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**Predicting the Adoption of Innovations by
Businesses in Agricultural Processing**

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1. Introduction

The Victorian government invests substantial public resources in the development of innovations for agricultural production and processing. The scale and rate with which these innovations are adopted by agricultural processing businesses is a critical factor influencing the return on this investment. Consequently, an important concern for government is that research into innovations in agricultural processing is directed to developing innovations that will be useful to processing businesses.

The purpose of commercial businesses is to make profits. Businesses make profits by competing with each other to create value for customers. Consequently, a business's decision to adopt an innovation depends fundamentally on the contribution the innovation can make to the business's competitiveness. Hence, understanding how a business creates a competitive advantage is crucial to understanding the potential usefulness of an innovation to a business. In this report we present Porter's (1980; 1985) model of competitive advantage and describe how this model can be employed to identify the factors that are likely to influence the potential usefulness, and therefore attractiveness, of innovations to agricultural processing businesses.

In the next section we describe Porter's (1980) concept of competitive advantage and generic competitive strategies. We then outline the features of innovations that are compatible with each of the strategies. We then present an illustrative application of Porter's (1980) model using a case study of innovations in the wine processing.

2. Competitive advantage and competitive strategy

Porter (1985) argued that businesses make profits by creating value for their customers that exceeds the cost of performing the activities involved in creating that value. Porter (1985) also argued that to remain profitable in the longer term businesses must create a sustainable competitive advantage. That is, businesses must have a means of creating value for customers that competitors have difficulty matching if the business is to remain profitable in the long term. Consequently, the potential contribution of an innovation to the competitive advantage of a business will have a critical influence on the usefulness of the innovation to the business.

Porter (1985) viewed businesses as collections of activities that produce, market and support products and services. A competitive advantage arises from combining activities that are valuable, rare, or difficult to imitate and provide the basis for the creation of value for buyers (Porter 1985; Kotler *et al* 1998; Assael *et al* 1995). Generally speaking, there are two sources of competitive advantage – low cost and differentiation. A cost advantage exists where a business is able to supply, at a lower cost, a product with features comparable to that supplied by competitors. A differentiation advantage exists when a business is able to supply, at a cost comparable to competitors, a product that offers improved features to customers. An innovation will vary in its usefulness to a business depending on the source of the business's competitive advantage and the degree to which the innovation can contribute to creating, improving or countering a cost or differentiation advantage, or both.

The two sources of competitive advantage give rise to three types of generic competitive strategies depending on the scope of market coverage – cost leadership, differentiation and focus (Porter 1985). A business following a cost leadership or differentiation strategy seeks competitive advantage with a single offer across all market segments, while a business following a focus strategy seeks a cost or differentiation advantage in only a limited number of market segments (see Table 1).

Cost leadership strategy

A business seeking to follow a cost leadership strategy sets out to be the low cost producer in its industry (Porter 1985, 12). To achieve this, a business must be aware of, and make use of, all sources of cost advantage. Cost leadership centres on reducing costs by taking advantage of economies of scale, capacity utilisation, learning, linkages between activities, linkages with suppliers and buyers, and timing activities (Porter 1985). Typically, a cost leader sells a standard, no frills product focusing on economies of scale, processing efficiencies, or preferential access to materials. Hence, a cost leader is most interested in innovations that lower production costs. Innovations that lower costs include innovations that, for example, enhance economies of scale or lower the cost of inputs. However, to be successful the cost leader must supply a product that their customers perceive as being comparable in quality to rivals' products.

		Competitive advantage	
		<i>Lower Cost</i>	<i>Differentiation</i>
Competitive scope	Broad Target	1. Cost Leadership	2. Differentiation
	Narrow Target	3A. Cost Focus	3B. Differentiation Focus

Table 1: Three generic competitive strategies (Porter 1985,12)

Consequently, a cost leader is less interested in innovations that lead to new products or new product features - unless these are needed to maintain proximity with competitors (Porter 1985).

Differentiation strategy

A business following a differentiation strategy seeks to provide products with unique attributes or benefits that are valued by buyers across a range of segments in a market (Porter 1985). A business following a differentiation strategy aims to obtain a price premium for offering this uniqueness which is greater than the cost of differentiating, while maintaining cost parity with competitors by reducing cost in all areas that do not affect differentiation (Porter 1985). Differentiation can be embodied in the product itself, the delivery system by which the product is distributed to buyers, the marketing approach, and a broad range of other factors (Porter 1985; 1980). To be effective a business must differentiate on attributes that are meaningful to buyers but different to those offered by competitors. Businesses adopting a differentiation strategy are attracted to innovations that create new features, or enhance the existing features, of products or services.

Focus strategies

Businesses following a focus strategy identify a particular segment within the market and tailor their product and service offering specifically to meet the particular needs of that segment. The business seeks to achieve either a cost advantage or differentiation advantage by specialising in meeting the needs of buyers in the target segment (Porter 1980). For a focus strategy to be successful the buyers in the target segment must either have unusual needs relative to other buyers in the market or require a specialised production or delivery system (Porter 1985). This strategy is based on servicing a segment more effectively and efficiently than competitors (Porter 1985). Businesses using this strategy are interested in innovations that allow them to meet the unique needs of the target segment while still maintaining costs in line with their competitors.

The combination of competitive advantage and competitive scope creates three strategies for sustaining competitive performance – cost leadership, differentiation and focus. The attractiveness of an innovation to a business will depend on the extent to which the innovation contributes to the competitive strategy of the business.

3. Competitive strategy and innovation

Porter (1985) observed that a critical influence on the adoption of a new technology by a business is the potential contribution of the technology to the competitive advantage and competitive strategy of the business. A business will choose to adopt different innovations depending on its source of competitive advantage and the strategy the business is following. The primary focus of the innovation should be compatible with the generic strategy of the business (Porter 1985, 177). The characteristics of innovations that are compatible with the different competitive strategies are summarised in Table 2. For example a cost leader would be interested in innovations in product development that lower production costs, especially if those innovations reinforce the returns from economies of scale. A cost leader is not interested in innovations that improve product performance per se. A cost leader will only be interested in innovations that improve product performance to the degree that such innovations must be adopted to maintain proximity with the performance of competitors' products. The differences in the characteristics of innovations that fit with each competitive strategy means that businesses such as agricultural processors can be classified into organisational buyer segments for innovations based on the identification of their competitive advantage and associated competitive strategy (Assael *et al* 1995).

Porter (1985, 171-172) identified four criteria for assessing the attractiveness of an innovation to a business. These are:

- The innovation itself lowers cost or enhances differentiation and can be protected from imitation by competitors.
- The innovation shifts the sources of cost or differentiation advantage in favour of the business. For example, an innovation that creates new product features but is not subject to economies of scale will favour businesses seeking a differentiation advantage.
- Pioneering the innovation creates first-mover advantages. For example, an innovation in product features that increases switching costs for buyers by reducing the ease with which they can use competitors products as substitutes.
- The innovation improves industry structure. For example, an innovation that significantly increases the capital costs of production may improve the attractiveness of an industry by raising barriers to entry.

	Cost Leadership	Differentiation	Cost Focus	Differentiation Focus
<i>Product Technological Change</i>	Product development to reduce product cost by lowering material content, facilitating ease of manufacturing, simplifying logistical requirements, etc.	Product development to enhance product quality, features, deliverability, or switching costs	Product development to design in only enough performance for the target segment's need	Product design to meet the needs of a particular segment better than broadly-targeted competitors
<i>Process Technological Change</i>	Learning curve process improvement to reduce material usage or lower labour input Process development to enhance economies of scale	Process development to support high tolerances, greater quality control, more reliable scheduling, faster response time to orders, and other dimensions that raise buyer value	Process development to tune the value chain to a segment's needs in order to lower the cost of servicing the segment	Process development to tune the value chain to segment needs in order to raise buyer value

Table 2: Innovation and the Generic Strategies (Porter 1985, 178)

Consideration of these criteria leads to the conclusion that many innovations will appear most attractive to one type of competitive strategy and less attractive to the others. This highlights the critical role that innovations can play in influencing the relative profitability of different competitive strategies, and the important role that innovations can play in influencing the overall profitability of an industry.

4. Competitive strategy and wine processing innovations

In this section we illustrate the principles described in the previous section by applying Porter's (1985) model to examples of potential innovations in wine processing. Hill and Kaine (2007) used Porter's (1985) model to predict the characteristics of innovations in the identification, measurement and modification of natural and exogenous tannins that would be attractive to wine processors. Natural tannins are compounds which occur in the seeds, skins and stalks of grapes and are an important component of red wine quality as they contribute to the structure, colour, complexity and mouth feel of the wine. Tannins can also be added in an exogenous form to grape juice during processing to influence the characteristics of the resulting wine. The use of exogenous tannins during processing depends on the natural tannin content of the grapes being processed and the quality and style of the wine being produced. Hill and Kaine (2007) classified winemakers into segments depending on the way in which the use of exogenous tannins contributed to the generic competitive strategy of the processor.

Differentiation strategy

Hill and Kaine (2007) identified a segment of winemakers that were following a differentiation strategy. These winemakers produced wines that were relatively complex in structure and tannins. They argued that the larger wineries in this segment, with the capacity and resources to process, market and distribute a larger range of wine products, sometimes under different brands, tended to follow a classic broad, differentiation strategy. These winemakers pursued a differentiation strategy by growing or sourcing grapes from cool to warm regions with complex flavours, tannins and acids. These grapes are relatively expensive to purchase and are processed in small-to-medium sized batches in relatively small plants. Also, more time and additional steps may be involved in the winemaking process. Grapes from cool to warm regions can be susceptible to

green tannins and the winemakers in this segment used exogenous tannins to mask unpalatable flavours resulting from the presence of such tannins.

Hill and Kaine (2007) argued that these wineries would be interested in innovations that support product or process development that will enhance product features, such as quality and reliability that are attractive to their customer segments. For example, innovations in the identification, measurement and modification of tannins that would improve reliability in controlling or eliminating green tannins without substantially increasing production costs. These winemakers may be interested in research that provides information on measurements during processing to identify green characters, reduce inputs and ensure time on skins is optimised. They may also be interested in new exogenous tannins that mask green characters more effectively. They are likely to consider adopting alternative processing technologies that remove green tannins from wine.

The adoption of alternative processing technologies that remove green tannins could be especially attractive if such technologies generated first-mover advantages. For example, the pioneer of such technologies may gain unique access to marketing and distribution channels, obtain supplies of affected grapes on favourable terms, or possibly obtain patent protection in the application of the technology.

Focus cost strategy

Hill and Kaine (2007) identified one segment as consisting of winemakers seeking a cost advantage. These winemakers used exogenous tannins primarily to stabilise wine colour. The source of competitive advantage for these wineries was their capacity to offer consumers wine of certain quality at the same, or a lower, price than their competitors. These winemakers had access to large volumes of low price grapes from grape-growing regions in hot climates. These winemakers took advantage of economies of scale by processing the grapes in large quantities, at large scale plants to produce wine at low cost.

Hill and Kaine (2007) argued that these wineries were less likely to be interested in product development to provide additional product features, as they only require that the wine they produced meet the needs of consumers in the target segment, the predominant feature of which is low price. To achieve this, these wineries need to keep production costs low. Therefore the winemakers in this segment would be most interested in innovations such as measurement technologies that allowed them to reduce input costs or improve processing efficiency by, for

example, reducing the costs and improving the reliability of techniques for preserving and stabilising wine colour. These winemakers would also be especially interested in these innovations if they reduced the time taken to get the wine to market, or create additional economy of scale advantages. Innovations in exogenous tannins would have to be comparable in cost to those currently available, or correspondingly superior in reliability or performance.

Innovations that reduce the cost and improve the reliability of techniques for preserving and stabilising wine colour could be regarded as improving industry structure from the perspective of processors. Such innovations weaken the power of grape growers as suppliers to processors by increasing the scope for grape growers from warmer regions to compete with grape growers from cooler regions in supplying grapes for the production of wine.

Focus differentiation strategy

Hill and Kaine (2007) identified a segment of winemakers that were following a focus differentiation strategy. These winemakers produced wines using grapes from cool to warm regions to create wines with specialised features such as oak characters, individual flavours, or flavour blends and styles. These winemakers were targeting the ultra-premium or icon quality grades of the wine market. Consumers that purchase these wines may feel that they are getting something special and unique. The winemakers in this segment were following a focus differentiation strategy where their competitive advantage was based on creating complex wines with highly specialised characteristics that appeal to their customers. The winemakers in this segment used exogenous tannins such as oak to add characteristics to their wine.

Wineries in this segment would be interested in innovations that support product or process developments that will enhance product quality, features, and reliability that are attractive to their customer segments. An example may be the development of exogenous tannins that could add new features, such as novel flavours, to the wine. By creating new product features such an innovation could enhance the differentiation advantage of the winemakers in this segment, provided such an innovation is not subject to economies of scale.

5. Conclusion

Porter (1985) characterises the purpose of commercial businesses as being the creation of profit and businesses seek to establish a competitive advantage over competitors in order to remain profitable. Porter (1985) argues that there are two sources of competitive advantage – low cost and differentiation – and that businesses can follow one of three generic strategies in pursuing their competitive advantage. The three generic competitive strategies are cost leadership, differentiation and focus. Logically, businesses will be most interested in adopting innovations that contribute to their competitive advantage and their competitive strategy. Consequently, an understanding of the competitive strategies of businesses, and the sources of their competitive advantage, enables inferences to be made about the characteristics of innovations that will appeal to them.

Porter (1985) offers a range of examples drawn from a number of industries supporting the proposition that the attractiveness of an innovation to a business depends on the fit of the innovation with their competitive strategy. Hill and Kaine (2007) describe how this proposition might apply to a set of innovations within a single industry – wine processing. Hill and Kaine (2007) identified the importance of natural and exogenous tannins in the competitive strategies of winemakers. This allowed them to identify the different characteristics that innovations in the identification, measurement and management of tannins would have to possess in order to appeal to winemakers following each of the strategies. Knowledge of these characteristics provides a systematic basis for understanding how the products of research are likely to fit with the different competitive strategies of winemakers. In effect, Hill and Kaine (2007) identified benefit segments for a product aimed at an industrial market (Assael *et al* 1995). Knowledge of these potential market segments should, in principle, provide a platform for planning the direction of future research on the identification, measurement and modification of tannins.

In this paper we have illustrated how the concepts of competitive advantage and competitive strategy (Porter 1985) can provide a basis for understanding the characteristics of innovations that businesses in the agricultural processing sector would consider adopting. These concepts have the potential to enable investors in research to characterise the benefits processors are seeking from innovations and therefore their likely interest in the outputs of research. Hence, these concepts

could be of help to policy makers responsible for directing public investment in research into new technologies for the agricultural processing sector.

6. References

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