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Value chain analysis: an approach to supply chain improvement in agri-food chains

David H. Taylor

*Lean Enterprise Research Centre, Cardiff Business School,
University of Wales, Cardiff, UK*

Abstract

Purpose – To develop an innovative methodology to apply lean value chain improvement techniques to a complete supply chain for a food product from farm to consumer.

Design/methodology/approach – Action research based on a UK case study involving farmers, a food processor and a major retailer.

Findings – Value stream analysis (VCA) highlights significant opportunities to improve supply chain performance, profitability and relationships.

Research limitations/implications – Lean/VCA methodologies can be readily applied to the retail and processor elements of food chains. However, further research is required to apply the concepts to farm operations.

Practical implications – Subsequent to this research, VCA techniques have been increasingly adopted in UK agri-food sectors including meat, dairy, cereals and horticulture.

Originality/value – Application of lean concepts and VCA in the agri-food sector. Development of a multi-echelon supply chain improvement methodology.

Keywords Value chain, Value analysis, Supply chain management, Meat, Food products

Paper type Research paper

Introduction

The Red Meat Value Stream Analysis Programme commenced in 2002, with the aim of assessing the opportunities and possible approaches to making significant improvements in the efficiency and competitiveness of red meat value chains in the UK. The programme involved the mapping and analysis of eight red meat value chains each of which encompassed the range of activities from farm to consumer. The chosen value streams were representative of the different sectors of the UK red meat industry and included beef, pork, lamb as well as a number of speciality or niche chains such as those for organic products. This paper focuses on the results from one such chain for pork products.

The research gap

The value stream analysis (VSA) methodology first put forward by Hines and Rich (1997) has subsequently been developed and extended by other researchers (Rother and Shook, 1998; Jones and Womack, 2002) and applied in a variety of situations such as the SMMT industry forum initiatives (Bateman, 2001). However, to date these

techniques have not been applied in the red meat industry which has a number of distinct, and possibly unique, characteristics and circumstances including:

- *Product dis-assembly.* An animal carcass starts life (or more accurately death!) as a whole unit and is split into a wide variety of finished products each with potentially independent demand. To date, VSA techniques have only been applied to assembly operations.

- *Long animal production lead times.* For example, the period from insemination to slaughter of a pig is typically 40 weeks. In such protracted operations, the application of value stream mapping and improvement techniques posses particular challenges, as does the linking of supply to demand through the application of lean concepts such as "pull".

- *The dominant position of the UK supermarkets within the chain* and the extent to which they have used their power to force down prices to both food processors and farmers means that the cultural environment within these chains is frequently highly adversarial.

With this context in mind the following research questions were formulated:

RQ1. To what extent can value chain analysis methods that have been developed in the environment of industrial products be appropriately applied in chains dealing with agricultural products?

RQ2. To what extent can value chain analysis techniques form the basis of a cooperative approach to improvement in supply chains where the pre-existing cultural context presents major challenges to the development of cooperation and establishment of common goals as espoused in much supply chain management literature (Simchi-Levi *et al.*, 2000)?

The methodological context
There are three methodological foundations on which this work is based:

(1) Value stream management (VSM) – from which the practical tools and techniques employed in the work are derived.

(2) The case study approach – in that the findings are based on a specific group of companies in a specific supply chain.

(3) Action research – which is the approach adopted by the researcher in relating to the case companies in order to collect the research data.

The value stream management
The VSM methodology applied in this research combines and builds on approaches used by previous researchers. Elements of the value stream mapping techniques described by Hines and Rich (1997) were applied to collect some base data; in particular process activity mapping and demand amplification mapping were found to be useful tools. The visual mapping techniques developed by Rother and Shook (1998) for analysis of plant level processes and the subsequent extension of this approach by Jones and Womack (2002) to mapping the whole supply chain were used as a basis for the presentation of data and development of recommendations.

The case study approach

McCutcheon and Meredith (1993) recommend use of case study research in operations management to close the gap "between operations management research's prescriptive advice and workable answers for managers". They outline the potential for case research in operations management:

> Case research methodology is just one of many empirical approaches that aim to develop our understanding of "real world" events. Typically investigating ongoing business operations does not allow conditions to be controlled. The researcher must, therefore, study the phenomena by noting the states, in each case, of all the conditions that might affect outcomes. Case study research is often used for developing new theories or for examining unfamiliar situations. Case studies may also be used to support, expand or raise doubts about existing theories (McCutcheon and Meredith, 1993, pp. 240-1).

The case study reported in this paper is one of eight red meat value chains to be studied within the overall research project. Varying approaches to improvement have been adopted in these chains and in due course, a comparative evaluation of the methods will be reported.

Action research

The companies participating in the research did so on the understanding that the project should if possible lead to actual improvements in the performance of both their internal operations and of the value stream as a whole. An action research approach was, therefore, adopted which requires the researcher to be involved in the improvement process as a facilitator. The researcher becomes part of the team that has responsibility for the change process and assists in achieving the aims of the team members and the organisations (Checkland, 1991). The researcher brings specialist knowledge in the improvement techniques and acts as an independent "honest broker" in issues which are potentially contentious between the supply chain partners. In addition, the researcher tries to make sense of the situation whilst it is happening and, after leaving the situation, reviews the experience to extract lessons relevant to the research (Sadler, 1999).

The value chain analysis methodology and its application in the case study

The project described in this paper focused on a value chain for fresh pork products.

The chain included three UK companies – a major supermarket group, a major food processing company and a farming company that had control of some 400 pig farms. The aims of the project were to:

- understand the "current state" of the whole supply chain for pork products from animal production to purchase of meat products by the consumer;
- identify key wastes, problems and opportunities across the supply chain;
- develop a "future state vision" of the pork supply chain based on lean principles; and
- to develop an "action plan" to achieve the future state vision.

A staged approach (Figure 1) was developed, each element of which was designed to encourage and facilitate the eventual adoption of policies or procedures that would achieve quantifiable operational improvement.
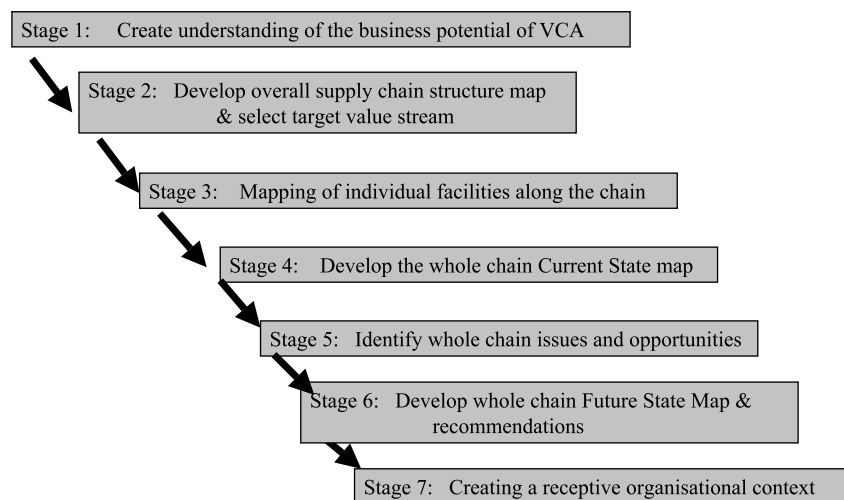
Figure 1.
Summary of value chain
analysis methodology

Stage one: creating understanding of the business potential of VCA
It is suggested that one of the most critical elements in the eventual success or otherwise, of any value chain improvement project is achievement of corporate commitment or "buy-in" to the concepts, implications and potential benefits of the development of an integrated and lean supply chain. A strategy was, therefore, developed at the outset to inform and engage senior management throughout the project, in order to give the eventual recommendations the best chance of being fully understood and appropriately evaluated by the companies.

The starting point was to make separate presentations to the senior management teams of each the three companies involved. These presentations outlined the scope and objectives of the project, gave an overview of the lean concepts and mapping tools to be used and of the nature of eventual outputs and recommendations. It also gave each company the opportunity to individually consider the potential benefits, i.e. "what's in it for me". Subsequent to this meeting senior management were requested to read various background literature on both lean thinking and supply chain management as it was clear that neither of these topics were well understood.

Each company in the chain nominated a representative to form a joint value chain analysis team. It was suggested that, if possible, the nominee should meet the following criteria:

- be of sufficient seniority to liaise directly with the board of directors;
- have sufficient authority to access all divisions of the company and gain the cooperation of functional managers in providing information;
- be capable of taking an holistic view of the whole business rather than a restricted functional perspective; and
- have an openness to new approaches and ideas.

Establishing an appropriate value chain analysis team was a critical aspect in ensuring that the work had real potential to create operational improvement. Because this team

was responsible for mapping the whole chain and developing solutions, they were committed to the eventual recommendations and hence better able to "sell" them into their respective organisations. A further important advantage of this approach was that the operations of each company became clear to their supply chain partners as the team jointly mapped all facilities along the chain and jointly developed recommendations.

Stage two: understanding supply chain structure and selecting a target value stream
The objective of VCA is to improve supply chain performance. A pre-requisite, therefore, is an understanding of the scope of the processes, which make up the supply chain system. Because most firms are part of complex supply networks, it is common to find that they do not have a clearly defined picture of their supply chain structures. A first task for the VCA team was to develop a supply chain structure map. This identified the companies and processes along the chain and the main linkages between processes. Importantly, the supply chain structure map also included data on approximate volumes within the chain, both in terms of output volumes for the processes and flow volumes along the various linkages. This data formed a basis for prioritising pathways within the supply chain for analysis and improvement. Figure 2 shows the supply chain structure map developed by the case study companies.

Value chain analysis requires the selection of a specific value stream as the focus for initial analysis and improvement (Jones and Womack, 2002). A value stream is typically defined as a specific product or product family serving a specific customer or market segment. The aim is to "cut a slice" through the complexity of the supply network in order to understand the key features of the current operation. Once improvement has been carried out on the pilot stream, the approach is extended to other value streams within the businesses concerned.

Selection of the target value stream across a whole supply chain involves three aspects. First, it is necessary to decide the scope of the value chain project in terms of the distance along the chain to be included; should everything from raw material supply to final consumer be considered or only part thereof? This is usually determined pragmatically by the resources available and the companies involved. In the case study, the scope included everything from insemination of a sow at a breeding farm, to the sale of pork products at the supermarket checkout desk. It did not include activities upstream of the farms such as provision of animal feed or semen.

The second aspect is the selection a specific pathway through what is often a fairly complex supply network. The flow volume data on the supply chain structure map provides a logical basis for this selection. It is usual to select a pathway, which has significant volumes, so that any improvements made in the pilot project will have a significant impact on the business. In the case study the pathway chosen included a major pig breeding farm and a major "growing" farm. The meat processing company had five abattoirs/processing plants, one of which was largely dedicated to supplying the supermarket group in the project, so this was the obvious choice. At the supermarket level, one regional distribution centre and one store were selected for detailed analysis.

The third aspect of value stream selection requires the identification of a target product group. This is often done on the basis of Pareto analysis of sales value or volume (Taylor, 1999) and the selection of a top selling products In the case study, the
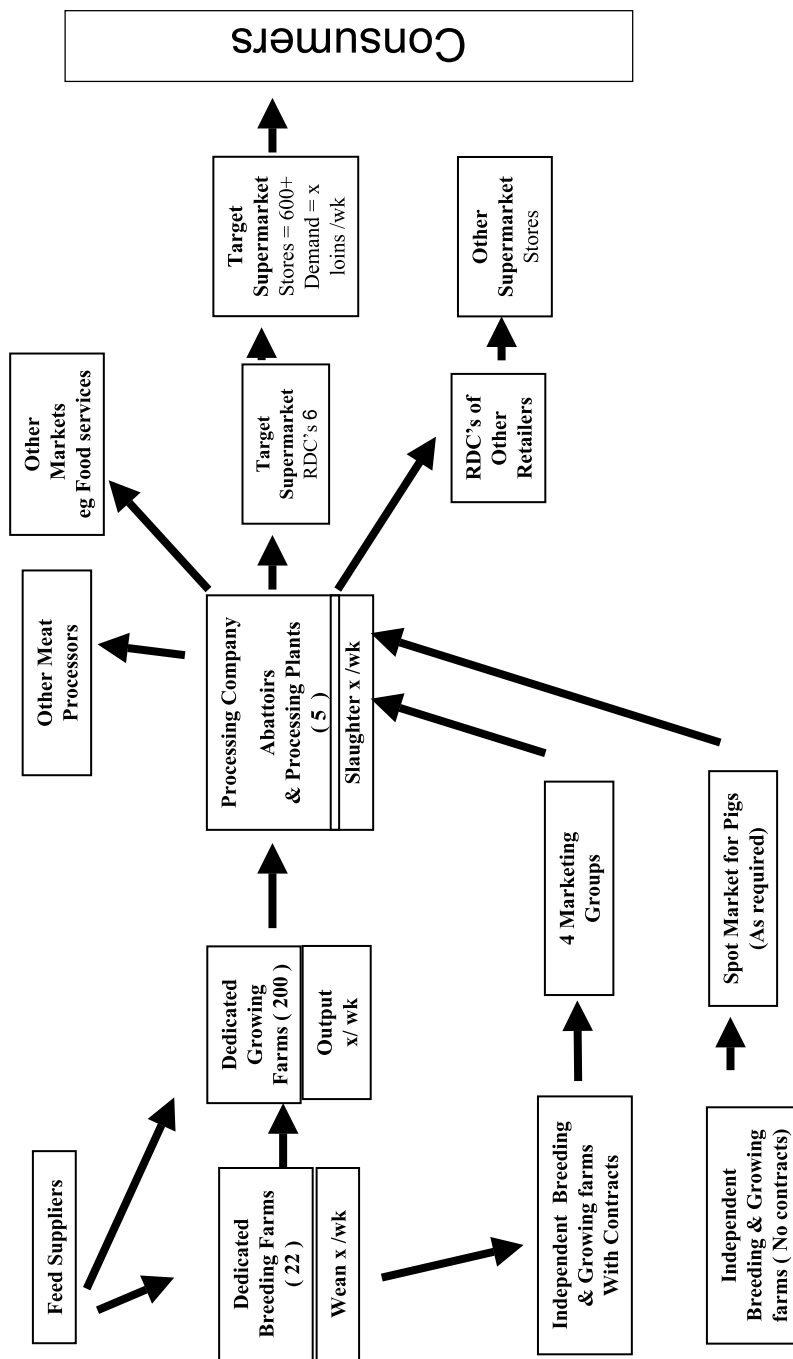
Figure 2.
Overall structure of the
supply chain

product selected was "pre-sliced pork loins" (i.e. pork chops to the layman) which was the top selling fresh pork product sold by the supermarket group.

Pork chops are sliced from the loin or back of the pig. The loin is referred to as a "primal cut"; other primals include legs, belly and shoulders. Cutting of the carcass into the various primals is the first step in the meat processing plant as shown in Figure 3. From primal cut onwards, the target product can be followed as a discrete product. Prior to the primal cut the target product is part of the complete pig and, therefore, the mapping of the upstream elements of the value chain had to focus on the full pig.

Stage three: analysis of the individual facilities along the chain
In order to collect the data necessary to understand the overall chain, the individual plants and facilities along the chain were analysed using the framework shown in Figure 4. The VCA team visited each facility in turn and followed the target product (i.e. pre-sliced loins) through all processes. Process activity mapping (Hines and Rich, 1997) was used to record identify and quantify the value adding or non-value adding steps in the process. The team also tracked all the steps in the information systems for producing and processing demand information including both forecasts and product orders. Mapping was undertaken at each of the operational plants along the chain including the retail store, the retail RDC, the processing plant, the abattoir and the farms. Additionally head office functions that impacted the value chain such as forecasting, marketing and planning were mapped at each of the companies.

The data collected in the process activity maps was used to construct a "current state map" for each facility as described by Rother and Shook (1998). Current state maps are based on a standard format with the three main elements showing the physical flow of materials, the information flows and a process time-line. They also use a set of standard symbols to illustrate key features. Once team members and other mangers become familiar with the standard format, current state maps become a very effective method for summarising, presenting and communicating the key features of a process within the organisation. These maps also have other important advantages in that they highlight imbalances in the process, they allow mangers to see waste and opportunities for improvement, they tie together the physical flows and information flows and they form the basis from which to develop an implementation plan (Rother and Shook, 1998).

Using the current state maps as a basis, an "issues and problems map", a future state map and a "SMART" action plan were developed for each facility along the chain. In each case the full VCA team was involved in developing theses maps. This had the dual benefit of first giving an external "fresh pairs of eyes" perspective to each operation and second, giving team members a real insight in to the difficulties and problems faced by their supply chain partners. The future state maps were developed in a lean context by reference to the five lean principles (Womack and Jones, 1996) and the key features of a lean value stream as described by Rother and Shook (1998). The SMART action plan (specific, measurable, achievable, realistic, timed) provides a systematic method of selecting projects, ensuring they related to the overall improvement aims and establishing quantified goals, timescales and resource requirements. A four maps series as shown in Figure 4 was produced for each facility in the chain and became the working documents for planning, communicating and implementing internal projects at each company.
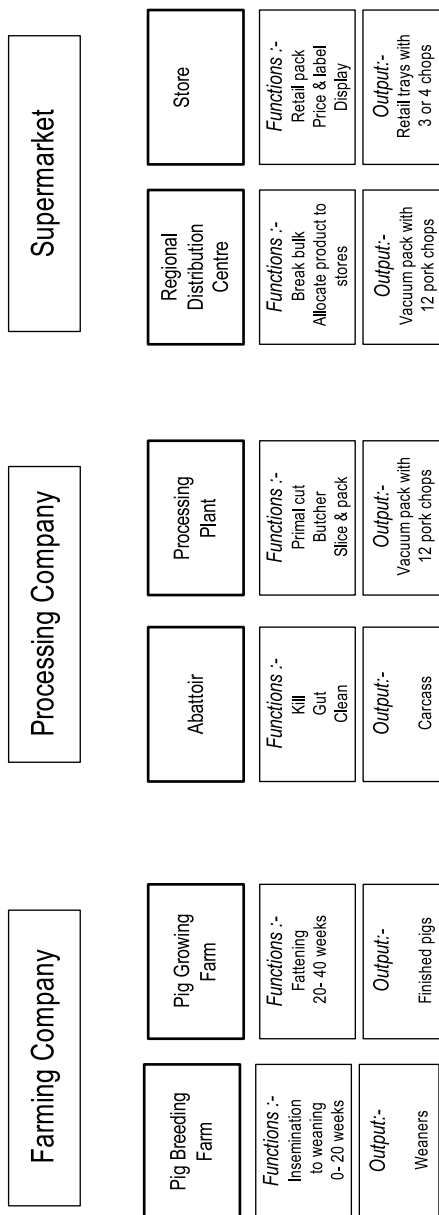
Figure 3.
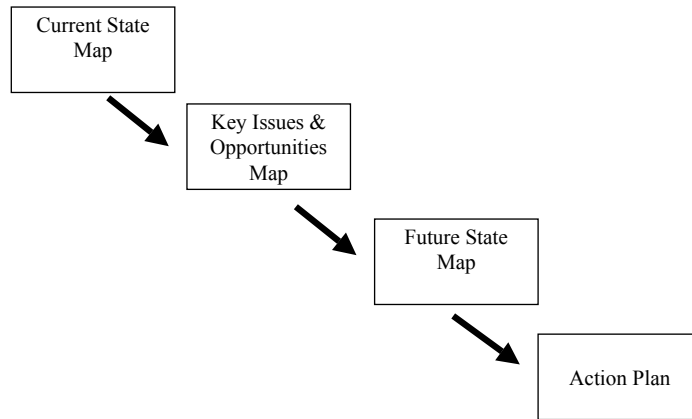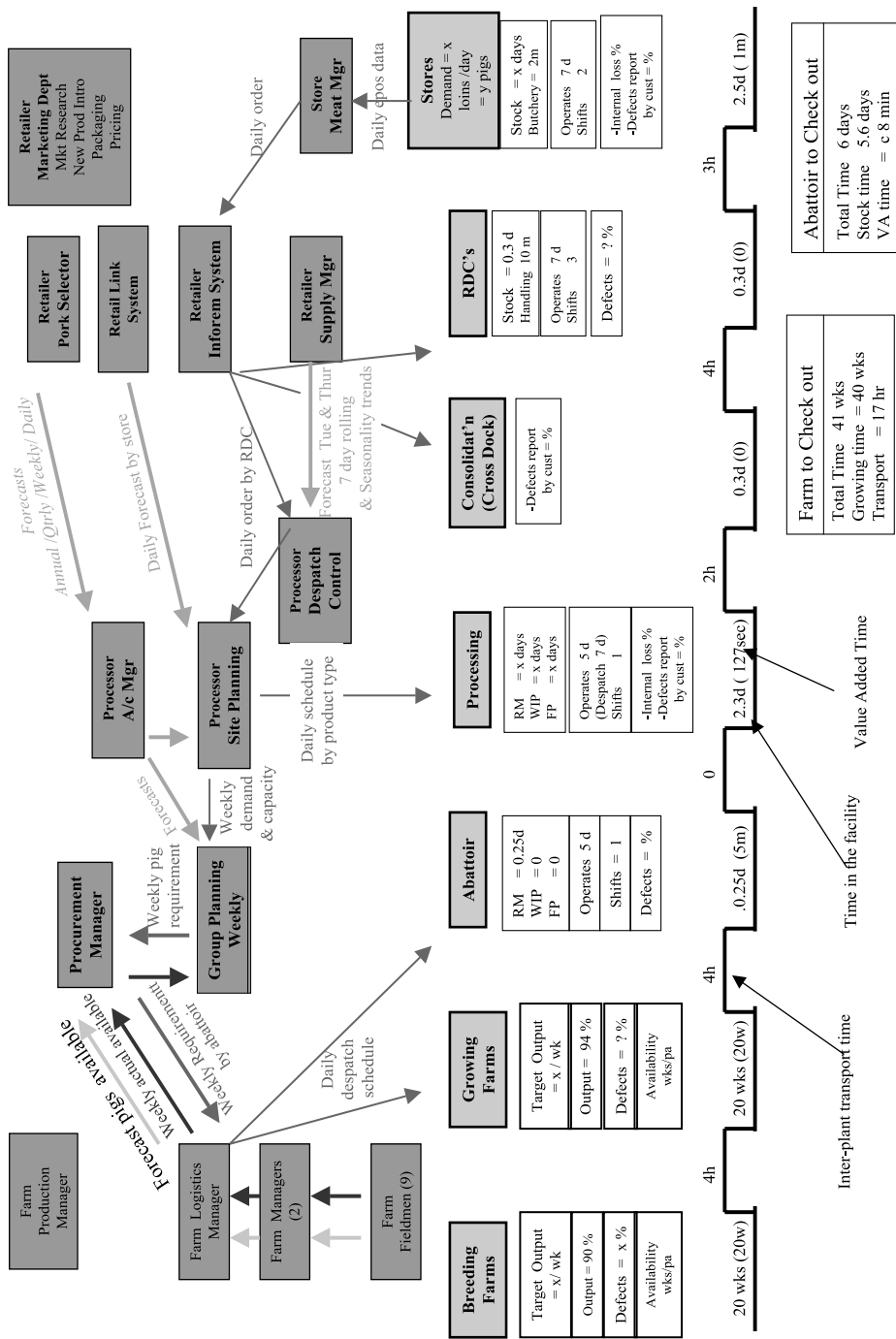Structure of the target
value stream

752

Figure 4.
Output maps for each
facility along the chain

Development of detailed maps and action plans for each individual site was time
consuming, taking approximately two days per site to collect and collate the data.
However, it was deemed to be crucial to the success of the wider value chain
improvement project for a number of reasons. First, the development of certain internal
improvements was a necessary forerunner to achievement of subsequent cross-supply
chain recommendations. Second, the identification and achievement of quantified
internal improvements gave a clear indication to senior management of the tangible
benefits for their company of developing a lean process improvement approach. Third,
internal successes helped to create a receptive environment for subsequent full value
chain recommendations.

Stage four: developing the current state map of the whole value chain
The detailed information collected at the individual facilities provided the data
required for the development of the whole chain map. The current state map of the full
chain was based on the "seeing the whole" model developed by Jones and Womack
(2002). The structure of this map is similar to the current state maps for each facility in
that information flows, physical product flows and time are the three key elements
recorded. The characteristics of each plant along the chain are summarised in one data
box showing key features that impact on whole supply chain performance. These
include plant availability, total stock, quality performance and service performance. A
further important feature of the full chain map is that it plots the interactions between
the companies, which is particularly important in highlighting interface waste. A
simplified version of the current state map for the whole chain is shown in Figure 5.

An important additional dimension when mapping the complete chain is the
requirement to analyse demand dynamics, with the aim of identifying variability and
amplification effects along the chain (Forrester, 1958). Hence the value chain analysis
methodology not only examines the structure of the information channels as shown in
the current state map, but also the nature of the information that flows through these
channels. Demand mapping requires collection of data on forecasts, orders placed and
production achieved. Data is required by individual stock keeping unit on a weekly
basis. Typically this data is not easily available as many companies store historical
data in an aggregated format by product family and by month. In the case project,

**Retailer
Marketing Dept**
Mkt Research
New Prod Intro
Packaging
Pricing

**Store
Meat Mgr**

Daily order

Daily epos data

Stores
Demand = x
loins /day
= y pigs

Stock = x days
Butchery = 2m

Operates 7 d
Shifts 2

-Internal loss %
-Defects report
by cust = %

**Retailer
Pork Selector**

**Retail Link
System**

**Retailer
Inforem System**

**Retailer
Supply Mgr**

RDC's

Stock = 0.3 d
Handling 10 m

Operates 7 d
Shifts 3

Defects = ? %

*Forecasts
Annual /Qrly /Weekly/ Daily*

Daily Forecast by store

Daily order by RDC

Forecast Tue & Thur
7 day rolling
& Seasonality trends

**Consolidat'n
(Cross Dock)**

-Defects report
by cust = %

**Processor
A/c Mgr**

**Processor
Site Planning**

**Processor
Despatch
Control**

Daily schedule
by product type

Processing

RM = x days
WIP = x days
FP = x days

Operates 5 d
(Despatch 7 d)
Shifts 1

-Internal loss %
-Defects report
by cust = %

Forecasts

Weekly
demand
& capacity

Weekly pig
requirement

**Procurement
Manager**

**Group Planning
Weekly**

Abattoir

RM = 0.25d
WIP = 0
FP = 0

Operates 5 d

Shifts = 1

Defects = %

*Weekly Requirement
by abattoir*

Daily despatch
schedule

**Growing
Farms**

Target Output
= x / wk

Output = 94 %

Defects = ? %

Availability
wks/pa

Weekly actual available

Forecast pigs available

**Farm
Production
Manager**

**Farm Logistics
Manager**

**Farm Managers
(2)**

**Farm
Fieldmen (9)**

**Breeding
Farms**

Target Output
=x/ wk

Output = 90 %

Defects = x %

Availability
wks/pa

Abattoir to Check out

Total Time 6 days
Stock time 5.6 days
VA time = c 8 min

Farm to Check out

Total Time 41 wks
Growing time = 40 wks
Transport = 17 hr

2.5d (1m)

3h

0.3d (0)

4h

0.3d (0)

2h

2.3d (127sec)

0

.0.25d (5m)

4h

20 wks (20w)

4h

20 wks (20w)

Value Added Time

Time in the facility

Inter-plant transport time

considerable effort was required to disentangle the historical data and to capture on-going data in an appropriate format, but again, however, the effort was deemed to be worthwhile as the resulting analysis highlighted a major opportunity for improving supply chain performance. Figure 6 shows an example of a demand analysis chart for the target pork product over a 14 week period.

Stage five: analysis of issues, and opportunities along the whole chain
Mapping of the complete chain inevitably throws up many issues and improvement opportunities. The value stream mapping model presented by Jones and Womack (2002) naturally leads to classification of issues into those related to physical flows and those related to information flows. It is suggested, however, that it is useful to consider a further dimension in terms of issues related to the organisation, management and control of the chain. An appreciation of the current state of the relationships between chain members and of the realities of the management and control of the chain is particularly important, as this sets the context as to what might realistically be achievable in terms of supply chain development. Examples of some of the issues arising in the pilot value stream within each of these categories were as follows:

Issues related to physical product flows

- There was no link between pig breeding and consumer demand; pig production was a "push" system which continually created problems of under or over supply at the processing plants.

- There was a poor link between processing and consumer demand; a "pseudo pull" system operated between the retail outlets and the processor, being partially disconnected by stock at the store and at the processor.

- The chain between the processor and the store contained more stock (ten days) than was necessary given the short information and processing lead times.

- There was significant duplication of stock at either side of corporate boundaries.

Store Orders & Processor Production
Target Product : Pre sliced loins
Period : Week 48 2002 to Week 9 2003

Note
Real demand
ie EPOS sales
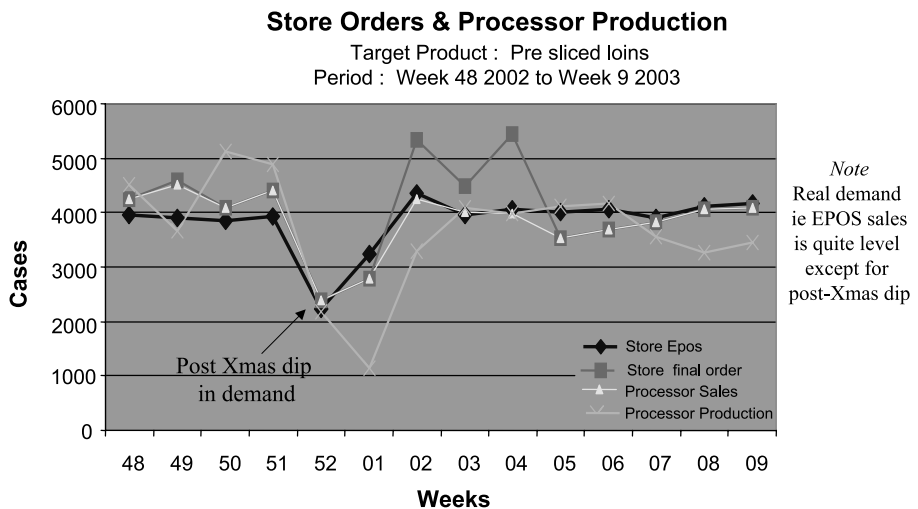is quite level
except for
post-Xmas dip

Figure 6.
Demand variability chart

- Many non-value adding steps exist at both the micro and macro levels.
- Significant product waste occurred due to product non-conformance along the chain; for example, over 30 per cent of pigs were out of specification in terms of required weight or fat levels.
- There were poor mechanisms to identify and solve root causes of operational problems in the chain particularly across corporate boundaries.

Issues related to information flows
- A multiplicity of forecasts existed. Not only did each firm along the chain make independent forecasts, but also different departments within the firms produced separate forecasts. There was little correlation between any of these forecasts.
- Demand information passed from one company to another was often provided in a poor format, creating non-value added rework for recipients.
- Numerous examples existed of information produced in one department being passed to partners upstream or downstream, but not used by the recipients.
- Demand amplification was apparent together with a lack of synchronisation of demand and activities rates as shown in Figure 6. Taylor (2000) demonstrated that unnecessary demand variability is highly detrimental to the efficiency of supply chain operations, yet presents significant and low cost opportunities to improve chain performance.

Issues related to management and control of the chain
- No one person or group had responsibility for management of the whole supply chain. Instead control was fragmented across functional silos.
- There were a number of inter-company "black-holes" for which no one had responsibility, for example, the persistence of sub-optimal inter-company transport policies.
- There were no overall value chain "key performance indicators" and hence nothing to drive improvement in chain performance.
- Independent decision making by farmers, processor and supermarket did not foster an environment for joint continuous improvement.
- There was a clear lack of trust, at times verging on hostility, between upstream players and the supermarket and to a lesser extent between farmers and the processor/abattoir.

Stage six: development of the whole chain future state map and recommendations
Mapping and subsequent problem analysis identified many opportunities for waste elimination and efficiency improvement in the chain, some of which are summarised in Figure 7. Most of these suggestions could be categorised as operational in that they could be achieved within the context of existing supply chain structures and relationships and would require only a modest increase in cooperation between supply chain partners. However, it was clear that operational improvements would have only a limited impact on chain performance and there was a deeper opportunity for a much more radical strategic change based on the development of a "lean vision". The following strategic vision was, therefore, developed:
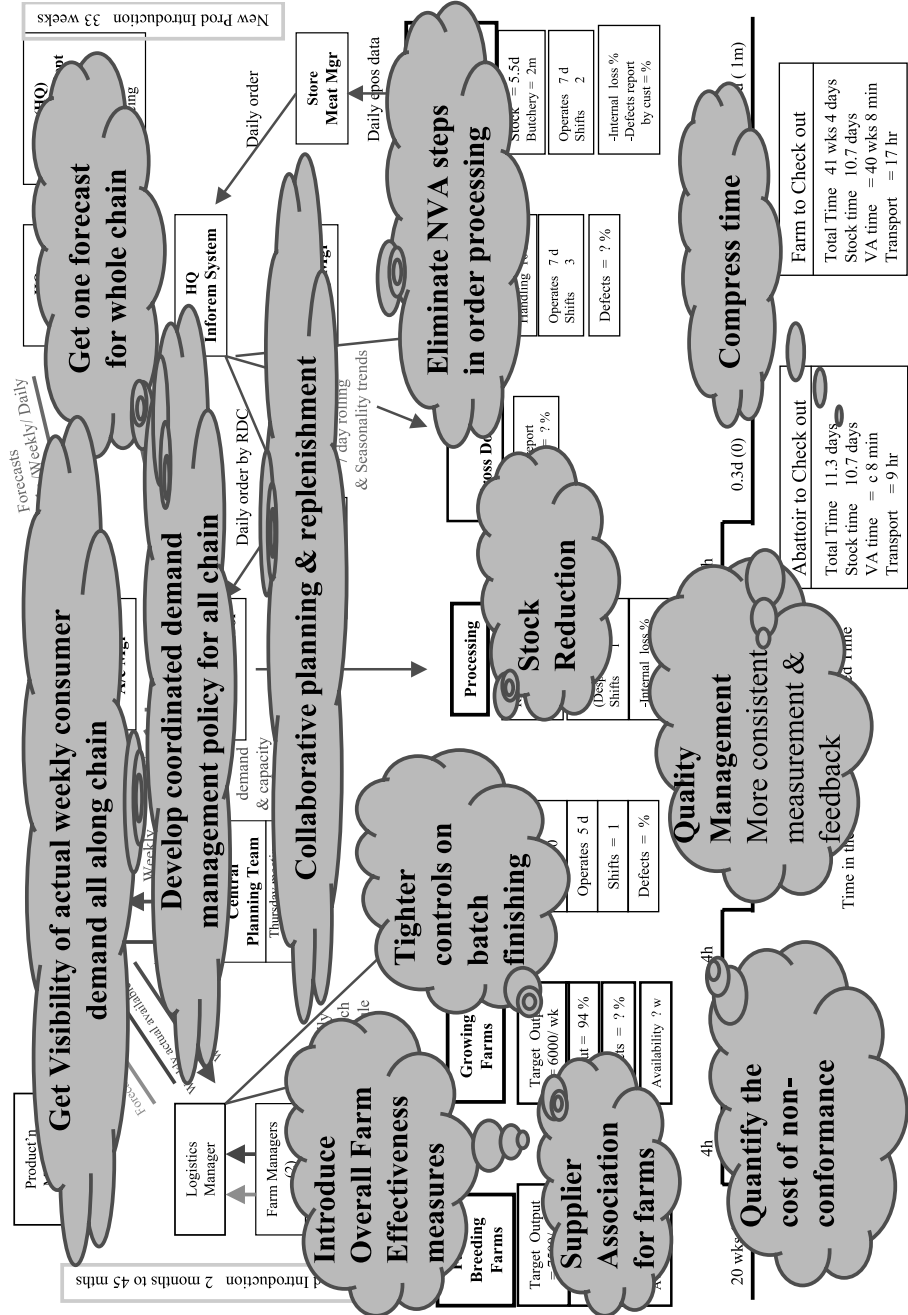
Figure 7.
Creating a lean value
chain: potential
operational improvements

> A dedicated value stream supplying a full range of pork products to the supermarket from the food processor, with pigs sourced from a specific group of dedicated farms, to be underpinned by a commitment of the three companies to work together over a prolonged period to optimise whole chain performance.

It was suggested that the achievement of this vision would require a number of fundamental changes including:

- The development of a clear specification of "value to the end user" in terms of pork products. This in turn would require market research with the consumer and a willingness to consider the potential for a different marketing strategy on the part of the processor and the supermarket.
- A strategy to manage the whole value stream as an integrated process. This in turn would require stability in chain membership and mutual, long-term commitment to supply chain partners.
- Improvement of value chain efficiency through development of a flow system and associated lean improvement techniques (Bichino, 2000) with a view to reducing costs and improving service and quality. This in turn would help to insulate the chain from the price fluctuations which are a problematic feature of commodity agricultural markets.
- Linking of supply to demand by the establishment of a "pull system". This in turn would help to eliminate demand amplification effects and allow more consistent planning of pig production and scheduling of processing activity.

The above recommendations represent just some possibilities as to how a lean value stream might be structured and operated. However, in the in the context of this research, the precise details are not particularly important and in practice would have to be further developed by the supply chain partners themselves. What is of more interest are the organisational obstacles and requirements related to the adoption of a integrated and strategic vision for the whole value chain, however, that vision might be designed.

Stage seven: creating a receptive organisational context for value chain improvement
Achievement of improvement across multi echelons of a value chain usually requires strategic as well as operational change. From the outset of the project a strategy was in place to create a receptive atmosphere for any proposals that might eventually be developed. This was approached at two levels, first, within the VCA team and second, at senior management level within the partner companies.

The mere creation of the VCA team with a remit to jointly examine the whole chain was an important element in the change strategy. The project team were jointly responsible for current state analysis, identification of wastes and opportunities and the development of recommendations. The team were educated in lean concepts and approaches primarily through practical application of VCA techniques, but also through more formal education methods such as directed reading and presentations. Importantly, the team members also all fully subscribed to the improvement recommendations, as they had all been involved in their development. However, it was recognised that this, in itself, was insufficient to translate the recommendations into action.

It was anticipated from the start, that the implications of developing a lean chain would probably require strategic decision from the most senior management of the companies (in this case the managing directors of the farm company and processing company, together with the fresh products trading director at the supermarket). A vital objective, therefore, was to ensure that these directors had sufficient understanding of not only the recommendations, but also the underpinning lean concepts in order to make a reasoned judgement as to the appropriateness of the proposals. To try and adequately convey all this information in one end-of-project presentation was clearly impractical. A series of communications were therefore scheduled in which each member of the value stream team had meetings with their respective directors to explain interim findings and recommendations. Also the final report was individually presented to each director and discussed in detail, so that each company could develop a view of the proposals from their own perspective before attending a joint meeting with the directors of the other companies in the chain, at which an overall value chain strategy was discussed. At this meeting, only a brief summary was given of the main findings and recommendations as the main objectives were first, to make a decision as to whether or not to proceed with joint improvement initiatives and second, to establish agreements as to how costs and savings could be shared if the project was to proceed. The achievement of an equitable and mutually acceptable benefit share agreement was recognised as an essential pre-requisite to the development of a cooperative approach to supply chain improvement.

Evaluation of the approach and conclusion

This review of an "action research" project has described an approach to the practical improvement of supply chain operations It is suggested that the approach has both strengths and weaknesses, some of which are fundamental to the methodology and some of which are contingent on the sector being studied.

Many companies espouse the idea of partnership within the supply chain. Undertaking a VCA project is an effective way to start the process of translating the partnership concept from a wish to a reality, even in environments where pre-existing relationships are quite hostile. Team members gain first hand appreciation of operations, issues and problems in their partner organisations. Subsequent analysis typically highlights clear opportunities to reduce waste and improve quality and service, such that each supply chain member can usually see "what's in it for them". If these opportunities are perceived to be sufficiently attractive there will be the incentive to commit resources to implement value chain improvement initiatives.

One of the weaknesses with the current/future state mapping techniques described by Rother and Shook (1998) and Jones and Womack (2002) is the lack of a clear and workable financial model to measure the costs of current operations and the potential financial benefits of lean improvements across the whole chain. This is partly because financial accounting systems are not structured to provide costs related to value streams, nor are they easily able to untangle many of the real costs of waste (e.g. administrative costs, true costs of stock holding, costs of inefficient scheduling) which are frequently immersed in the "overheads" category. It is also argued by lean purists that time and quality measures are adequate proxies for cost; and as time is compressed and quality improved, so cost will drop out of the process. Logically this is true, but in practice most senior managers are used to justifying decisions on a clear

financial basis and typically demand some form of cost benefit analysis of proposals. Preliminary work on the development of a lean costing model has been carried out by Hines *et al.* (2002), however, it is suggested that further research is needed in this area particularly with a view to incorporating a cost model into the framework of the current state map. At the request of the company directors in the case study, a fairly rough cost-benefit model was developed using estimates of savings in relation to stock reductions, quality improvement, administration costs on the target value stream. These savings were then extrapolated across the whole pork products range. Even with the most conservative estimates, the benefits of adopting the joint approach to improvement amounted to savings to over £2 million per annum.

A further problem with the VCA approach is that it demands considerable resource in terms of management time. The team typically will have at least one, but more likely two members from each company. Each meeting, therefore, can directly involve six people plus other staff on an *ad hoc* basis. The amount of time involved can present an obstacle at the outset, in gaining commitment from the companies to take part in a project for which they are unsure of the potential benefits. As the VCA research has been extended to other red meat chains, this problem has been addressed by developing a tight ten day framework in which the work can be completed.

Research from this case study and other studies within the wider red meat VCA project, suggests that in any joint a value chain initiative, and particularly in chains where there is a prevailing environment of mistrust or instability, it is necessary to confront the hard commercial realities at the outset – so that all parties know clearly and preferably contractually what they stand to gain by embarking on a joint initiative. Without such an agreement at the outset, there is probably little point in trying to pursue a cooperative approach to value chain improvement as this is likely to be undermined by a lack of trust, anxiety as to benefit shares, or fear of short-term changes in policy.

It was found that the value stream mapping techniques were on the whole relevant and easily transferable to the red meat industry. Certainly this was the case at the retail end of the chain in terms of stores and distribution activities. Lean improvement approaches were also readily applicable in the processing plant in spite of the fact that many managers in the meat trade claim to be in a unique, disassembly operation, a belief that seems to have discouraged consideration of best practices in other industries. The farm, however, presents a different environment where it is less clear how to apply some of the lean analysis and improvement techniques. The focus of value chain mapping is the product; follow the product through the process and categorise and quantify the activities through which it passes. When the pig is the product and it takes 40 weeks to grow, it is less clear what constitutes value adding and non-value adding time and how, if at all, lean concepts can impact that process. In this situation, it is suggested that the focus needs to change away from the animal to the processes that the farmer undertakes to facilitate the animals' growth such as feeding routines or veterinary routines. The development of a framework for applying VSA on the farm is an area for further research.

At a strategic level, the development of an integrated value chain is seen as a necessity by many people in the red meat sector. Not only do farmers, processors and supermarkets claim this as the way forward, but also the UK government espouses it as a key solution in stemming the decline of Britain's food supply base (Curry, 2002). It

is suggested that the methodology applied in this case study has demonstrated a workable approach to, and the potential benefits of value chain improvement.

End note

Shortly after the completion of the value chain analysis project described in this case, the supermarket group concerned announced that it was reducing its supplier base as result of a strategic review in its sourcing of red meat products. As a consequence, the processor involved in the project lost part of its pork business with the supermarket. This strategic decision was made without reference to the work carried out in the project. As a result, none of the recommendations for joint improvement initiatives between the three project partners were carried forward. However, in the post-project evaluation, both the supermarket and the processor deemed the VCA project to have been a valuable. The supermarket has subsequently applied VCA to a number of other food chains with other suppliers. The processor recognised the potential of applying lean internally and has adopted a group wide lean education and improvement initiative. As far as is known, the farm company did little to progress with lean or VCA initiatives, thus underlining the need for further research as to the applicability of these approaches in the farm environment.

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