding €50m or £33.4m or an annual balance sheet total not exceeding €43m (£29.02m).

About a thousand questionnaires were sent off to Welsh SMEs for this project. The questionnaire was used to examine the potential use of the web within SMEs for Lean oriented training via the web.

This report uses results from the questionnaire to focus on the potential for Welsh SMEs to engage in training via the web by examining a number of factors to determine the current state of use of the web within Welsh SMEs, SMEs knowledge and application of Lean tools within their businesses, an analysis of the characteristics of SMEs that think the web is applicable for training, those that think it

is not and reasons behind this rationale as well as a brief analysis of the manufacturing sector of Welsh SMEs.

Introduction to findings

Use of the Web in Business

This section focuses on the potential for SMEs in Wales to engage in eLean by assessing factors relating to their current use of the web during business hours.

This section considers the following factors:

- Businesses with access to the web
- Type of connection used to access the web
- Category of staff with access to web during business hours
- For what purposes the web is used during business hours
- How the web is used for training
- Applicability of the web for training purposes
- Areas suitable for web training
- Barriers to using the web more than currently used.

The Role of Lean Thinking in the Business

This section focuses on the potential for SMEs in Wales to engage in eLean by assessing their current Lean Thinking knowledge and practices.

The following factors were assessed:

- Businesses use of Lean Thinking
- Usage of specific lean tools
- Sources used to develop lean oriented knowledge in business
- Impact of Lean implementation in businesses with respect to quality, cost and delivery

Data Analysis

Data of specific category of companies were analysed to pinpoint what type of companies should be targeted for the project.

The companies are as follows:

- Companies already using the web for training
- Companies indicating lack of applicability to product as a large barrier
- Companies that think the web is NOT applicable for training

These companies were analysed with respect to their annual turnover, number of full time employees, company ownership, length of time in which company has been established and in the case of companies that think the web is NOT applicable for training, the business activity of the companies.

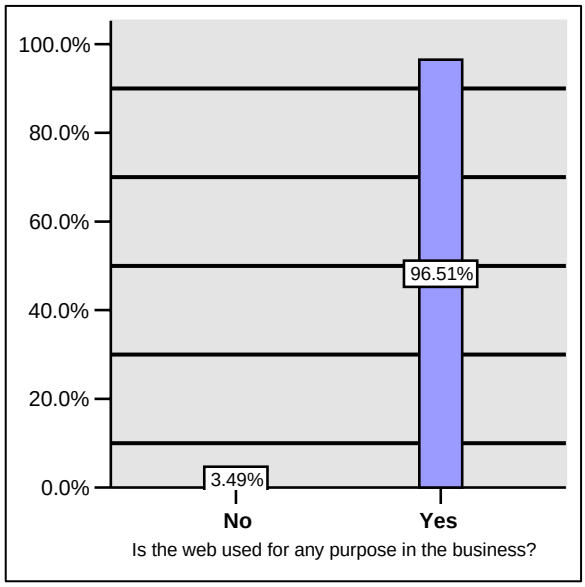
Analysis of the Welsh SME Market

The project is targeted at Manufacturing SMEs, therefore a short analysis of the Welsh SME market was also done to determine the market share of Manufacturing SMEs within the Welsh SME market.

Use of Web in the Business

Is the Web used for any purpose in the Business

The questionnaire result showed that internet access availability in welsh SMEs is quite high with 97% of respondents indicating they have internet connection and 4% that they are not using but have plans to get internet connection.



This is supported by a survey of Electronic Commerce Utilisation in Small and Medium Sized Enterprises in South Wales (2001) which indicated that 92% of companies had Internet Access.

Compared with results from eCommerce in Welsh SMEs; The State of the Nation Report 2003/2004 which showed that 57% of respondents already had internet access and 7% that they plan to get internet access within 12 months of the report, indicates that generally, there has been significant increase of internet access within Welsh SMEs.

This shows that a majority of SMEs in Wales are striving to keep up with change in technology and are looking for more innovative ways of improving their products and services. High access to the internet proves that a high majority of SMEs have the required infrastructure to take part in the eLean project.

Internet Connection Type

Majority of respondents with internet access (83%) reported they connect to the internet via broad band and a smaller percentage (14%) showed to be dependent on dial up. 2% uses other connection types like ISDN.

The State of the Nation Report 2003/2004 showed majority of SMEs were using dial up but that there was an increase in the use of broadband technologies.

Hence, a lot of Welsh SMEs have advanced in technology by adopting the use of broadband in their businesses. This is a significant improvement that indicates a more frequent use of the internet during business.

Employees with access to the web during office hours

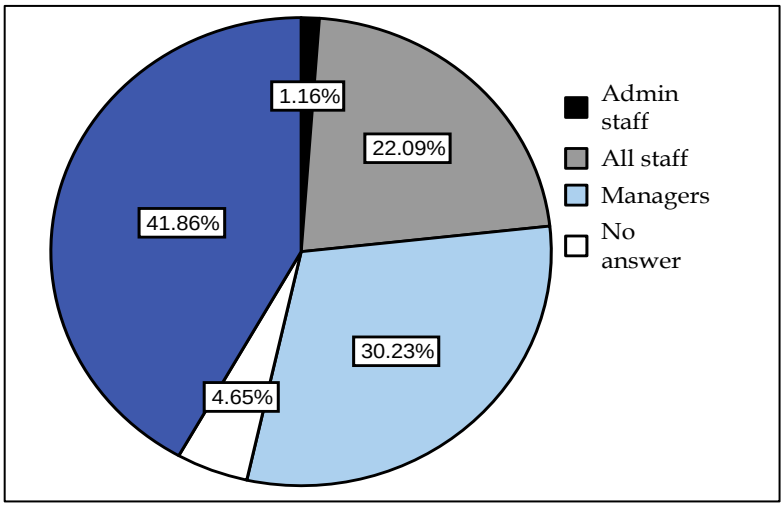
Businesses with access to the web were asked what categories of employees have a daily access to the web during office hours. Results showed that a majority of the respondents (42%) indicated that the supervisory staff which includes the managers has daily access to the web, 30% say that the managers only have daily web access during office hours while 23% indicated others.

95% of companies with internet access have at least one staff using the web during business hours. This can be compared with The State of the Nation Report 2003/2004 which indicated that there was significant increase from 87% (from the 2001/2002 report) of companies with internet access indicating that at least one employee uses the web.

22% indicated that all staff members have frequent access to the web during business hours. This is a great advantage to the eLean project because a significant amount of SMEs are indicating they have enough people using the web to play a significant role in the project.

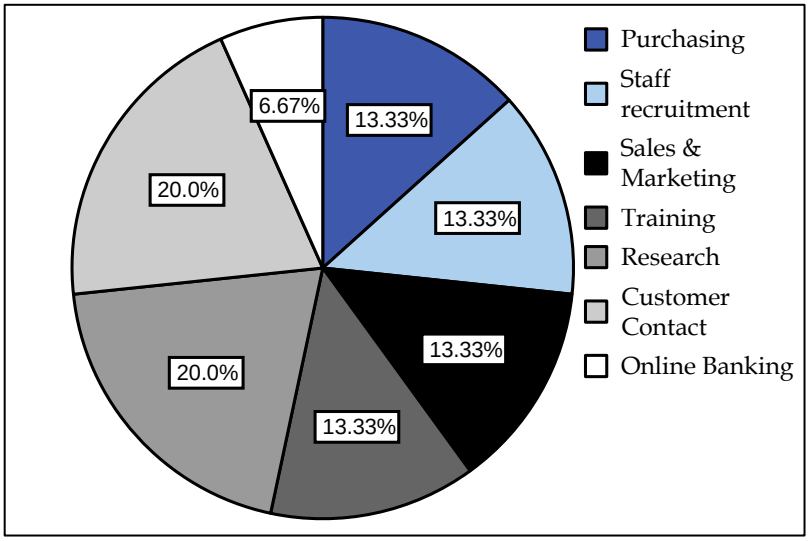
Purpose of the web in business

Businesses were asked what they use the web for during business hours in order to examine about how many of them use it already for training purposes.



Results show that 13% of respondents using the web in business already use the web for training purposes, hence, training via the web is already accepted by some welsh SMEs. However, majority of SMEs are missing out on the significant use of the web for training purposes.

Type of training given via the web



12% of respondents already using the web for training use it for distance learning/online training. This could be through accessing training sites, self training, in-house training and induction.

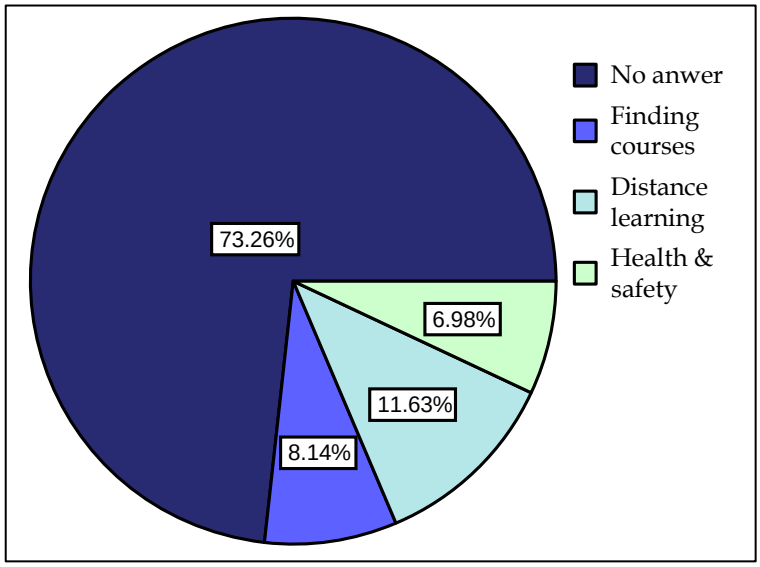
8% of those respondents on the other hand use it for accessing course information. This could be getting training material online, searching for training providers, searching for seminars or conferences to attend.

7% use the web for Health and Safety information for all staff within the company.

Majority of the SMEs already using the web for training purposes use it for distance learning. This shows that distance learning is accepted and to an extent appreciated within the industry.

Applicability of the web for training in business

60% of respondents believe the web is applicable for training purposes. This is a significant percentage which shows that Welsh SMEs have an open mind to training via the web.



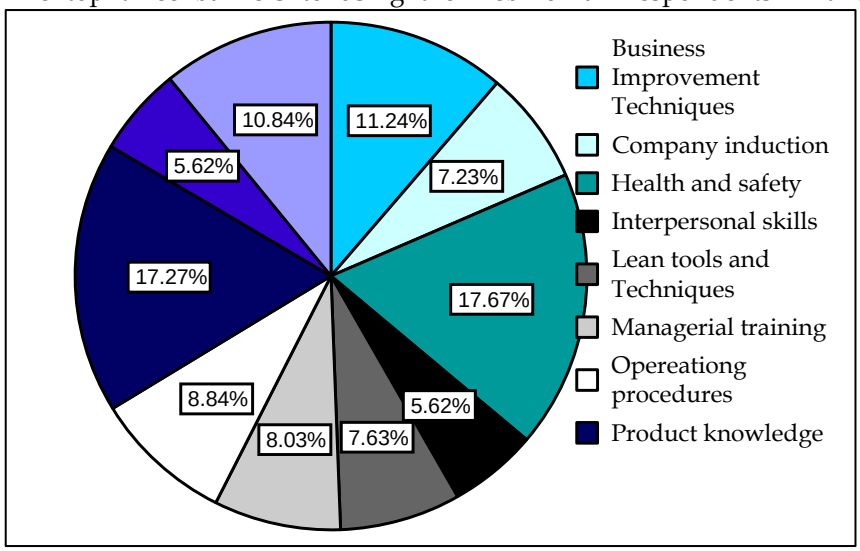
Health and Safety with 18% is the most popular thought to be very applicable for training via the web, followed by Product Knowledge with 17% and then Business Improvement Technique with 11%.

8% of respondents indicated Lean tools and Techniques training to be applicable through the web. This shows SMEs in Wales are not very knowledgeable about Lean and that there are probably not enough available online training courses on Lean tools and techniques.

Barriers to using the web more than is currently used in business

Respondents were asked to indicate which factors represent barriers to more usage of the web in their business. Results were analysed by businesses currently with and without an internet connection.

The top three barriers to using the web for all respondents in this study are "applicability to products/markets (59% of respondents)", "lack of web knowledge throughout the organisation (58% of respondents)" and "lack of staff web skill (58% of respondents)".



Compared to eCommerce in Welsh SMEs: The State of the Nation Report 2003/2004, where the top three barriers are "type of product/services not suitable, "high cost" and "not enough skilled staff" and "internet connection too slow/undependable" as the 4th largest barrier for all SMEs and 3rd largest for people already connected.

Also, compared to the DTI benchmarking study, 2001 which concluded that cost and lack of knowledge/ skilled staff are important factors explaining the fall of the proportion of micro sized businesses with internet access in the UK as a whole.

Results show inadequate web skill and knowledge among the staff has continued to remain a barrier for SMEs in Wales, the significance of cost as a barrier is going down (33% of respondents), instead, applicability of the web to products and market is becoming a significant barrier.

Results also showed that a lack in professional web training and support (56% of respondents) is also identified as a significant barrier to use of web in Welsh SMEs.

The Role of Lean Thinking in the Business

Use of Lean in Business

24% of businesses use Lean Thinking related tools and ideas in their business while a significant 76% do not use Lean in their business. Compared with results form the LDP final report 2003 which indicated that 52% of businesses in East London indicated that they had no knowledge of Lean Thinking, there is clearly a need to raise awareness of lean thinking and its potential benefits to the community of SMEs.

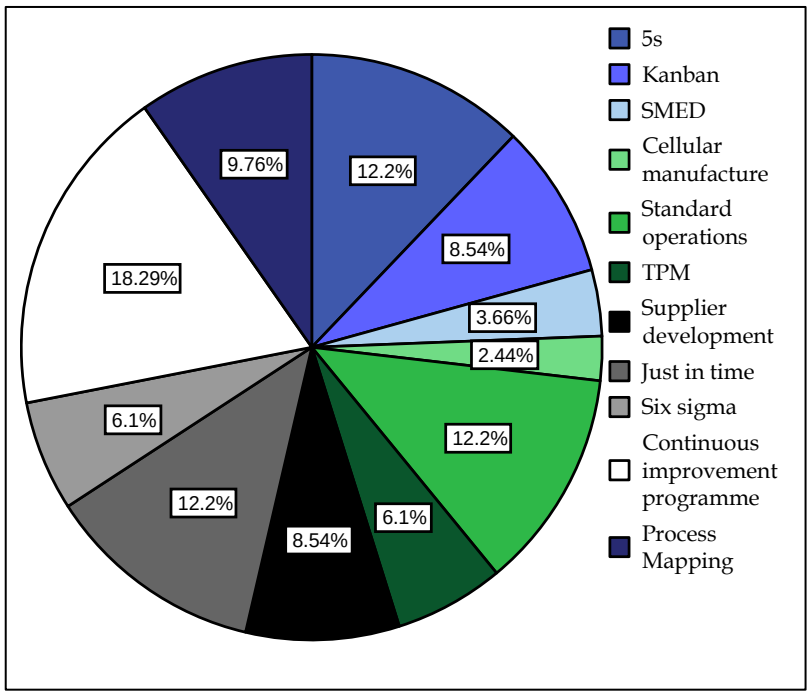
An analysis of welsh SMEs and the specific type of lean tools presently being used gave the following results: continuous improvement programme (18%), 5S housekeeping (12%), Just in time (12%), Standard operations (12.2%) had the highest application and Cellular manufacturing (2%) and SMED changeover reduction (4%) had the lowest.

Report showed that not a huge percentage of SMEs have a basic knowledge of the Lean tool as a successful and sustainable strategy that can be used to meet challenges of the ever changing market. SMEs believe that they do not have the resources to implement the Lean strategy.

SMEs are in dire need of education on Lean as a strategic tool that can be implemented irrespective of company size to achieve sustainability in business.

Development of Lean oriented knowledge in business

Businesses were asked what venues were used for the development of Lean oriented knowledge in business.



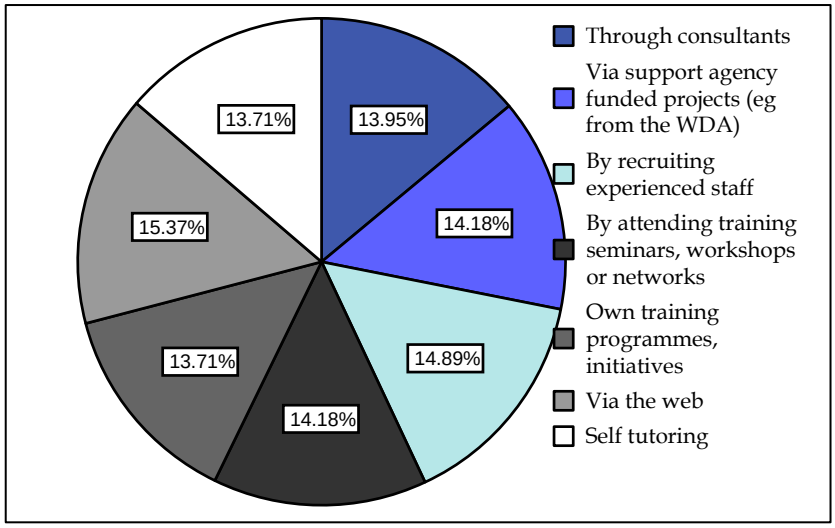
Majority of respondents implementing Lean oriented knowledge indicate using the web. Clearly the use of the web is efficiently being used by businesses with the knowledge of Lean. This is a positive result for the eLean project since it means businesses would be open minded about the use of the web for training on Lean implementation.

Impact of Lean in business

Those respondents (n=21) that had implemented lean practices in their businesses were examined for the impact of Lean in their businesses with respect to quality of products/services, cost of products/services and delivery of products/services.

Quality of products/services

33% of respondents implementing lean in their businesses (7 of n) indicated that quality of products/services greatly increased, slightly increased and stayed the same.



Cost of products/services

19% (4 of n) admitted to having a slight increase in cost, 48% (10 of n) says cost stayed the same, 19% (4 of n) had a slight increase in cost and 14% (3 of n) experienced a great decrease in cost.

Delivery of products/services

19% of respondents practicing lean (4 of n) experienced a great increase in delivery of products/services, 33% (7 of n) had a slight increase of delivery while the delivery of 38% (8 of n) stayed the same.

Generally, result from Welsh SMEs implementing Lean in their businesses has been very positive and encouraging. This result should be used to motivate more implementation of Lean within SMEs

67% (14 of n) of respondents implementing Lean admitted to an increase in quality of their products while the remaining 33% admitted to quality staying the same.

33% (7 of n) experienced a decrease in cost, cost of products/ services for 48% (10 of n) of them stayed the same while 19% (4 of n) experienced a slight increase in cost of product/services.

52% (11 of n) experienced an increase in delivery of product/services; delivery for 38% (8 of n) stayed the same while there was a decrease in delivery for 10% (2 of n).

Companies using the web for training

This section analyses the type of companies (n = 23) that are already using the web for training purposes.

Annual Turnover

8% of all respondent SMEs with an annual turnover of <£1/2m use the web for training, 8% of respondents with an annual turnover of £1/2m-£2m use the web for training, 2% of these companies with an annual turnover of £2m-£10m, and £11m-£25m uses the web for training.

Full Time employees

11% have <10 full time employees, 7% have a full time employees of 10-25, 5% have 26-50 full time employee while 2% have 51-100 and 101-250 full time employees.

Company Ownership

2% of respondents are sole traders and partnership companies respectively, 17% are private limited companies, while 4% are public limited companies

Length of time, company established

2% of respondent companies have been in existence for up to 3 years already use the web for training, 1% between 3-5 years, 5% have been established for 6-10 years, 8% have been established for 10-20 years while 10% of respondent companies have been established for over 20 years

Companies indicating lack of applicability to products as a large barrier

17% of all respondents indicated that lack of the web's applicability to their products is a large barrier to using the web more than they currently do. This section highlights the attributes of these companies.

Annual Turnover

27% of these companies have an annual turnover of <£1/2m while 73% have an annual turnover of £1/2m-£2m.

Full Time employees

47% have <10 full time employees while 53% have a full time employees of 10 to 25.

Company Ownership

13% of respondents are sole traders and partnership companies while 73% are private limited companies.

Length of time, company established

7% between 3-5 years, 13% has been established for 6-10 years, 47% have been established for 10-20 years while 33% of respondent companies have been established for over 20 years.

Business Activity

The activities varied in type as shown in the list. However, the list of business activities of the respective companies prove that indeed companies are unaware of how to make a good use of the web to enhance their knowledge with respect to their businesses

- Renewable Energy Development
- Craft Pottery Manufacture
- Filter Manufacturer
- Mechanical, Structural Engineer
- Laboratory Supplier
- Steel Fabrication & Erection
- Material Provider for Electrical Wholesale Trade
- Process Engineering
- Mechanical Equipment Manufacturer
- Specialist Hygienic Finishes and Moulding
- Exhibition & Display Conducting
- Electronic Equipment Manufacture
- Plastic Injection Moulding

- Ventilation, dust and Fume Extract
- Insulation Contractor

.Companies that think the web is NOT applicable for training

Annual Turnover

17% of companies that think the web is NOT applicable for training have an annual turnover of <£1/2m, 12% have an annual turnover of £1/2m-£2m, 6% have an annual turnover of £2m-£10m while 1% £11m-£25m.

Full Time employee

17% have <10 full time employees, 12% have a full time employees of 10-25, 4% have 26-50 full time employee while 2% have 51-100 while 1% 101-250 full time employees respectively.

Company Ownership

5% are sole traders and partnership companies respectively, 26% are private limited companies, while 1% is public limited companies.

Length of time, company established

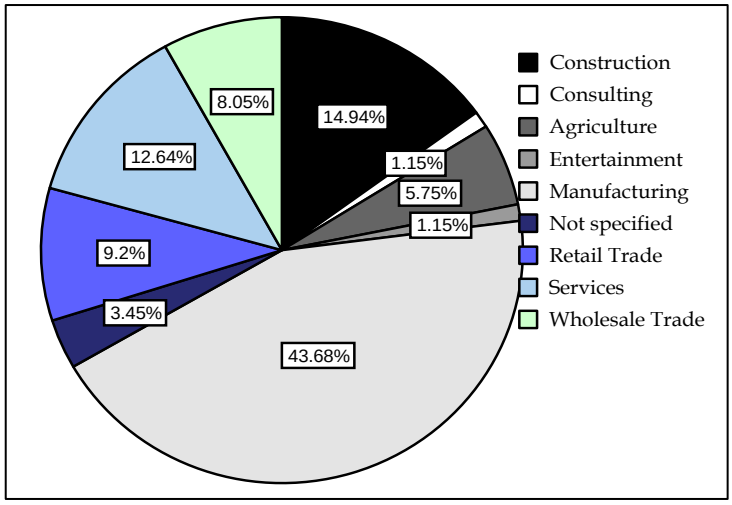
1% between 3-5 years, 3% has been established for 6-10 years, 13% have been established for 10-20 years while 17% of respondent companies have been established for over 20 years.

Welsh SMEs Market Analysis

In order to provide a business environment context, an analysis of the manufacturing sector of Welsh SMEs was undertaken

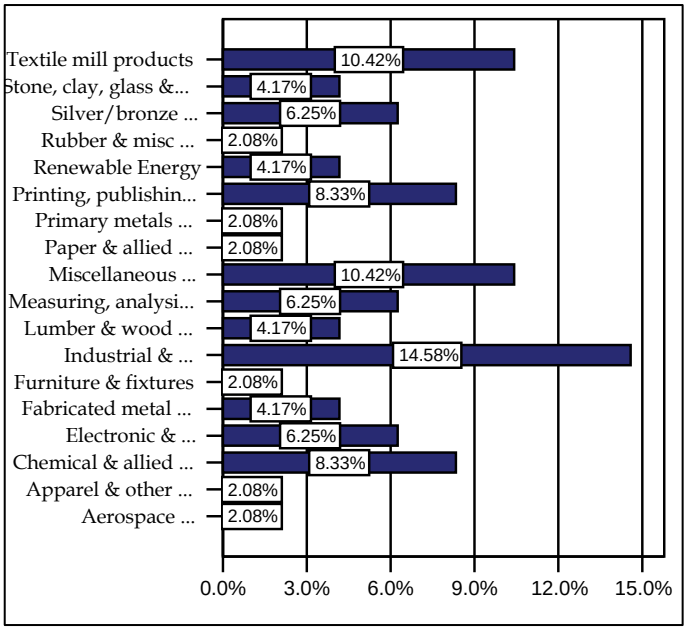
Business Sectors

In terms of business sectors in, manufacturing represents the largest sector, with 44% of the total, while Construction is the second largest, just in front of Services.



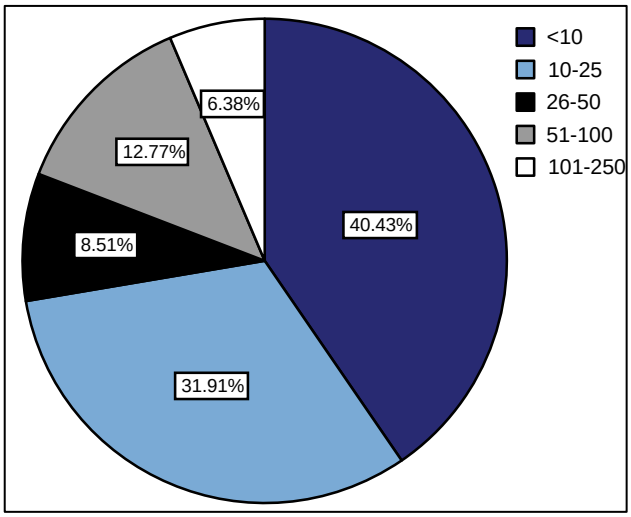
Manufacturing Profile of Welsh SMEs

Analysing the area's manufacturing business profile of companies showed the dominance of the Industrial and commercial machinery, which accounts for 15% of the total.



Manufacturing companies by size (number of employees)

An analysis of companies by size showed that companies with <10 employees is majority followed closely by companies with 10-25 employees.



Conclusions & Implications

This section highlights the main points that have emerged from the research and also states their implications for elearning in general and the eLean programme in particular. Further avenues of research that may be required are also highlighted.

The points highlighted are as follows:

- There is already a significant use of the web and especially the use of broadband within welsh SMEs. Assess to the web during office hours is a very significant advantage for e-learning and the eLean project, especially since the results also indicate that a high volume of staff use the web

during business hours. With regards to the needed infrastructure for the project, SMEs can afford to get their staff involved with much of a hassle.

- The survey showed only a small percentage (13%) of SMEs already using the web fro training purposes, hence the web is not being used enough as a source of training within welsh SMEs. Increased awareness of the advantages of using the web for training could be said to be needed. However, a very significant percentage (60%) of SMEs indicated that the web is applicable for training purposes.
- Although results show that inadequate web skill and knowledge among staff and lack of professional web training and support remain significant barriers. Further research could specifically pinpoint if there are specific barriers to using the web for training such as lack of available online resources.
- Distance Learning is already being used by majority of SMEs using the web for training. This is an obvious advantage to the project. This project will tend to highlight the successes and failures of distance learning.
- There is a significant lack of knowledge of Lean Thinking principles and techniques within SMEs were 24% are using Lean Thinking in their business and 76% are not. A huge implication of this to the project is that a massive amount of time might be spent selling Lean to SMEs rather than implementing e-Lean. However, the survey showed that a majority of companies implementing Lean Thinking already use the web for the purpose of training. This is significant to the implementation of eLean.
- Impact with respect to quality, cost and delivery of product and services on SMEs implementing Lean Thinking showed a positive and encouraging result which could be used to motivate more implementation of Lean within SMEs.

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