European Regions for Innovative Productivity

ERIP Deliverable

Report Work Package 6:

The Final Evaluation Report

Final Document	
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Evaluation

The previous work packages and testing of the lean methodology will provide the substance of the overall project aims and objectives. Work Package 6 will bring the outcomes and results of the previous work packages together. The intended outcome is a transnational SME lean manufacturing methodology available and transferable to regional development initiatives of partner regions and across the North Sea Region (NSR) and potentially beyond. In order to do this, data were collected from 23 companies spanning all six partner regions.

Company Overviews

	Turnover			Employees			
Company	**2008**	**2009**	**2010**	**Direct**	**Indirect**	**Market**	**MTO/ MTS/ ATO**
SausageCo	18,000,000	21,000,000	24,000,000	200	40	Meat and sausage Production	MTO
WholesaleCo	11,900,000	13,400,000	15,000,000	10	0	Wholesale Company	MTO MTS
MetalCo	6,000,000	5,277,000		63	7	Metal Producer	N/A
PrintCo	4,800,000	5,500,000	5,500,000	65	8	Printing Company	MTO
WindowCo	9,900,000	12,400,000	12,400,000	122	0	Window Manufacturer	MTO
TradeCo	19,000,000	22,100,000	28,400,000	64	0	Trade Company	N/A
BoatliftCo	13,000,000	8,500,000	7,400,000	50	19	Development, production and sale of semi-finished products, packaging and boat lift systems	MTO
HeatCo	18,780,000	18,469,000	15,437,000	49	46	Heating Equipment	MTO/ MTS
PotatoCo	24,470,000	19,814,000	20,535,000	48	45	Producer of potato planting and storage equipment	MTO
LabelCo	15,829,000	17,325,000	17,813,000	90	30	Label Printing Company	MTO
GraphicCo	9,809,000	11,895,000	11,709,000	37	14	Printing Company	MTO
TechnoCo	15,543,000	15,795,000	15,170,000	30	48	Rectifier technology, and project efficiency	MTO

GlazingCo	10,558,000	10,117,000	10,341,000	54	15	Window Manufacturer	MTO
SheetMetalCo	7,168,474	4,929,326	6,920,376	52	8	Metal Sheet Processing	MTS
DécorCo	19,296,300	16,409,910	18,171,650	17	11	Décor Business	MTS
AssembleCo	1,372,790	7,808,590	1,463,624	8	1	Development of Automatic Production/ Assembly lines	MTS
FurnitureCo	7,249,913	6,191,640	6,180,067	38	12	Metal Furniture Supplier	MTO
CircuitCo	20,140,123	15,413,811	16,305,363	73	50	Assembly of printed circuit boards and electronic products	ATO
LightCo	12,435,676	7,577,157	5,116,851	50	33	Manufacturer and supplier of lighting and heating control products	ATO
StairCo	20,140,123	15,413,811	16,305,363	73	50	Manufacturer of Interior Wooden Stairs	MTO
ElectronicsCo	10,424,897	8,340,772	8,857,955	30	20	Manufacturing and Service Supplier within Electronics and Electronics Development	ATO
MouldCo	11,451,631	13,191,011	12,290,921	46	30	Injected Moulded Products	MTS
ShoeCo	9,614,934	11,211,510	12,568,521	167	60	Manufacturer of Orthotic and Medical Products	MTO

The table shows that the largest of the companies had a turnover of €28 million. The production systems in the majority of the companies were make-to-order or assemble to order. For these companies, customer intimacy and reducing lead-times were critical to achieve competitive advantage. As a consequence, implementing lean through the ERIP methodology, in theory, should be regarded as essential by our SME testers. Whilst some of the companies' turnover remained consistent over the three year period, other companies were operating in very turbulent markets. This factor again implies that companies that are willing to engage with lean through the ERIP methodology should find benefit in the approach. As companies grow in terms of size and turnover, additional personnel in sales, marketing, administration, etc are required who may not directly contribute to the manufacturing or production of the companies' products or services. Within the ERIP methodology all categories of employees are required to add value to an organisation's operations. Therefore, it is important to look at our ERIP SME testers through the number of direct and indirect employees when performing this evaluation. This is shown in the table below.

Company Overviews – Ranked by Total Employees

	Turnover			Employees			Total Employees
Company	**2008**	**2009**	**2010**	**Direct**	**Indirect**	**Market**	
SausageCo	18,000,000	21,000,000	24,000,000	200	40	Meat and sausage Production	240
ShoeCo	9,614,934	11,211,510	12,568,521	167	60	Manufacturer of Orthotic and Medical Products	227
CircuitCo	20,140,123	15,413,811	16,305,363	73	50	Assembly of printed circuit boards and electronic products	123
StairCo	20,140,123	15,413,811	16,305,363	73	50	Manufacturer of Interior Wooden Stairs	123
WindowCo	9,900,000	12,400,000	12,400,000	122	0	Window Manufacturer	122
LabelCo	15,829,000	17,325,000	17,813,000	90	30	Printing of Labels	120
HeatCo	18,780,000	18,469,000	15,437,000	49	46	Heating Equipment	95
PotatoCo	24,470,000	19,814,000	20,535,000	48	45	Producer of potato planting and storage equipment	93
LightCo	12,435,676	7,577,157	5,116,851	50	33	Manufacturer and supplier of lighting and heating control products	83
TechnoCo	15,543,000	15,795,000	15,170,000	30	48	Rectifier technology, and project efficiency	78
MouldCo	11,451,631	13,191,011	12,290,921	46	30	Injected Moulded Products	76
PrintCo	4,800,000	5,500,000	5,500,000	65	8	Printing Company	73
MetalCo	6,000,000	5,277,000		63	7	Metal Producer	70
BoatliftCo	13,000,000	8,500,000	7,400,000	50	19	Development, production and sale of semi-finished products, packaging and boat lift systems	69
GlazingCo	10,558,000	10,117,000	10,341,000	54	15	Window	69

						Manufacturer	
TradeCo	19,000,000	22,100,000	28,400,000	64	0	Trade Company	64
SheetMetalCo	7,168,474	4,929,326	6,920,376	52	8	Metal Sheet Processing	60
GraphicCo	9,809,000	11,895,000	11,709,000	37	14	Printing Company	51
FurnitureCo	7,249,913	6,191,640	6,180,067	38	12	Metal Furniture Supplier	50
ElectronicsCo	10,424,897	8,340,772	8,857,955	30	20	Manufacturing and Service Supplier within Electronics and Electronics Development	50
DécorCo	19,296,300	16,409,910	18,171,650	17	11	Décor Business	28
WholesaleCo	11,900,000	13,400,000	15,000,000	10	0	Wholesale Company	10
AssembleCo	1,372,790	7,808,590	1,463,624	8	1	Development of Automatic Production/Assembly lines	9

The table shows that only two companies employ over 200 people. Four companies employ over 100 hundred people with a large majority of companies employing 50 to 100 people. Three companies employed less than 50 people. In comparison to large companies which employ over 500 people, it is important that our SME testers are able to engage with the ERIP methodology if they are able to reap the benefits of implementing lean. Therefore, we have classified our testers into medium, small, mini and micro firms based on the number of employees. This simple classification will allow us to identify if the number of individuals employed is a factor which determines whether the ERIP methodology is utilised.

Company Classifications

	Employees			
Company	**Direct**	**Indirect**	**Total Employees**	**Company Classification**
SausageCo	200	40	240	**Medium**
ShoeCo	167	60	227	**Medium**
CircuitCo	73	50	123	**Small**
StairCo	73	50	123	**Small**
WindowCo	122	0	122	**Small**
LabelCo	90	30	120	**Small**
HeatCo	49	46	95	**Small**
PotatoCo	48	45	93	**Small**
LightCo	50	33	83	**Small**
TechnoCo	30	48	78	**Small**
MouldCo	46	30	76	**Small**
PrintCo	65	8	73	**Small**

MetalCo	63	7	70	**Small**
BoatliftCo	50	19	69	**Small**
GlazingCo	54	15	69	**Small**
TradeCo	64	0	64	**Small**
SheetMetalCo	52	8	60	**Small**
GraphicCo	37	14	51	**Small**
FurnitureCo	38	12	50	**Mini**
ElectronicsCo	30	20	50	**Mini**
DécorCo	17	11	28	**Mini**
WholesaleCo	10	0	10	**Micro**
AssembleCo	8	1	9	**Micro**

The classification of companies in the table is basic and may not comply with governmental criteria of what constitutes micro, mini, small, and medium organisations (e.g., employees, turnover, etc.), Our aim is to understand whether the size (in terms of employees) of a company has an influence on its ability to implement lean. We have classified companies that employ over 200 people as a medium company, those employing 51 to 199 individuals as small, and companies that employ 11 to 50 individuals as mini companies. Finally, companies that employ 10 people or less we have classified as micro. By looking at the companies through this lens brings us to our first finding as demonstrated in the table below.

ERIP Companies Competitive Profiles

1 = unimportant; 5 = important

Company	Profile Analysis	Delivery lead time	Delivery reliability	Features	Quality	Flexibility	Volume	Price
SausageCo	Achieved Performance	5	5	3	5	4	3	3
	Market Requirements	5	5	4	5	4	4	4
ShoeCo	Achieved Performance	3	3	4	5	5	2	1
	Market Requirements	1	1	3	4	4	1	3
CircuitCo	Achieved Performance	5	3	2	1	5	2	3
	Market Requirements	1	2	1	3	3	1	-
StairCo	Achieved Performance	2	2	3	3	5	4	3
	Market Requirements	4	4	3	5	5	3	3
WindowCo	Achieved Performance	5	5	3	5	4	3	4
	Market Requirements	5	5	3	5	5	3	4
LabelCo	Achieved Performance	5	3	2	1	5	2	3
	Market Requirements	1	2	1	3	3	1	-
HeatCo	Achieved Performance	3	3	3	2	5	3	3
	Market Requirements	3	4	2	4	2	1	3
PotatoCo	Achieved Performance	3	3	4	4	4	3	3
	Market Requirements	5	5	4	5	5	3	4
LightCo	Achieved Performance	5	3	2	1	5	2	3
	Market Requirements	1	2	1	3	3	1	-
TechnoCo	Achieved Performance	5	4	5	5	5	5	3
	Market Requirements	4	4	5	5	3	2	2
MouldCo	Achieved Performance	5	3	2	1	5	2	3
	Market Requirements	1	2	1	3	3	1	-
PrintCo	Achieved Performance	4	3	3	4	5	3	4
	Market Requirements	5	3	3	5	5	3	4
MetalCo	Achieved Performance	3	3	1	4	4	1	5
	Market Requirements	5	5	1	5	5	1	3

BoatliftCo	Achieved Performance	3	3	1	4	5	3	4
	Market Requirements	5	5	1	5	5	3	4
GlazingCo	Achieved Performance	4	4	5	4	5	5	4
	Market Requirements	4	4	4	5	2	2	5
TradeCo	Achieved Performance	5	4	5	4	4	3	4
	Market Requirements	5	5	4	5	4	3	3
SheetMetalCo	Achieved Performance	3	3	3	4	5	4	5
	Market Requirements	5	5	3	5	5	4	4
GraphicCo	Achieved Performance	5	5	3	4	5	4	3
	Market Requirements	5	5	4	5	5	2	3
FurnitureCo	Achieved Performance	4	4	3	4	5	4	4
	Market Requirements	5	5	3	5	5	4	5
ElectronicsCo	Achieved Performance	3	2	2	4	5	3	3
	Market Requirements	4	3	3	4	4	3	4
DécorCo	Achieved Performance	4	4	2	4	5	2	3
	Market Requirements	5	5	2	4	4	1	3
WholesaleCo	Achieved Performance	4	5	4	5	4	4	4
	Market Requirements	5	5	3	5	4	3	5
AssembleCo	Achieved Performance	5	3	2	1	5	2	3
	Market Requirements	1	2	1	3	3	1	-
	Achieved Performance lacking	**10**	**10**	**3**	**14**	**4**	**1**	**6**

Key	**Meaning**
	Performance significantly below market requirements
	Performance just below market requirements
	Performance exceeds market requirements

Quality appears to be the main area where the companies believed that their performance was below the market requirements. The perceptions varied from significantly below to just below. This was followed by delivery lead-time and delivery reliability. Five of the companies recognised that they were significantly below the market requirements in terms of delivery lead-time and delivery reliability. This implies that the lead-time performance could be

considerably improved by taking waste out of the internal processes. The implementation of 5S and the instigation of standard operating procedures could contribute to improving quality.

Business Objectives – Current Organisational Competencies

Company	Dominant product design	Dominant product development	Special materials	Specific production skills	Superior distribution	Superior inventory management	Niche marketing	Leading-edge information technology	Inimitable human resource allocation	Knowledge creation
SausageCo	✓	✓		✓	✓		✓		✓	
ShoeCo			✓	✓				✓		✓
CircuitCo				✓		✓				
StairCo				✓			✓			
WindowCo				✓	✓					
LabelCo			✓	✓			✓			
HeatCo				✓	✓	✓	✓	✓	✓	
PotatoCo	✓	✓			✓		✓			
LightCo				✓		✓				
TechnoCo	✓	✓					✓			
MouldCo				✓						
PrintCo				✓	✓		✓	✓		
MetalCo			✓	✓						
BoatliftCo				✓						
GlazingCo		✓								
TradeCo					✓	✓	✓			
SheetMetalCo				✓						
GraphicCo				✓	✓		✓			
FurnitureCo	✓	✓	✓	✓						✓
ElectronicsCo				✓						✓
DécorCo				✓	✓					
WholesaleCo	✓	✓			✓			✓		
AssembleCo	✓	✓	✓	✓						
Total	**6**	**7**	**5**	**18**	**9**	**4**	**9**	**4**	**2**	**3**

The table indicates that the companies perceive that their competencies are in production skills, distribution and niche marketing. The areas where they perceive themselves to be weak are in information technology, human resource management, and knowledge creation. The latter two may account for the problems faced by these companies when implementing lean. This is because supportive human resource policies are essential for implementing lean and bringing about change. Furthermore, the establishment of a learning organisation is also essential. This is because leading edge companies have integrated production workers and their suppliers into the learning process.

Business Objectives – Organisational Competencies Required to Succeed

Company	Dominant product design	Special material(s)	Special production process(es)	Superior distribution	Superior storage	Niche marketing	Leading-edge information technology	Inimitable human resource allocation	Knowledge creation
SausageCo			✓	✓					
ShoeCo		✓			✓				
CircuitCo			✓						✓
StairCo			✓						
WindowCo			✓				✓		
LabelCo		✓				✓			
HeatCo	✓		✓						
PotatoCo	✓			✓		✓			
LightCo	**Nothing Selected**								
TechnoCo			✓						
MouldCo	**Nothing Selected**								
PrintCo					✓				
MetalCo			✓						
BoatliftCo			✓						
GlazingCo	✓								
TradeCo					✓				
SheetMetalCo			✓	✓	✓	✓			
GraphicCo		✓	✓	✓			✓	✓	✓
FurnitureCo	✓		✓	✓	✓				✓
ElectronicsCo			✓	✓			✓		
DécorCo	✓		✓						
WholesaleCo				✓					
AssembleCo	✓	✓	✓			✓			
Total	**6**	**4**	**14**	**7**	**5**	**4**	**3**	**1**	**3**

The table demonstrates that the companies on the whole have not recognised the need to improve the management of their human resources or to improve knowledge creation and capture. The focus is still on the production process. Some companies would like to improve their design capability but few have recognised the need to improve the management of their human resources.

Methodological Approaches Adopted by ERIP Companies

	Employees				
Company	**Direct**	**Indirect**	**Total Employees**	**Company Classification**	**Methodology Adopted**
SausageCo	200	40	240	Medium	**ERIP**
ShoeCo	167	60	227	Medium	**Bite Size**
CircuitCo	73	50	123	Small	**Bite Size**
StairCo	73	50	123	Small	**Bite Size**
WindowCo	122	0	122	Small	**ERIP**
LabelCo	90	30	120	Small	**Master Class**
HeatCo	49	46	95	Small	**Master Class**
PotatoCo	48	45	93	Small	**Master Class**
LightCo	50	33	83	Small	**Bite Size**
TechnoCo	30	48	78	Small	**Bite Size**
MouldCo	46	30	76	Small	**Bite Size**
PrintCo	65	8	73	Small	**ERIP**
MetalCo	63	7	70	Small	**ERIP**
BoatliftCo	50	19	69	Small	**Master Class**
GlazingCo	54	15	69	Small	**ERIP**
TradeCo	64	0	64	Small	**ERIP**
SheetMetalCo	52	8	60	Small	**ERIP**
GraphicCo	37	14	51	Small	**ERIP**
FurnitureCo	38	12	50	Mini	**ERIP**
ElectronicsCo	30	20	50	Mini	**Bite Size**
DécorCo	17	11	28	Mini	**ERIP**
WholesaleCo	10	0	10	Micro	**ERIP**
AssembleCo	8	1	9	Micro	**ERIP**

ERIP

S1 Pre-Diagnostic

All companies involved in the ERIP project were supposed to follow the ERIP methodology. We define the ERIP methodology as having ten stages. Firstly an agreement is reached with each SME (S1) and a Pre-diagnostic is carried out. This however is not part of the method, only its formal starting point. It is however mandatory in order to maximize the chance that the SME will stay committed for the whole project period. A *Change agent is hopefully identified*: based on the principle that SMEs have short lines of communication and mostly a simple management structure. It is important that the person or persons selected will have the drive to implement the necessary actions in the SMEs.

S2 Diagnostic

The next stage is to carry out the diagnostic. The diagnostic is designed to determine the focus of the activity area within the SME: besides a generic description of the SME activity area, it is important to document the area(s) (value streams) that will be the focal point for the ERIP improvement activities. Documentation includes

a. *NEPA needs analysis checklist (MNA / TNA/ PNA mandatory)*

b. *Value Stream Map (current state)*

This documentation will have to be drawn up by the IPC members, as it is unlikely that the SME will already have this available, or the expertise to make them.

Interview two groups of SME people separately: management team and shopfloor team, and then take the findings to the discussion with management. This way intangible issues will be captured, as well as a check versus the checklist indicators.

2. *Identify Team Members*: both the IPC staff to be assigned to the SME, as the SME internal team members (operators and management), are identified. The IPC staff member is responsible for the reporting to the ERIP project partners and should be identified in the KX reporting tool. This team should include representatives (or all of the team) from operators, supervisor and management. This team should actually carry out the improvement activities (for their area). The supervisor is crucial to obtaining drive and sustainability, and additional training might be needed (in both Lean and People skills).

3. *Understand company expectations*: this is akin to the future state of a VSM. It should set a realistic but ambitious goal, to make sure that enough drive is present within the SME to improve. These expectations should ideally be translated into KPI values to be reached after 6 months and after 1 year (see measurements). Here the concept of VALUE should be introduced and elaborated, to make sure the objectives are of use to the SME for its future competitiveness. The MNA checklist is a good guideline for this. This should be in the form of a discussion with management.

4. *Needs + Tools to cure*: follows from the NEPA checklist and should indicate which tools are more likely to be used, and hence need to be introduced through training or showcasing (exemplar visit or SME pilot area). The tools that will be used should be reported in the ERIP tool for research purposes, and therefore should come from a limited list of Lean tools.

S3. Lean Introduction

1. *Lean introduction*: the team (S2.2) will have to be trained in the Lean Continuous improvement method, as well as in the basic Lean principles. Ideally (in the Lean spirit) there should be a standard content of the training, but minimally the following elements should be present:

a. *Explanation of the basic Lean principles*:

i. *Quality first and built in*

ii. *Gemba orientation*

iii. *Waste elimination*

iv. *People development*

v. *Visual standards (= standard work + visual management)*

vi. *Process and results (= process orientation + KPI)*

vii. *Pull Flow thinking (= flow + pull)*

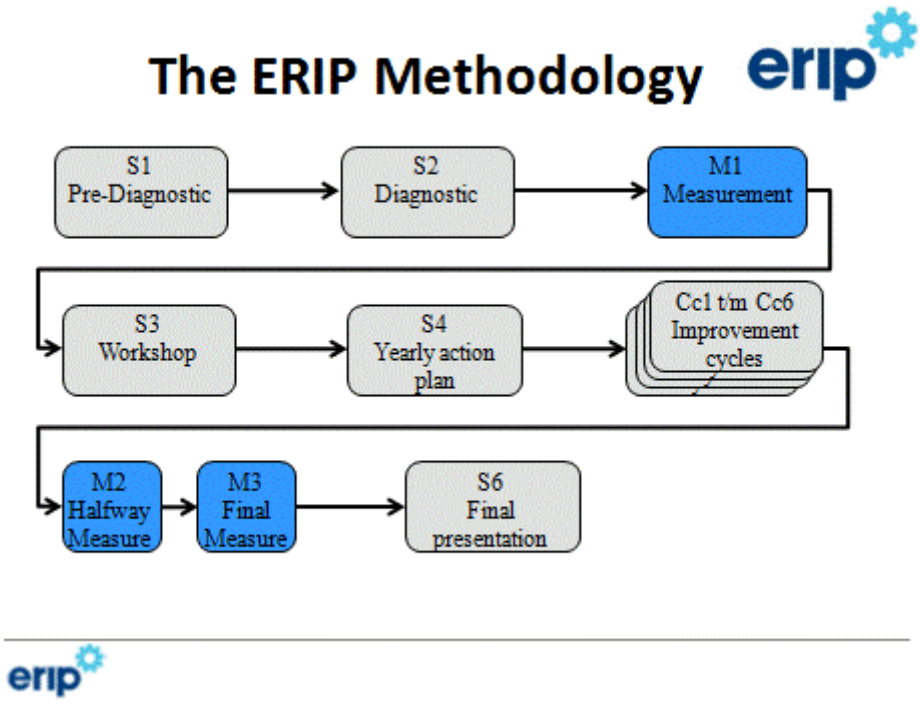
b. *A hands-on game or simulation to experience the effect of the Lean principles* (the type of game is open, but could be interesting to share experiences among ERIP, to try again to come up with an optimal standard)

2. *Visit to exemplar*: The choice of visits is not limited to the national exemplar, it could be organized transnationally.

S4. Action Plan next year

Basically the objectives from S2.3 and S2.4 should be put on a time scale, in improvement cycles of 1 to 3 month each, covering 1 to 1.5 years (depending on start time, end should be early enough to allow reporting within ERIP project timeframe). This plan should be registered in the KX tool, as it is an important synchronization element for internationally organized events and synergies. Each improvement cycle will go through the following steps S5 to S8:

For each improvement cycle Cc.1 to Cc.6



S5. Prepare area

1. *Measure local indicators*: these are the indicators that are linked to the improvement tools and activities for this cycle and are (possibly) different from the general KPI's to be measured in the M steps.
2. Value Stream Map (when data are available), Process Map (otherwise)
3. *Set up operator team*: the operators of the area under scrutiny should be briefed and prepared for the action. This should include a limited training or presentation.

S6. Workshop

Agenda of the workshop should be constructed in 30 minute segments.

1. *Kaizen event to introduce topic* : given the short timeframe to "make them see", a Kaizen event (intensive improvement activity lasting 2 to 3 days) is the most effective form to start the improvement cycle. There should be a succinct Standard Work manual for Kaizen events.
2. *Day 1-2*: Team introductions / NEPA presentation (7 wastes, VA, NVA, W + visual management) / Focus on gemba tour (Measures, process map)
3. *Measures that describe the problems (or process mapping) +get data yourself (video)*

4. *Day 3-4*: Corrective actions appropriate to the problem detected + always 5S (counters wastes) + problem solving (counters problems)

5. *Take first measures by operators, decide on actions by operators*: following the Kaizen event, the first results must be recorded, and from these learning points the operators should develop (together with Lean Team and IPC staff) an action plan for further implementation of the findings across the whole area under scrutiny.

6. *Document results, capture standard work*

S7. Pilot use

Set up a rollout plan

This is the execution of the plan of S6.2. Regular visits by IPC are advisable to check on progress and lend support. There is an opportunity here to involve other SME's from the local group, or even from other countries in ERIP, and also to involve IPC staff from other countries. This is to enhance synergies from the international collaboration.

S8. Local Exemplar visit, Networking

This is an optional step. The purpose is to have SME operators learn from operators from the exemplar companies regarding the same tool that they are using themselves, and also to serve as a kind of reward/recognition to the operators.

S9. Review results

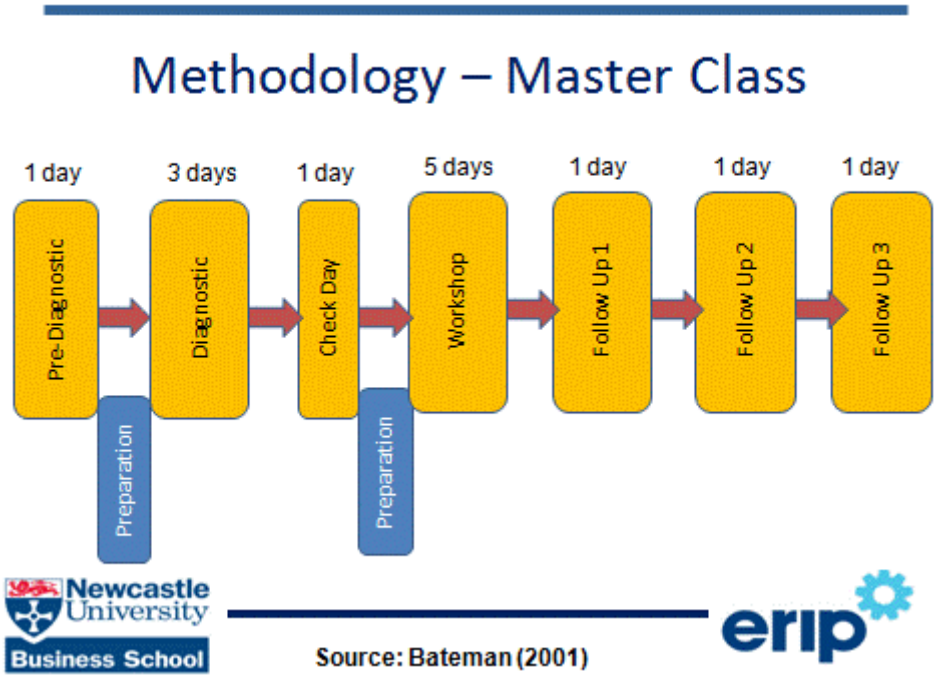
This is an important, and thus mandatory, step. The formal reporting should be to the SME management and Lean team. Reporting can include results from other SME's in the ERIP group that are comparable. Any benchmarking serves as reinforcement to keep the momentum going. If an SME is doing extremely well, it will motivate them. If an SME is lagging, then seeing that other SME's achieve better results will reinvigorate them by showing the goals are attainable.

S10. Present results

To provide recognition to the SME management and Lean team, they should report the final results of each cycle to their SME peers, preferably in an international setting.

MasterClass

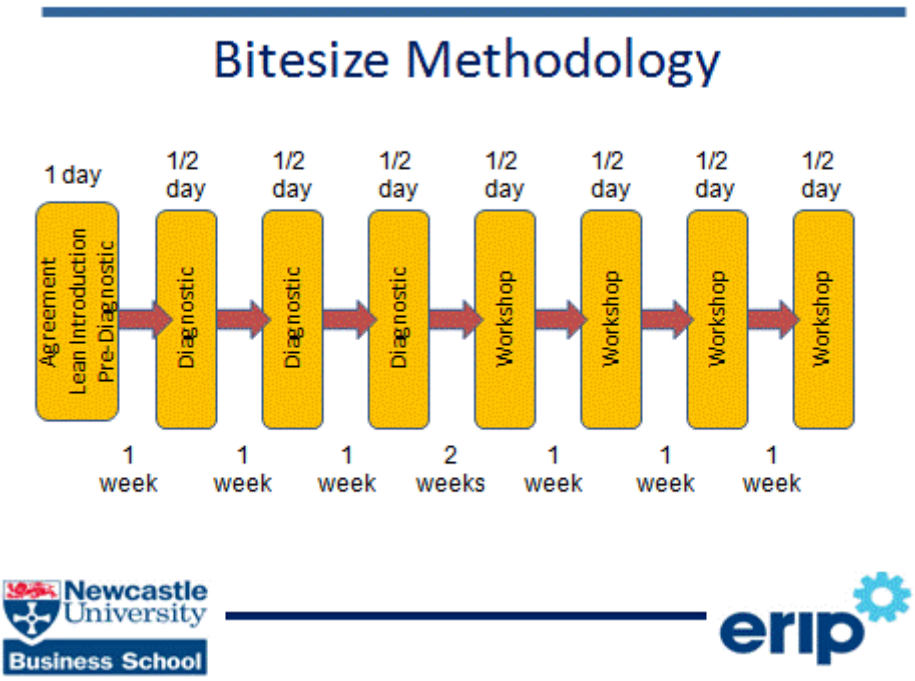
A minority of companies adopted the MasterClass approach. This was because the ERIP approach adopted a number of short cycles. Companies that adopted the MasterClass approach focus more on the transfer of knowledge from the external Change Agent to their own nominated Change Agent. In order to do this longer diagnostics and workshops were required. The emphasis was more on training the internal change agent rather than improvement activities. This was because the internal Change Agent was to initiate change within the company. We define MasterClass as a 13 day intervention as outlined below. This comprises a one day pre-diagnostic to identify the objectives of the improvement activity. Two weeks later a 3 day diagnostic takes place which includes: data collection and analysis; the identification of the starting position from which performance improvements are benchmarked; and potential areas for making improvements are identified. A few days later a 'check day' is conducted to ensure that any actions, data or resources needed for the workshop are available. This is followed by a 5 consecutive days MasterClass workshop whose aim is to achieve the objectives and targets specified by the pre-diagnostic and the diagnostic.



Bite Size

The Bite Size methodology was developed from engaging with SMEs which had difficulty trying to structure intervention activities around the ERIP or MasterClass approach. The Bite Size approach embodies the principles of the ERIP approach but reduces the amount of time SMEs have to commit to diagnostic and intervention activities. In order to maintain contact and motivation within SMEs using this approach focus is placed on frequent contact over a number of weeks. Emphasis is placed on employees to undertake improvement activities when they can schedule these and report back

to the ERIP team. The Pre-diagnostic stage is the same but the diagnostic is reduced by half. Check days are not used as frequent contact is kept with the companies over a weekly period. In total, only two days are dedicated to the workshop but these are split over four half day sessions spanning four weeks. The reporting function is the same as the ERIP methodology. This approach is shown below.



Lean Tool Popularity

Lean technique	SausageCo	WholesaleCo	MetalCo	PrintCo	WindowCo	TradeCo	BoatliftCo	HeatCo	PotatoCo	LabelCo	GraphicCo	TechnoCo	GlazingCo	SheetMetalCo	DécorCo	AssembleCo	FurnitureCo	CircuitCo	LightCo	StairCo	ElectronicsCo	MouldCo	ShoeCo	Total
Seiton	1.0	0.0	1.0	0.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	0.0	1.0	1.0	1.0	1.0	1.0	**20.0**
Seiso	1.0	0.0	1.0	0.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	0.0	1.0	1.0	1.0	1.0	1.0	**20.0**
Seiketsu	1.0	0.0	1.0	0.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	0.0	1.0	1.0	1.0	1.0	1.0	**20.0**
5S	1.0	0.0	1.0	0.0	1.0	1.0	0.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	0.0	1.0	1.0	1.0	1.0	1.0	**19.0**
Standard operations	1.0	1.0	0.0	1.0	1.0	0.0	0.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	0.0	0.0	**18.0**
Team working	1.0	0.0	1.0	1.0	1.0	1.0	1.0	1.0	0.0	0.0	1.0	0.0	1.0	1.0	1.0	1.0	0.0	1.0	1.0	1.0	1.0	0.0	1.0	**17.0**
Visual Management	0.0	1.0	1.0	1.0	1.0	1.0	0.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	0.0	1.0	0.0	1.0	0.0	0.0	**17.0**
Kaizen	1.0	0.0	1.0	1.0	1.0	1.0	0.0	0.0	1.0	1.0	1.0	0.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	0.0	0.0	**17.0**
7 Wastes	1.0	0.0	1.0	0.0	0.0	0.0	0.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	0.0	**17.0**
Seiri	1.0	0.0	1.0	0.0	1.0	1.0	1.0	1.0	0.0	0.0	1.0	1.0	0.0	1.0	1.0	1.0	1.0	0.0	1.0	0.0	1.0	1.0	1.0	**16.0**
Plan-do-check-act	1.0	0.0	1.0	0.0	0.0	0.0	0.0	1.0	1.0	1.0	1.0	1.0	0.0	1.0	1.0	1.0	1.0	1.0	0.0	1.0	0.0	1.0	0.0	**14.0**
Quality circles	1.0	1.0	1.0	1.0	1.0	1.0	0.0	0.0	0.0	1.0	0.0	0.0	1.0	1.0	1.0	1.0	1.0	0.0	0.0	1.0	0.0	0.0	0.0	**13.0**
Problem solving	1.0	1.0	1.0	0.0	1.0	1.0	0.0	0.0	0.0	1.0	1.0	0.0	1.0	1.0	1.0	1.0	1.0	0.0	0.0	1.0	0.0	0.0	0.0	**13.0**
Multi-skilled staff	1.0	1.0	0.0	1.0	0.0	0.0	1.0	0.0	0.0	0.0	1.0	0.0	1.0	1.0	0.0	1.0	0.0	1.0	1.0	1.0	1.0	0.0	1.0	**13.0**
Organisation for change	1.0	1.0	1.0	1.0	1.0	1.0	0.0	1.0	0.0	1.0	1.0	0.0	1.0	1.0	1.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	**13.0**
Shitsuke	1.0	0.0	1.0	0.0	1.0	1.0	0.0	0.0	0.0	0.0	1.0	1.0	0.0	1.0	1.0	1.0	1.0	0.0	0.0	0.0	0.0	1.0	1.0	**12.0**
Customer focus	1.0	1.0	1.0	0.0	1.0	0.0	0.0	0.0	0.0	1.0	0.0	1.0	0.0	1.0	1.0	1.0	1.0	0.0	0.0	1.0	0.0	0.0	1.0	**12.0**
Monitoring quality costs	0.0	1.0	1.0	0.0	1.0	0.0	0.0	0.0	0.0	1.0	1.0	0.0	0.0	0.0	1.0	1.0	1.0	1.0	0.0	1.0	1.0	0.0	0.0	**11.0**
Gemba Kanri	1.0	0.0	1.0	0.0	1.0	1.0	1.0	1.0	0.0	1.0	1.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	**10.0**
Cellular/Line layout	1.0	0.0	1.0	0.0	1.0	0.0	1.0	1.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	1.0	1.0	1.0	0.0	1.0	0.0	0.0	0.0	**10.0**
Skill control	0.0	1.0	0.0	1.0	0.0	0.0	0.0	1.0	0.0	1.0	0.0	0.0	0.0	1.0	0.0	1.0	0.0	0.0	0.0	1.0	0.0	0.0	1.0	**8.0**
Total Preventative Maintenance	1.0	0.0	0.0	1.0	1.0	0.0	0.0	0.0	0.0	1.0	1.0	0.0	0.0	0.0	0.0	1.0	1.0	0.0	0.0	1.0	0.0	0.0	0.0	**8.0**
Fool proofing	1.0	1.0	1.0	1.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	1.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**8.0**
Competitive benchmarking	1.0	1.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	1.0	0.0	1.0	0.0	0.0	1.0	0.0	0.0	0.0	**7.0**
Total Quality Management	1.0	1.0	1.0	0.0	1.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	**6.0**
Single Minute Exchange of Dies	1.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	1.0	0.0	1.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**6.0**
Overall Equipment Effectiveness	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	1.0	0.0	0.0	0.0	0.0	1.0	1.0	0.0	0.0	0.0	0.0	1.0	0.0	**6.0**
Supplier certification	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	1.0	0.0	1.0	1.0	0.0	0.0	**5.0**
Single sourcing	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	1.0	1.0	1.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	**5.0**
Jidoka	1.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	**4.0**
Pull scheduling	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	**4.0**
Family of parts sourcing	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	1.0	1.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	**4.0**
Statistical process control	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	1.0	1.0	0.0	**4.0**
Weighted factor vendor selection	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	1.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**3.0**
Andon	0.0	0.0	0.0	0.0	1.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**2.0**
Smallest machine concept	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**2.0**
Inter-company Lean	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	**2.0**
Supplier development team	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**1.0**
Point of use delivery	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**0.0**
Total	**25.0**	**12.0**	**24.0**	**10.0**	**22.0**	**15.0**	**8.0**	**14.0**	**9.0**	**26.0**	**21.0**	**15.0**	**15.0**	**20.0**	**23.0**	**28.0**	**19.0**	**9.0**	**11.0**	**27.0**	**14.0**	**10.0**	**10.0**	

Most of the companies have implemented elements of 5S, standard operations, teamworking, visual management, reducing waste, Kaizen, quality circles, problem solving, and plan-do-check-act. There has also been an emphasis on multi-skilling the workforce. The companies have attempted to implement the basic tools of Lean. There has been less emphasis on preventative maintenance or pull scheduling, which is surprising since the majority of the companies operate on an MTO or ATO basis. All of these companies are at the beginning of their lean journey. The other areas which have less focus are customer focus and organisation for change. MTO companies should have a strong focus on meeting customer requirements. The weakness in the human resource management area probably explains why there is less focus on managing change.

With the different methodologies that developed as part of engaging with the SMEs a number of interventions were attempted. What these companies actually focused on is important. Revisiting the organisational competencies required to succeed table we can map out which areas these companies undertook improvement activities in. It is interesting to note, along with the lean tools table depicted above, that even though these companies vary in size and market, most emphasis was placed on the production area and attempted to implementing 5S, produced standard operating procedures and promote team working as shown in the table below.

Company	Dominant product design	Special material(s)	Special production process(es)	Superior distribution	Superior storage	Niche marketing	Leading-edge information technology	Inimitable human resource allocation	Knowledge creation
SausageCo			✓	✓					
ShoeCo		✓	**Floor space utilisation**		✓ **Inventory control**				
CircuitCo	**Failed Intervention**								
StairCo			✓ **Introduction of 5S and standard operations**						

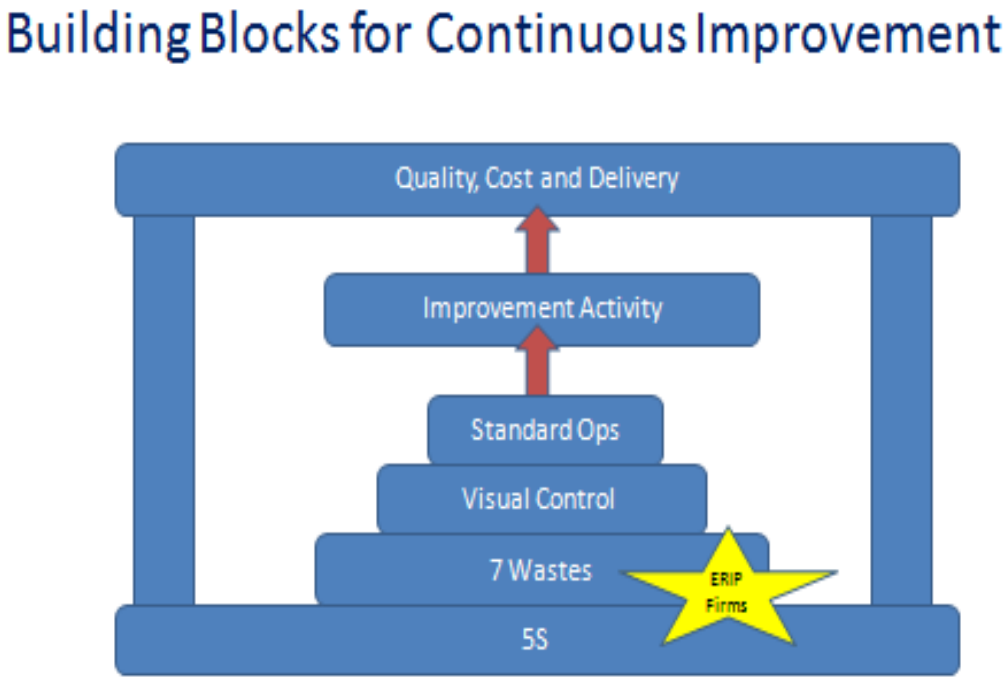
WindowCo			**✓ Quality Improvement**				✓		
LabelCo			**✓ Introduction of 5S, standard work and value stream mapping to take out waste**						✓
HeatCo	✓		**✓ Improved layout**						
PotatoCo	✓			✓		✓		**Create knowledge on the shop floor – implement 5S**	
LightCo			**✓ Standardised work and team working**						
TechnoCo			**Reduce down time, 5S**						
MouldCo					✓				
PrintCo			✓						
MetalCo	✓		**Reducing re-work, downtime and increase**						

			productivity						
BoatliftCo		✓	**Implement 5S, reduction in set up time and visual management**			✓			
GlazingCo					✓				
TradeCo			✓	✓	✓	✓			
SheetMetalCo		✓	**✓ Set up time reduction and standardised work**	✓			✓	✓	✓
GraphicCo					✓				
FurnitureCo			**✓ Reduce set up time, lead time, inventory and 5S**	✓			✓		
ElectronicsCo	✓		✓						
DécorCo				✓		**Increase sales**			
WholesaleCo	✓	✓	✓			✓			
AssembleCo			**✓ Increasing productivity of machining department**						
Total	**6**	**4**	**14**	**7**	**5**	**4**	**3**	**1**	**3**

Findings

From undertaking the ERIP project we have identified a number of findings. On first contact with the SMEs, both employees and managers had a similar level of awareness of Lean principles, despite the disparate sizes of the firms and backgrounds of the individuals. On average, all firms had only moderate awareness of the lean themes, with the management only slightly more aware than the workforce. In some of the companies there was very limited awareness around the knowledge or application of Statistical Process Control (SPC) and Value Stream Mapping (VSM).

From engaging with the ERIP project it can be concluded that all firms now have a very good understanding of 5S and identifying wasteful activities. For these companies the next phase of their lean journey will be to focus around on improving processes across the production area by taking out wasteful activities.



Source: Bateman (2001)

Due to these companies being on the early stages of their lean journey we can place them on the foundations of the lean temple. The companies are in the process of mastering 5S and identifying

wasteful practices throughout their production operations. Some of the firms engaged with visual control and standard operations but they have a lot of work to do to fully embed these improvement practices in the workplace. Regardless of which methodological approach is adopted by small firms (ERIP, Bitesize or MasterClass) they will not be able to progress on the journey until they have implemented and sustained 5S and removed wasteful practices from their processes. As the companies proceed through the temple of quality they will be able to close the gap between market requirements and actual performance. The markets that these companies are competing in are dynamic and to gain competitive advantage the firms will need to become more flexible to meet customer requirements. The companies will need to be better at creating and managing knowledge. This requires integrating the workforce into the knowledge creation process. This will be brought about through more effective human resource management practices such as training, teamworking, flexibility, communication and change management initiatives. These are areas that on the whole these companies have not addressed. However, the journey through the Lean Temple is not linear, Lean needs to become part of the culture of the company.

From the initial ERIP methodology that was developed to engage these companies, a number of lessons have been learnt. Firstly, the methodology implied a linear pass through each of the stages with several smaller cyclic processes occurring. In trying to apply this approach to SMEs, sometimes it was difficult to complete all of the cycles. This was due to each organisations motivation for engaging with ERIP being different and in some cases, SMEs needed to switch methodological approaches during implementation. Some companies valued the MasterClass approach as a way to train interval Change Agents to carry out improvement activities within the organisation, whilst other companies could spare the appropriate time to engage with the methodology fully. In order to satisfy these companies, the Bite Size approach was used. From our findings we have developed a second version of the ERIP methodology, encompassing a more flexible approach. The initial engagement with a company is focused around preparing for change. An agreement is reached with a pre-diagnostic and practices designed to learn about Lean. A step by step improvement stage is undertaken to bring about the planned change that involves diagnostics, kaizen showcases and actual improvement activities. This stage is heavily supported by the Plan, Do, Check, Act approach. Once an improvement activity has been undertaken, measured and evaluated it needs to be rolled out throughout the organisation. The later stages of the ERIP methodology are focused around networking with other companies in the hope of transferring knowledge. As new challenges or opportunities present themselves, organisations can return to stage 2 in order to prepare for change. This new ERIP methodology can be seen below.

ERIP Methodology for Lean in SMEs