

## Implementing Whole of Chain Analyses for the Seafood Industry: A Toolbox Approach

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### Abstract

Whole of chain analyses are increasingly recognised as an important tool for improving the efficiency and effectiveness of agri-food chains, particularly in industries where many producers are small, family-owned businesses. However, there remains confusion in the literature and in practice about the different approaches that can be taken to whole of chain analysis. The purpose of this paper is twofold; firstly to define and describe the various approaches to analyses of food chains, and secondly, to provide a set of principles and a decision tree from which food industry companies can choose their preferred whole of chain activity based on their intended outcomes. This paper will use the seafood industry as an exemplar, noting that principles could apply across other primary production sectors.

Keywords: value chains, seafood, supply chain, demand chain

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## Introduction

Agribusiness food chains are under pressure due to increasing production costs and a competitive market driven in part by the power of chain retailers (Hingley 2005). This pressure and ability to maintain competitiveness is aggravated by the nature of many smaller agribusinesses being production driven and often non-collaborative (Mowat and Collins, 2000). Whole of chain analyses has been identified as a means to increase competitiveness for such chains and hence a number of investigations have been completed on food chains in developing (Stringer, Sang and Croppenstedt, 2009) and developed countries (Taylor, 2006). Initially these diagnostic analyses tended to focus on decreasing costs, increasing efficiencies and improving product quality of existing chains. However, more recently analyses have been more market/consumer driven, focusing on developing new or revised efficient chains to develop an end product to meet pre-identified buyer needs (Zokaei and Hines, 2007; Al-Mudimigh, Zairi, and Ahmed, 2004). These studies tend to focus on outcomes identified from understanding consumer value, information flow, product flow and relationships and have been applied in sectors including beef (Canever, Van Trijp and Beers, 2008; Francis, Simons and Bourlakis, 2008), wine (Taylor and Fearn, 2009) and salmon (Otteson 2006).

One outcome of this evolution of analyses has been some confusion in the terminology used to describe the various whole of chains analyses (Feller, Shunk and Callarman 2006). Terminology such as supply chain analyses, value chain analyses and demand chain analyses are often intermingled in the literature. Further, there appears some confusion amongst primary producers in identification of which of the various analyses would be most appropriate to their intended outcomes and business strategies. Hence the purpose of this paper is twofold; firstly to define and describe the various approaches to analyses of food chains, and secondly, to provide a set of principles and a decision tree from which food industry companies can choose their preferred whole of chain activity based on their intended outcomes. This paper will use the seafood industry as an exemplar, noting that principles could apply across other primary production sectors.

## Whole of Chain Analyses: Definitions

Following a review of the literature, whole of chain analyses have been divided into three categories: chain mapping, supply chain analysis and value chain analysis. Each approach is discussed in turn outlining the objectives, methods used and outcomes of each approach.

### Chain Mapping

*Chain Mapping* is the first and mandatory stage for all analyses. Chain mapping involves the broad understanding of the players along the chain and what the major issues/impacts/opportunities are between chain partners. It also seeks to understand the various transaction mechanisms that are in place, the physical movement of the product and the various shares of total production that move along various channels. Chain mapping may also identify why or why not buyers purchase a particular product. Also gathered where relevant is information on packaging and product forms/transformations that occur along the chain. Methods of gathering this data include interviews through the chain, desktop research, data analysis,

integration of results and production of an accurate supply chain map. The key outcomes of chain mapping include the identification of all of the players selling and buying a product, from production to consumer, the collection and comparison of the perspectives of all the players along the chain about the major issues, the production of an accurate supply chain map, identification of research and development priorities and intervention projects identified through the chain mapping process.

Within the Australian seafood industry a number of supply chain mapping exercises have been undertaken for products such as farmed prawns (CDI Pinnacle Management, 2009), oysters (CDI Pinnacle Management, 2010) wild capture prawns (Johns pers comm.) and farmed barramundi (Lawley and Howieson, in prep). Such studies have resulted in a better understanding of the channels and estimated cost sharing between the chain partners and identified further analyses and improvement projects to improve chain efficiency and profitability.

### **Supply Chain Analyses**

Turning to *supply chain analyses*, the aim is to reduce the technical costs (or increase quantity/quality with the same costs) and so increase profits by modifying an existing chain. Supply chain analyses are about operational efficiencies rather than focussing on effectiveness ie what consumers actually value. Such analyses are generally focussed around increasing profitability (usually by decreasing cost of production or increasing production/quality) for an existing product and distribution chain. More specifically supply chain analyses can focus on product quality, cost and/or processing efficiency. While all three foci are addressed through structured interviews with players along the chain, the questions clearly vary. Product quality improvements involve topics such as in-chain monitoring of quality, product waste, drip loss, microbiology, spoilage, temperature, time, harvest details, and logistics details which are studied from harvest to retail. Processing efficiency focuses on industry receiving quantitative information on how to minimize costs (or how to maximize production with same costs) within their facility or operation (in regards to waste minimisation, more efficient handling, transportation, stockpiling, staff activity and training etc). Cost efficiencies include questions on quality measured with technical indicators, quantity, and technical costs and the monitoring of whole or part chain costs, returns and margins (as modelled by Islam and Xayavong, 2010). All players in the chain provide and have access to information about where revenues are being distributed. This provides an opportunity for partners to redesign chains to change their share of the revenue pie. Research and development priorities are based on industry costs (best cost benefit activities).

A supply chain analysis of the Australian Oyster industry (Madigan 2008) resulted in changed practices in regards to temperature control and monitoring and handling. Further, examination of the supply chain for Spencer Gulf prawns resulted in changed handling practices/preservation practices which have increased shelf-life (Thomas, Holds and Pointon 2003).

### **Value Chain Analyses**

The value chain concept was initially proposed by Porter (1985) as a major way to create more customer value and gain competitive advantage. Value chain analyses assess whether the value chain is effective at maximising the opportunities for adding value in the eyes of the consumer; and efficient in adding value, producing, processing and distributing at the least

cost. This requires that the value chain: understands what consumers value in the product, and focus on adding value throughout the chain; develops strategic collaboration and operational co-operation throughout the value chain; and strives for continuous innovation to improve effectiveness and efficiency.

The question from the seafood industry partner representing multiple players along the chain is: *Could we create higher value for our product along the chain by working collaboratively on product and process innovation?* The question from the individual firm in the industry is: *Are we doing the right things?* That is, could we obtain higher profits (or maintain our current profits) by changing our sourcing or marketing strategy? Value Chain Analyses may be qualitative, using consumer surveys to clarify which product attributes different consumers' value and semi-structured interviews with players along the chain with questions on: product and input flows; how information is generated, shared and used along the chain; how relationships among chain players can create collaboration. Value is discussed qualitatively in terms of expected benefits, costs and risks (Taylor and Fearn, 2009). Alternatively a quantitative approach using consumer surveys with estimation of willingness-to-pay (conjoint analysis, auctions, contingent evaluation), attitudes and beliefs, structured interviews with players along the chain, from retailer to fishery with questions on prices, quantities, technical costs and coordination costs and structured interviews with players along the chain, from retailer to fishery with questions on current and expected prices, quantities, technical costs and coordination costs, can be used. Value is measured quantitatively in terms of estimated prices, quantities, costs (technical + coordination costs) and risks along the chain.

Value chain analyses provide:

- estimates of how much consumers value a product with different attributes, in different occasions of use, in different markets;
- information on the total value currently created by the chain, and its distribution along the chain;
- information on the change in total value and its distribution caused by adopting an alternative strategy involving product and process innovation; and
- suggested investments and/or changes in strategies based on the quantitative information provided.

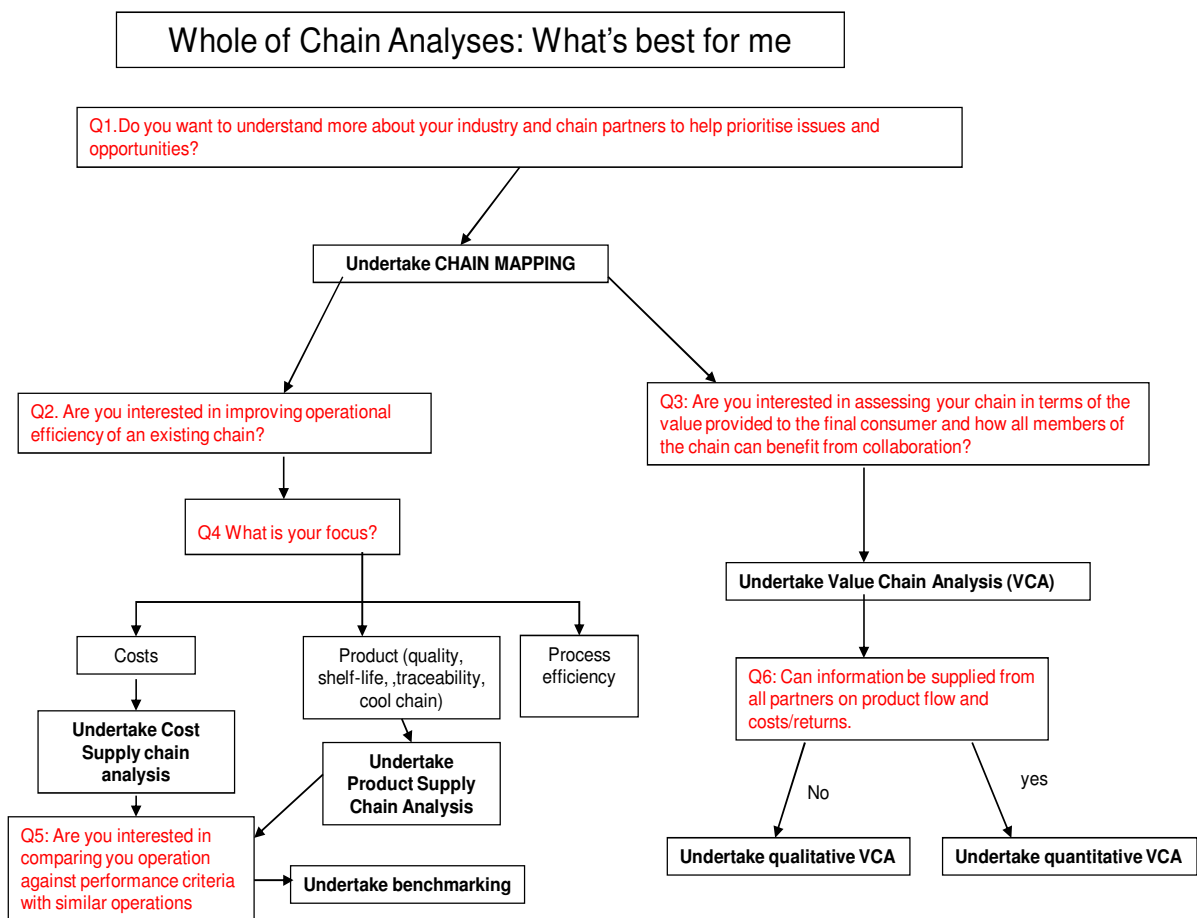
Much of the literature relating to value chain analyses undertaken for the seafood industry has been characterised by diagnostic outcomes, there is little reporting in the literature of the impact on profitability/costs benefit implications of implementing recommendations from value chain analyses and the impact on profitability. Such diagnostic examples include recommendations for farmed Mediterranean seabass and seabream (Wagner and Young, 2006), frozen cod from Norway (Grunert et al, 2004) Norwegian salmon (Otteson, 2006) and Scottish trout and salmon (Wagner and Aldercise, 2006). Most of these studies have resulted in recommendations around better understanding of consumer needs, and changing practices/collaboration at the producer/processing stage of the chains to better meet these needs.

### **Toolbox for Whole of Chain Analyses**

Figure 1 shows a simple decision-tree which industry players can use to guide their selection of the most appropriate or feasible approach to a whole of chain analyses. Briefly, the decision tree suggests that all whole of chain analyses should commence with a chain mapping exercise as a basis for understanding the chain and identifying and prioritising

issues. Once this stage is completed, questions 2 and 3 force the decision maker to clearly identify whether their focus is on efficiencies within the chain or effectiveness, that is focusing on what consumers value. If the answer to Q2 is yes, the decision maker then focuses on whether costs, product quality or process efficiency are the key and undertakes a supply chain analysis of some sort. Whereas if the focus is effectiveness, value chain analysis will be the outcome, with further consideration given to the willingness and ability of players to provide information determining whether the approach will be qualitative (where players are unwilling or unable to provide specific data) or quantitative (where players can and will supply specific data).

Figure 1 Decision Tree for choosing Whole of Chain Analyses



Other considerations when designing implementation of whole of chain analyses include:

- building analyses sequentially and with flexibility so that there is scope for a preliminary project to be expanded based on initial findings;
- ensuring whole of chain commitment to proposed project and industry champions to assist in facilitating engagement with other operators. The major impediment to effective whole of chain analyses is information sharing between chain links. Hence there needs to be a clear understanding of and commitment to the extent to which all participants in any chain projects must cooperate and contribute data such as quality records / movement costs / margins etc.; and
- in design, deciding whether the analyses will encompass an end point of recommendations for improvement/intervention projects (ie diagnostic only) or will

encompass trialling the recommended strategies. Inclusion of such pilot trials will impact both on budgets and timelines.

## **Conclusions and Future Research**

By clarifying the types of whole of chain analyses available to agri-food producers in terms of their objectives, methods and outcomes and then using this information to develop a decision tree to assist players identify the appropriate approach for their goals and resources, this paper has added to the body of knowledge in this area. Further the decision tree provides a practical tool for all those involved in agri-business chains. The exemplars from the seafood industry have highlighted how this approach can be applied in a real world setting although it is noteworthy that, perhaps due to issues of commercial confidentiality, there is very little reporting of costs benefit analyses/increased profitability of implementing recommendations from such whole of chain research. Given the value of being able to provide firm evidence of the costs and benefits of our approach, further research is proposed to document the outcomes of whole of chain analyses in the Australian wild capture prawn industry.

Currently, the Australian wild prawn fishery is facing considerable challenge to maintain profitability due to a changing market, notably: a decrease in export markets and changes in the pricing structures of Australian wild caught prawns from a traditional premium price due to parameters such as provenance, size, quality and an extended shelf-life to a lower price due to competition from supermarkets who are sourcing lower priced imported product. The resulting decrease in market share has highlighted the need to change current business models in this industry. Hence, the Australian Council of Prawn Fisheries (ACPF) have identified whole of chain analyses as a research priority with an objective to identify interventions and repositioning strategies that would increase their competitiveness.

Three wild capture prawn fisheries have agreed to be pilot cases for this genre of research. These chains are variable in value, target species, product and degree of post harvest, business models, and geography (one in Queensland, one in New South Wales and one in Western Australia). The aim of this research will be to pilot the value chain principles and toolbox to conduct chain analyses and identify strategies to increase profitability in these fisheries. Following our toolbox, the first stage will be chain mapping which will develop preliminary maps of the current harvest, processing, distribution and marketing channels of the selected chains. Based on preliminary discussions with each fishery, the next stage will focus on a value chain analysis rather than a supply chain analysis as the key priority is understanding consumer demand rather than improving chain efficiencies. At this stage the answer to question 6 in our toolbox, whether to undertake qualitative or quantitative analysis is unclear, but will be evident upon completion of the initial chain mapping.

In brief, these diagnostic analyses will identify market/consumer drivers and knowledge gaps resulting in the identification of fishery specific intervention/repositioning projects to be implemented by the specific groups. More importantly, these case studies will contribute to filling the research gap identified in this paper of a lack of studies highlighting the actual costs and benefits of implementation of whole of chain analysis.

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