

Australasian Agribusiness Review – Vol. 20 - 2012**Paper 5****ISSN 1442-6951**

**Factors Influencing Industry Uptake of Marketing and Supply Chain
Innovations Promoted by the Australian Seafood Cooperative Research Centre****Domenico Dentoni and Francis English**

Domenico Dentoni, Assistant Professor, Management Group, School of Social Sciences, Wageningen University, Hollandseweg 1, 6706 KN, Wageningen, The Netherlands.

Francis English, 2011 Graduate Program, Australian Government Department of Agriculture, Fisheries and Forestry, and Researcher, The University of Adelaide, North Terrace, Adelaide, 5000, Australia.

Corresponding author – Domenico Dentoni. Email: domenico.dentoni@wur.nl

Abstract

This study identifies factors influencing the Australian seafood industry's adoption of marketing and supply chain innovations created from public-private funded research and development (R&D). A grounded theory approach was followed by comparing and contrasting the evidence from 35 projects funded by the Australian Seafood Cooperative Research Centre (CRC). This research showed that: 1) the level of confidence in the value proposition of an innovation is a crucial condition in determining industry uptake of research outcomes and innovations, with organizational, seafood sector and environmental factors also playing a role; 2) to increase the industry level of confidence in a value proposition, researchers need to test hypotheses on benefits, costs and risks of an innovation through focused consumer and market research; and 3) to design effective consumer research, project managers need to establish clear, open and non-judgemental communication guidelines among project stakeholders during the project design stage. While focused on the Australian seafood industry the outcomes of this study could be applied through further research to other industries and countries to help construct and/or analyse the best environment for effective marketing and supply innovations to be adopted.

Keynote: Innovation, public-private partnerships, marketing, seafood, project management, Australia.

1. Introduction

To compete and ultimately survive or grow in dynamic domestic and international markets, agri-food companies need to adopt innovations in products and services to meet evolving customer requirements and consumer needs (Grunert et al. 1995; Hooke 1997; Petroni 1991; McFarlane and McDonald 1988). While costs and risks of innovation are high, and companies need to maintain day-to-day operations, public-private funded research and development (R&D) institutions play a crucial role in testing and disseminating innovations for agri-food industry adoption worldwide and, ultimately, fostering a positive and efficient environment for firms' competitiveness in the marketplace. There is worldwide evidence that public institutions have provided technological and organizational knowledge to companies to foster innovation, with government funding and at times public-private agencies in different country settings (Jaffe 1989; Cockburn and Henderson 1998).

However, in practice, there is considerable field evidence of industry partners in the agri-food sector that did not make any tangible or intangible use of public-private funded R&D project outcomes. Further, this evidence, which may shed a negative light on the activities undertaken by research and

funding institutions, remains unreported in the literature. An industry that does not use a productivity-enhancing publicly-funded research output creates economic inefficiencies in terms of the opportunity cost of government funds and of missed benefits. Aware of the problem, researchers have analysed different economic, organizational, managerial, social and psychological drivers of industry adoption of public or public-private R&D outputs (Lindner 1987; Cohen and Levinthal 1989 and 1990; Guerin and Guerin 1994; Rausser 1999; Marra et al. 2003; Rogers 2003; Pannell et al. 2006; Roach 2009; Nossal 2010). These studies have focused only on the role of R&D in industry adoption of technical research able to create value for a company by increasing productivity (Pralahad 1993). On the other hand, research has had a limited focus on the drivers of agri-food industry adoption of marketing and supply chain research (Capitanio et al. 2009; Klerckx et al. 2010). Differently from technical research focusing on operational innovations, marketing and supply chain research aims to create value for the firm by increasing customer benefits and expanding demand through innovation (Pralahad 1993). These differences between technical research and marketing and supply chain research are critical because the benefits of adopting marketing and supply chain innovations are far more uncertain than the benefits of adopting technical research. While positive outcomes of technical research depend only on factors within the firm or its suppliers (such as the successful coordination of activities complementary to the introduction of the technical innovation), positive outcomes of marketing and supply chain research depend on multiple factors that are far harder to forecast such as consumer trends and coordination among multiple players along the supply chain (Rickart and Roberts 2008; Sankaran and Mouly 2007).

Therefore, in this paper we posit that agri-food industry decisions on the adoption of marketing and supply chain innovations are much more complex than those concerning technical innovations, and therefore it is worth investigating the factors influencing them. This is a timely topic for agricultural and food sectors worldwide, as public-private funded R&D in marketing and supply chain analysis can have a large impact on company competitiveness and economic development, especially in a world of rapidly changing and evolving consumer demands and preferences. To explore which factors influence industry adoption of public-private funded marketing and supply chain innovations, we take a case-based, inductive "grounded theory" approach (Glaser and Strauss 1967; Eisenhardt 1989). Consistent with this method of inquiry, initially we broadly assess whether the nature of the factors influencing industry adoption was mainly economic, organizational, managerial, social or psychological, or a combination of several factors. After this initial broad assessment, we collected further evidence to identify if these factors indeed had an impact on industry adoption of public-private R&D.

To explore which factors influence industry adoption of public-private R&D, we analysed 35 market development projects conducted by the Australian Seafood Cooperative Research Centre (CRC) between 2007 and 2010, in collaboration with a number of industry and research partners (Seafood CRC 2012). Although limited to the Australian seafood sector and to one R&D agency, by comparing and contrasting a number of market development R&D projects in sub-sectors with very different characteristics (including oyster, wild prawn, rock lobster, abalone, tuna, yellowtail kingfish, salmon, finfish, sardines and barramundi), this study allows for an empirical exploration of the impact of the following hypothesized factors on industry adoption of public-private R&D research in marketing: 1) individual firms' characteristics and capabilities; 2) firms' organization and governance within their industry and with external stakeholders; 3) project scope and focus of the value proposition; and 4) industry engagement with each project.

Usefully, the seafood sector offers unique insights to analyse the factors influencing public-private R&D in marketing and supply chains for at least three reasons. First, seafood is a growing sector worldwide as a larger segment of world consumers become increasingly aware of its perceived health benefits. At the national level, this also makes the seafood sector an engine of the Australian economy and attracts significant political attention. Second, seafood is often volume-constrained in terms of wild catch supply because of sustainability concerns with depletion of marine populations; thus, innovation downstream in the supply chain is essential to maximise value in post-harvest stages. Third, particularly given the nature of the job requiring long periods off-shore, managers working at fishery grassroots levels have a very different background to that of academics and public-private R&D project managers, which makes communication, knowledge exchange and adoption of innovations challenging. These three factors make adoption of marketing and supply chain innovations arising from public-private R&D projects a complex and at times fickle process.

The paper is organized as follows. Following an inductive research method (Glaser and Strauss 1967; Eisenhardt 1989), we first describe the data collection and interpretation procedure (in section 2), then

we identify a set of theories providing the theoretical frameworks to the cases studied (section 3). Based on these theoretical frameworks, empirical evidence is organized and interpreted (section 4) to lead a set of propositions to be tested in future research, which constitute results (section 5). Finally, in section 6 we discuss the managerial and policy implications of our results and summarise our findings in the conclusion.

2. Methods

“Grounded theory” involves inductive research aimed at the development of a new theory, as opposed to testing an existing theory (Glaser and Strauss 1967; Eisenhardt 1989). To implement this method, we undertook an iterative process with interaction between data analysis and collection; that is, the first wave of data collection was intentionally somewhat diffuse and broad. This was done to ascertain which factors were more relevant to the problem of interest, while the second and third waves of data collection and analysis were more focused. Cases and samples were selected to assist this process with simpler case studies used first to fine tune the data collection method for more complex projects (Glaser and Strauss 1967; Strauss and Corbin 1994). Specifically, grounded theory is considered an appropriate approach to assess complex dynamic issues between and within organizations when a restricted number of data observations are available (Stake 1995; Westgren and Zering 1998). Scholars have established that this method requires much interpretive work, in which the interpretations must include the perspectives of the studied subjects (Strauss and Corbin 1994). Such interpretations are necessary to understand the motivations behind the actions of the subjects (e.g. seafood companies, CRC staff and managers, industry participants) under study. Nevertheless, researchers using this approach of investigation accept responsibility for interpreting what they have observed and heard from the subjects, and not simply voicing the subjects' viewpoints (Strauss and Corbin 1994).

Thirty-five R&D projects funded by the Seafood CRC related to marketing and supply chain innovations in several Australian seafood sub-sectors provided the instrumental cases for this investigation. We interviewed all the partners working collaboratively within each of the 35 projects analysed, including Seafood CRC managers, project managers, researchers and targeted industry end-users. Overall, we conducted 75 interviews between January and December 2010. Consistent with the case-based grounded theory approach (Eisenhardt 1989), the first round of interviews posed broad questions about the project partners' perceived progress and expectations in terms of future costs and benefits arising from the relevant project with industry research adoption of the innovation outcome.

As a pattern of importance of some factors emerged across interviews with partners across various projects (Table 1 in Appendix), we selected a number of other projects to be included in the analysis with a purposive method (Yin 1984) by posing more specific questions to the interviewees (Table 2 in Appendix). Data from this investigation were analysed iteratively during the data collection process to guide the further rounds of information collection. Interpretation was led by the researchers who continuously reported their on-going analysis to CRC managers and other external experts in public-private research to avoid the risk of self-confirmation bias (Eisenhardt 1989). Moreover, to avoid the risks of pro-innovation bias (Rogers 2003) and blaming the industry end-users for research non-adoption (Abrahamson 1991), we chose to analyse only projects while the R&D was still taking place and to hear the point of view of multiple industry partners within each individual project. Based on the results of the iterative data collection and analysis performed, this study provides exploratory empirical evidence supporting a set of research propositions in a form that can be tested in future research.

3. Theory: Adoption of Marketing & Supply Chain Innovations

Marketing and supply chain innovations refer to the attraction of new customers by the development of increased customer value through solutions that meet new needs, unarticulated needs, or old customer and market needs in new ways (Rogers 2003) through the adoption of different processes and technologies involving either one organization or multiple organizations along the supply chain. While the effects of marketing and supply chain innovation in the agribusiness sector have been studied thoroughly and for a long time (Jackson and Spins 1982), the factors determining their adoption have not yet been comprehensively investigated in the context of public-private funded R&D (Capitanio et al. 2009; Klerckx et al. 2010). As described in the following paragraphs, much research

on the adoption of marketing and supply chain innovations has been conducted in different domains, yet no study has taken an holistic approach to investigate how the factors that influence the adoption of marketing and supply chain innovations interact in the context of public-private funded R&D innovations in the agribusiness sector (Muscio and Nardone 2012).

Three major strands of the literature contribute to provide an economic basis to the exploration of the factors influencing industry adoption of public-private funded marketing and supply chain innovations. First, economic models analysing farmers' and firms' adoption of innovations have, overall, reached the conclusion that any economic actor producing goods or services takes the decision of adopting an innovation based on his/her expectations of change in the following variables: the prices of the inputs and of the outputs of his/her production; the costs of output production; the risk associated with changes in price and costs; and the presence of a vector of capital assets needed for production (Feder et al. 1985; Sadoulet and De Janvry 1995). Second, by applying these economic adoption models, researchers have studied farmers' adoption of post-harvest technologies and the choice of market channels; for example, the choice between selling to large manufacturing companies and supermarkets through contract farming or establishing relationships with wholesalers and/or local shops (Neven and Reardon 2004; Hernandez et al. 2007). Third, a number of economic studies have recently explored the drivers of industry adoption of public-private funded technical research (Guerin and Guerin 1994; Marra et al. 2003; Rogers 2003; Pannell et al. 2006; Roach 2009; Nossal 2010) yet, as discussed in the introduction, no specific focus was dedicated to adoption of non-technical marketing and supply chain innovations.

From a sociological perspective, a crucial research strand is represented by the theories on the diffusion of innovations, which has been effectively described by Rogers (2003), although several areas of theoretical and methodological advancement have been explored in the more recent years (Valente and Davis 1999; Rogers 2003; Valente 2005). Drivers that have been widely found to have an impact on the adoption and diffusion of innovations include the social segmentation between the potential adopters and the innovators (Rogers 2003), the characteristics of the social ties between innovator and potential adopter as well as among potential adopters (Valente 2005), and the characteristics of opinion leaders (Valente and Davis 1999), industry leaders, representatives or "champions" (Wejnert 2002; Slater and Mohr 2006) as well as other actors that have high status and reputation within the potential adopters' group or industry.

A number of management and organization studies have analysed the role of industry managers' characteristics moderating the impact of R&D investments on the adoption of innovations (Cohen and Levinthal 1989, 1990; Marra et al. 2003; Roach 2009), deriving the following findings. First, companies with appropriate human resources and organizational structure and culture have more developed learning and changing capabilities; therefore, they are more ready to adopt marketing and supply chain innovations (Cohen and Levinthal 1989 and 1990). Yet, companies with more developed learning and changing capabilities also have the ability to sense when an innovation is not worthwhile to pursue; therefore, in some cases a more capable company may be less inclined to embrace innovation (Abrahamson 1991). Second, adoption of innovation depends on a firm's strategic resources, such as access to information sources and consumer channel sources, or to the firm's financial assets (Nilakanta and Scamell 1990). Third, managers that have entrepreneurial proclivity (Matsuno et al. 2002) and innovation capabilities (Hurley and Hult 1998; Hult et al. 2003) are more likely to adopt new innovations. Finally, firms that are market-oriented (Beverland and Lindgreen 2007) or that belong to a supply chain that is market-oriented are more likely to consider the adoption of innovations arising from R&D in marketing and supply chain innovations.

As a whole, these strands of the literature analysed the impact of individual variables from different disciplines on the adoption and diffusion of innovation both in the agribusiness and other sectors. In this paper, we aim to explore which of these factors, if any, is driving the industry uptake of public R&D in marketing.

4. Selected Background

The Seafood CRC and its "opportunity gap" projects

The Seafood CRC is a public-private R&D institution that since 2007 has undertaken and disseminated research on seafood harvest and production, post-harvest processing techniques and technologies and marketing throughout the seafood sector collaboratively with research institutions and industry organizations. This is one of the hundreds of Cooperative Research Centres instituted by

the Australian Government since 1991 to enhance collaboration between researchers and the private sector across a range of industries. The Australian Seafood CRC involves a seven-year plan of investment equal to \$AUD140 million from 2007 to 2013. Out of this amount, \$77 million is cash from the Commonwealth Government, the Fisheries Research Development Corporation and the seafood industry and, in minor part, from the South Australian Government and other R&D providers.

Three major R&D programs characterize the Seafood CRC: production innovation, innovation in post-harvest technologies and marketing, and education. Specifically, the Seafood CRC program on innovation in post-harvest technologies and marketing included more than seventy projects which are current or completed. Overall, this program aims at improving profit margins of the seafood industry by 1) providing knowledge and expertise for the industry to seize profitable market opportunities, and by 2) providing innovation concepts in post-harvest technology for the industry to optimize their operations (e.g. to reduce spoilage and losses). From the time of application for funding and project concept inception, research providers are required to clearly define the value proposition of the project and discuss its value with an interested industry participant. In order to enhance the probability of industry uptake of the research project outputs, a project cannot be funded by the Seafood CRC if an industry partner has not decided to contribute at least one third of the total project budget. Industry partners are either large individual companies or local, state and national industry associations representing the companies of their territory.

From the experience gained from the Seafood CRC investments since 2007, the projects involving R&D on marketing and supply chain aiming to provide knowledge and expertise to the seafood industry to seize new profitable opportunities have been particularly challenging. Although more than seventy-five projects have been carried out, industry partners have not invested as much as was hoped for these projects. Even when these projects started with industry financial support, some industry partners have remained sceptical about the future impact of the project. In projects involving milestones where decisions about further investment have to be taken at a point in time, some industry partners were sometimes reluctant to further invest in the project and withdrew from it. Looking from a broader perspective in the Australian seafood industry, these challenges when dealing with a range of sectors with different characteristics and constraints are not surprising. Industry cannot receive tangible empirical evidence of the results of these R&D investments before or during the project, as the time needed to fully exploit a market opportunity that generates profit is usually longer than the time of the project itself; therefore, higher risk and uncertainty are naturally embedded within these project process. Using the expression by Pralahad (1993), these R&D projects aim at creating value by filling an "opportunity gap" (rather than a "productivity gap") which requires strategic rather than operational changes; although more risky and uncertain, these investment may provide opportunities for sustained creation of value over time. This is why the value proposition is so important. If the industry is not confident of the value proposition of a project then they may be less likely to continue with a project where the benefits may appear long after the actual project has finished.

Looking at the detail of the "opportunity gap" R&D projects on marketing and the supply chain funded by Seafood CRC and the industry, two categories of projects can be identified. First, some R&D projects have a broader focus and aim at providing knowledge about market channels, estimated supply chain partners' margins and final consumer preferences for existing or potential seafood products in the domestic or international market. Seafood CRC projects in this category have been conducted with barramundi, oyster, farmed and wild prawn and yellowtail kingfish industry partners. Additionally, a few large projects involved the entire group of CRC industry participants, including twelve other seafood sub-sectors. These projects are generally led by research partners and Seafood CRC managers engaging the industry by discussing the importance of garnering this information for strategic business purposes. Based on the results of these research projects, the industry and the researchers usually discuss which opportunities are worthwhile and what resources are required to be able to seized the opportunity', and sometimes this discussion leads to another more focused R&D project.

Second, other R&D projects have a narrower focus as they aim at testing whether a specific market opportunity can be seized by industry participants. They usually involve a stage of a more specific consumer survey, i.e. testing hypotheses about the potential value created through the innovations at consumer level, one stage of new product development in terms of prototypes and one final stage of new product launch. Seafood CRC projects in this category have been conducted with abalone, barramundi, finfish, oyster, sardine, southern rock lobster, yellowtail kingfish and wild prawn industry partners, as well with a few large vertically-integrated processing companies dealing with multiple

seafood species. These projects have stop-or-go milestones where partners have to agree whether it is worthwhile to continue to invest or not and proceed to the next stage of the project.

Although the project management and organizational dynamics are different, these two categories of project face the same risk of limited industry uptake (either after or during the project) once the market and supply chain information is presented back to the industry partners.

5. Results

Based on the exploratory empirical evidence from thirty-five Australian Seafood CRC projects, results of the analysis of the factors influencing industry adoption of marketing and supply chain innovation funded with public-private R&D can be summarized as follows. First, an industry partner's level of confidence in the value proposition of the innovation project is a necessary and sufficient condition influencing his/her adoption of the innovation. In a set of projects analysed, industry partners have not been convinced that the proposed innovations in marketing and supply chains could indeed provide higher economic benefits than economic costs in the long run. The points of disagreement between researchers and industry partners are on the assumptions behind the expectations of the future price of outputs and inputs as well as on the change in the production and transaction costs.

Conversely, in multiple cases, marketing researchers convincingly confirmed or eliminated through hypotheses-testing the presence of a market opportunity for an innovative seafood species, product and format; for instance, seafood served in a more convenient format or in a new market channel such that it can better meet consumer needs. This convinced the industry partners that the innovation will increase the seafood quantity demanded and to some extent its price at retail level. Although convinced about the magnitude of the opportunity, industry partners still had one or more of the following three perceptions which limited their interest in adopting the innovation: 1) production or transaction costs associated with introducing the innovation exceeded the expected price and quantity increase associated with the market opportunity; 2) the opportunity cost associated with introducing the innovation is higher than the expected price and quantity increase associated with the market opportunity; in other words, resources such as money, time and human resources could be spent more profitably by introducing a different innovation; and 3) the risk of new competing entrants attempting to seize the same market opportunity is too high if the first entrant has no effective barrier to imitation.

After the market research was conducted, these perceptions discouraging the industry partners from adopting the innovation were still extant and needed to be addressed by the researchers conducting the marketing research. In some cases, researchers showed flexibility and promptness in tackling these industry concerns by conducting another round of data collection or at least providing an intuitive analysis based on their own previous research and marketing experience. When researchers were able to respond to industry partners' concerns in multiple rounds and convince the industry partners, the innovation was then adopted. Therefore, the first proposition that we offer is the following:

P1. The potential industry adopter's level of confidence in the value proposition of the marketing & supply chain innovation is positively associated with the probability that the innovation will be adopted.

Second, there is substantial evidence from a number of Seafood CRC projects that, when these concerns have been promptly taken into consideration and convincingly addressed by the researchers and the R&D institution, the level of confidence in the value proposition of the marketing and supply chain innovation increased significantly. In some cases, the industry partners expressed one of the three concerns mentioned above to the researchers at the very early stages of the project. For instance, the oyster and the wild prawn industry and some large processing companies expressed concerns about costs associated with introducing a packaged chilled format at retail level at early stages of a large Seafood CRC project. This allowed the researchers, in an early stage of the project, to collect either primary or secondary data with the aim of testing whether the industry partners' concerns were valid or invalid through rigorous empirical observation. This attitude of expressing and addressing each other's concern required a high degree of clear, open and timely communication with both researchers and industry partners throughout the project implementation.

In other cases, this level of communication quality was reached only half-way through the project, such that it was clear that a change in the quality of the communication improved the level of confidence of the partners. In other cases, as this level of communication quality was not reached, industry partners decided to leave the R&D project after the first round of data collection and analysis. For example, this happened to one group of abalone and southern rock lobster fishers once the project managers attempted to innovate by facilitating exports to China and the United States, respectively.

To some extent a number of industry actors dropping out of an innovation project is normal: multiple actors may have different vested interests and political positions in public-private innovation projects; therefore, not all of them can be simultaneously satisfied and in complete agreement when taking collective decisions. Based on this evidence, we found that the process of solving differences between industry and research partners' beliefs about future outcomes of the innovation by hypothesis testing was of paramount importance to match industry partners' and research partners' level of confidence in the outcomes of the innovation. In this way, the process of testing hypotheses through research based on timely, open and bi-directional communication moved from being a theoretical tool to a practical tool for reaching consensus between partners with conflicting ideas. Therefore, we offer the following second proposition:

P2. The potential industry adopter's level of confidence in the value proposition of the marketing and supply chain innovation increased when the process of transforming divergences in industry and research beliefs was undertaken using rigorous hypothesis testing.

Third, we found evidence that industry partners capable of collecting, analysing and using market information in their business strategies, and of looking for external resources to go for new opportunities, were more likely to use the R&D in marketing and supply chain and to adopt the innovation if a clear opportunity was in place. Many large companies in the tuna and prawn industry were able to do so and were avid adopters of marketing and supply chain innovations. However, while we found that having this capability and natural tendency of going wisely for opportunities makes innovation adoption more likely, this was neither a necessary nor sufficient factor for innovation adoption. The capabilities vary between seafood sectors and companies so the impacts of the level of ability would need to be assessed on a case by case basis.

On the one hand there are industry leaders that, while having a strong capability in identifying opportunity for improving efficiency within their operations, do not have an attitude or specific capability of identifying and exploiting market opportunities. They need marketing experts to identify market opportunities for them and present a strategy for exploiting them. However, when a market opportunity is presented, these industry partners evaluate the opportunity and they either are convinced or not, independently from their initial attitudes or capabilities. That really depends on the personality and the background history of business managers and industry partners.

On the other hand, there are industry partners that have, given their large firm dimension, a strong capability of identifying and exploiting market opportunities through skilled and experienced staff. Some of these industry partners are convinced by the value proposition of the project, while others are not. For instance, in our analysed cases, a number of retailers and processors with sufficient human resources to undertake their own marketing and supply chain analysis decided not to adopt innovations on pre-packaged chilled seafood because their own studies showed that the innovation would not have brought a competitive advantage for them. Therefore, the following third proposition is offered:

P3. The potential industry adopter's market-sensing capability and entrepreneurial proclivity are positively associated with the probability that the innovation will be adopted.

Fourth, we found that the process of transforming divergences in industry and research beliefs in rigorous hypothesis testing through clear, open and timely

communication between research and industry partners is a key factor influencing the development of industry partners' market-sensing capability and entrepreneurial proclivity. Therefore, it was suggested that projects were assessed not only in terms of financial benefits and costs but also in terms of organizational learning and human resource development (in Seafood CRC projects often referred as "non-monetary benefits") in order to provide a clear incentive to researchers to attend to this process with the aim of transferring these capabilities and attitudes. A number of researchers involved in Seafood CRC projects were very active in developing the research component of the project, while they did not have much time and incentive to focus on innovation dissemination and management education because their rewards were mainly related to academic publications and grant acquisition rather than on outcomes of research dissemination. Relative to a context of traditional education and learning in the classroom, during project implementation industry partners have the chance of learning with more involvement how to collect, analyse and use market information since they can apply the market knowledge from the research with their own money at stake. Therefore, we state the following fourth proposition as:

P4. The potential industry adopter's market-sensing capability and entrepreneurial proclivity is positively associated with the process of transforming divergences in industry and research beliefs using rigorous hypothesis testing.

Fifth, we found that the diffusion of the marketing and supply chain innovations is more likely when there is weak internal rivalry within the industry or, in other words, when relationships among companies and fishers within seafood sub-sectors are not exacerbated by personal or business competition tensions. However, internal industry rivalry was not a key factor influencing the adoption of the innovation by individual partners. There is evidence that some industry partners are characterized by fierce internal rivalry within their representative associations between private companies and individuals which meant collective decision-making was being constrained. For example, the abalone and the wild prawn industries at the national level are strongly divided on a number of key strategic, political and geographical issues. In these cases, the industry associations partnering within the Seafood CRC projects have not expressed a clear and unequivocal opinion on the innovation proposed by research providers.

However, in other cases strongly adversarial industries have found agreement with the Seafood CRC managers and researchers to take up and further invest in research if they were convinced by the value proposition. On the other hand, industry groups that have been proving to have the capability of taking joint unequivocal collective decisions and make appropriate strategic changes at industry level (with little internal rivalry), such as the oyster industry at the national level, have sometimes demonstrated low levels of confidence in the value proposition of an innovation proposed by researchers. In some cases, such as in the farmed barramundi industry, having an industry early adopter (sometimes also called "industry champion") helped the process of industry innovation adoption; however, the critical element was the social capital among the industry actors rather than having one early adopter only. Based on this evidence, we offer the following research proposition:

P5. Internal rivalry within the group/association representing the potential industry adopters is negatively associated with the diffusion of the innovation once few individual industry partners have adopted it.

Finally, we found that the history of previous collaboration between researchers and industry leaders is a factor that may influence the probability that innovations will be adopted by industry partners, although this is not a necessary nor sufficient condition affecting the adoption of innovation. In some cases industry partners showed an initial low level of trust in research partners and CRC managers with whom they were not familiar. On the other hand, industry associations that have a strong and positive history of collaboration with CRC, state agencies and research providers showed that they are also more likely to further invest in and use CRC project research outputs. Moreover, we found no case study evidence of negative situations of conflict between industry partners, researchers and Seafood CRC in past history. While certainly slowing down the process of adoption of innovations, the lack of a previous

history of collaboration and situations of unfamiliarity among partners did not determine the rejection of further investment in a project, as industry confidence in the value proposition remained the only thing that really mattered for the business partners. Therefore, we offer the following proposition:

P6. The previous history of collaboration between the research and industry partners influences the probability that the project outputs will be used. However, this is not a necessary and sufficient condition influencing research usage.

6. Conclusions

While numerous disciplines have investigated the drivers of farmers' and other economic actors' adoption and diffusion of innovations, this paper explored which of these factors were crucial in the specific case of innovations proposed through public R&D investments in marketing and supply chain research.

The results from this investigation based on the evidence from thirty-five Seafood CRC projects can be synthesized in the following three points. First, we found that a crucial condition determining industry uptake of public-private funded R&D on marketing and supply chains is the level of confidence in the value proposition of the innovation. Still, industry structure and governance characteristics, individual business characteristics and the history of previous collaboration between the industry and other stakeholders has a significant impact as well.

Second, to increase the level of confidence in the value proposition of the innovation on marketing and supply chain, researchers need to provide focused results from consumer research that challenge the project partners' prior beliefs by testing hypotheses rigorously to compare the benefits stemming from the identified market opportunity with its associated costs and risks.

Third, in order to provide focused results from consumer research that challenge the project partners' prior beliefs, it is crucial to establish a procedure of communication among project partners (including R&D managers, researchers and industry partners) before the design and the launch of the research is completed. This requires clear, open and timely communication. The challenges of communication among partners (especially with different backgrounds, in some cases cultures, geographic location and history) are known, but this analysis found this point to be crucial to increasing the level of confidence in the value proposition of projects and, ultimately, the industry uptake of the research outputs of R&D in the marketing and supply chain domain.

These results need to be read in the context of the following comments before being extrapolated more generally. First, the "grounded theory" approach followed to collect and analyse data is exploratory in nature (Glaser and Strauss, 1967) and provides evidence that is only sufficient to proceed and test the stated propositions formally in future research. Still, stating these propositions has a value for indicating a future research direction in a domain (drivers of adoption of R&D in marketing and the supply chain) with limited development. Second, these results are drawn on the basis of the observation of only one R&D institution operating in only one country and with only one industry. Nevertheless, we compared and contrasted 35 projects, across many seafood subsectors, that proposed different innovations related to marketing and supply chain innovations that were undertaken by different researchers with different methodologies for data collection, analysis and dissemination. Moreover, these projects targeted industry partners with different individual, group and sub-sector characteristics. Therefore, future research may attempt generalization by testing these propositions in different settings, including different R&D institutions, countries and sectors.

References

- Abrahamson, E. (1991). "Managerial Fads and Fashions: The Diffusion and Rejection of Innovations." *Academy of Management Review* 16 (3), 586-612.
- Beverland, M. and Lindgreen, A. (2007). "Implementing Market Orientation in Industrial Firms: A Multiple Case Study." *Industrial Marketing Management* 36 (4), 430-442.
- Capitanio, F., Coppola, A. and Pascucci, S. (2009). "Indications for Drivers of Innovation in the Food Sector", *British Food Journal* 111 (8), 820-838.
- Cockburn, I.M. and Henderson, A.M. (1998). "Absorptive Capacity, Coauthoring Behavior, and the Organization of Research in Drug Discovery." *Journal of Industrial Economics* 46 (2), 157-182.
- Cohen, W.M. and Levinthal, D.A. (1989). "Innovation and Learning: The Two Faces of R&D." *Economic Journal* 99 (397), 569-596.
- Cohen, W.M. and Levinthal, D.A. (1990). "Absorptive Capacity: A New Perspective on Learning and Innovation." *Administrative Science Quarterly* 35. 128-152.
- Eisenhardt, K.M. (1989). "Building Theories from Case Study Research." *Academy of Management Review* 14, 532-550.
- Feder, G., Just, R. and Zilberman, D. (1985). "Adoption of Agricultural Innovations in Developing Countries: A Survey." *Economic Development and Cultural Change* 33(2), 255-298.
- Glaser, G.B. and Strauss, A.L. (1967). *The Discovery of Grounded Theory: Strategies for Qualitative Research*. Chicago, Aldine.
- Grunert, K.G., Harmsen, H., Meulenberg, M., Kuiper, E., Ottowitz, T., Declerck, F., Traill, B. and Goransson, G. (1995). "A Framework for Analysing Innovation in the Food Sector." *MAPP Working Paper* 38, November.
- Guerin, L.J. and Guerin, T.F. (1994). "Constraints to the Adoption of Innovations in Agricultural Research and Environmental Management: A Review." *Australian Journal of Experimental Agriculture* 34, 549-571.
- Jackson, B. and Spinks, M. (1982), "Price Effects of Wool Marketing Innovations: Some Empirical Evidence." *Australian Journal of Agricultural and Resource Economics* 26, 14-22.
- Jaffe, A.B. (1989). "Real Effects of Academic Research." *American Economic Review* 79 (5), 957-970.
- Hernández, R., Reardon, T. and Berdegue, J. (2007). "Supermarkets, Wholesalers, and Tomato Growers in Guatemala." *Agricultural Economics* 36 (3), 281-290.
- Hooke, M. (1997). "The Australian Beverages Industry: Its Strategic Fit Within the Australian Processed Food and Beverages Industry." *Australian Food and Grocery Council*, March 1997.
- Hurley, R.F. and Hult, G.T.M. (1998). "Innovation, Market Orientation, and Organizational Learning: An Integration and Empirical Examination." *The Journal of Marketing* 62 (3), 42-54.
- Hult, G.M.T., Snow, C.C. and Kandemir, D. (2003). "The Role of Entrepreneurship in Building Cultural Competitiveness in Different Organizational Types." *Journal of Management* 29 (3), 401-426.
- Klerkx, L., Aarts, N. and Leeuwis, C. (2010). "Adaptive Management in Agricultural Innovation Systems: The Interactions Between Innovation Networks and Their Environment." *Agricultural Systems* 103(6), 390-400.
- Lindner, R.K. (1987). "Adoption and Diffusion of Technology: An Overview." In *Technological Change in Postharvest Handling and Transportation of Grains in the Humid Tropics*. (Eds BR Champ, E Highley, JV Remenyi) pp. 144-151. (ACIAR Proceedings No. 19, Australian Centre for International Agricultural Research: Canberra).
- Marra, M., Pannell, D.J. and Abadi Ghadim, A. (2003). "The Economics of Risk, Uncertainty and Learning in the Adoption of New Agricultural Technologies: Where Are We on the Learning Curve?" *Agricultural Systems* 75, 215-234.
- Matsuno, K., Mentzer, J.T. and Özsoy, A. (2002). "The Effects of Entrepreneurial Proclivity and Market Orientation on Business Performance." *Journal of Marketing* 66 (3), 18-32.

- McFarlane, J.F. and McDonald, D.W. (1988). "Research and Development in the Food Processing Industry: Current Status and Future Opportunities." *International Journal of Technology Management* 3 (6), 721-734.
- Muscio, A. and Nardone, G. (2012). "The Determinants of University-industry Collaboration in Food Science in Italy." *Food Policy* 37, 710-718.
- Neven, D. and Reardon, T. (2004). "The Rise of Kenyan Supermarkets and the Evolution of their Horticulture Product Procurement Systems." *Development Policy Review* 22 (6), 669-699.
- Nilakanta, S. and Scamell, R.W. (1990). "The Effect of Information Sources and Communication Channels on the Diffusion of Innovation in a Data Base Development Environment." *Management Science* 36 (1), 24-40.
- Nossal, K. (2010). "Productivity in Australia." Paper presented to a mini-symposium on Agricultural Productivity at the 54th Annual Conference of the Australian Agricultural and Resource Economics Society, Adelaide, 10-12 February 2010.
- Pannell, D.J., Marshall, G.R., Barr, N., Curtis, A., Vanclay, F. and Wilkinson, R. (2006). "Understanding and Promoting Adoption of Conservation Practices by Rural Landholders." *Australian Journal of Experimental Agriculture* 46(11), 1407-1424.
- Petroni, G. (1991). "New Directions for Food Research." *Long Range Planning* 24 (1), 40-51.
- Prahalad, C.K. (1993). "The Role of Core Competencies in the Corporation." *Research/Technology Management* 36, 40-47.
- Rausser, G. (1999). "Private-Public Research: Knowledge Assets and Future Scenarios." *American Journal of Agricultural Economics* 81 (5), 1011-1027.
- Rickart, S. and Roberts, D.L. (2008). "UK Farming Post Reform: The Key Marketing Challenges." *Journal of International Food & Agribusiness Marketing* 20 (1), 5-27.
- Roach, M. (2009). "When Do Firms Use Public Research? The Determinants of Knowledge Flows from Universities and Government Labs to Industrial R&D." Paper presented at the DRUID Summer Conference 2009, Copenhagen Business School, June.
- Rogers, E.M. (2003). *Diffusion of Innovations*. 5th edn. Free Press: New York, NY.
- Sadoulet, E. and de Janvry, A. (1995). *Quantitative Development Policy Analysis*. Johns Hopkins University Press, Baltimore.
- Sankaran, J. K. and Mouly, V. S. (2007). "Managing innovation in an emerging sector: the case of marine-based nutraceuticals." *R&D Management* 37, 329-344.
- Seafood CRC (2012). Website of the Australian Seafood Cooperative Research Centre, available online at: seafoodcrc.com.au.
- Slater, S.F. and Mohr, J.J. (2006). "Successful Development and Commercialization of Technological Innovation: Insights Based on Strategy Type." *Journal of Product Innovation Management* 23, 26-33.
- Stake, R.E. (1995). *The Art of Case Study Research*. California, Sage Publications.
- Strauss, A. and Corbin, J. (1994). "Grounded Theory Methodology: An Overview". In: N.K. Denzin and Y.S. Lincoln (editors), *Handbook of Qualitative Research*, pp. 273-285. California, Sage Publications.
- Valente, T.W. and Davis, R.L. (1999). "Accelerating the Diffusion of Innovations Using Opinion Leaders." *The Annals of the American Academy of Political and Social Science* 566 (1), 55-67.
- Valente, Thomas W. (2005). "Network Models and Methods for Studying the Diffusion of Innovations." In *Models and Methods in Social Network Analysis*, ed. Peter J. Carrington, John Scott, and Stanley Wasserman. Cambridge UK: Cambridge University Press.
- Wejnert, B. (2002). "Integrating Models of Diffusion of Innovations: A Conceptual Framework." *Annual Review of Sociology* 28, 297-326.
- Westgren, R.E. and K. Zering (1998). "Case Study Research Methods for Firm and Market Research." *Agribusiness* 14, 415-424.
- Yin, R. (1984). *Case Study Research: Design and Methods*. Applied Social Research Methods, Beverly Hills, California, Sage.

Appendix

Table 1 – Hypothesized Factors Influencing Industry Adoption of Public-Private R&D Marketing Research

Sector Characteristics

- Vertical Coordination among Partners along the Chain (from disintegrated to integrated)
- Sector Focus (from local to global)
- End-User's Perception of Market Opportunities (from low to high)
- End-User's Perception of Competitive Threats (from low to high)
- End-User's Perception of Changes in Industry Profitability (from negative to positive)

Project Characteristics

- Extent of Consultation between Research Providers and Industry Partner (from small to large)
- History of Collaboration between Providers and Industry Partner (from short to long)
- Number of Previous CRC projects (from low to high)
- Time Range of Realization of the Value Proposition (from short to long)
- Extent of Initial Investment by End-Users (from small to large)

End-User Institutional Governance Characteristics

- Organizational Ability of the Association to Change Strategy when Needed (i.e., organizational flexibility) (from low to high)
- Perceived Risk of Industry Leader/Association Manager (from low to high)
- Number of Firms within Association (from few to many)

End-User's Initial Individual Characteristics

- End-User's Initial Level of Innovation in Recent Product/Processes (from low to high)
- End-User's Initial Interest in Markets (i.e. from studies, participation to workshops, personal info) (from low to high)
- End-User's Initial Level of Collaboration (from low to high)
- End-User's Initial Exposure to Environment External to Its Daily Business Operations (from low to high)

Table 2 – Open Questionnaire for In-Depth Interview

- Analysis of the Impact of Seafood CRC Projects on the Industry Usage of Marketing Research Outputs
- Interview Guide with Industry Leaders
- Domenico Dentoni (Project Manager), Francis English and Rebecca McBride (Project Enumerators)

Introduction

- Personal Role in this Research Project 2010/749
- Project Objectives (1. Analyse factors influencing industry usage of project outputs; 2. Measuring the project generation of non-monetary benefits such as understanding consumers, markets and competition; evaluating changes in product, processes and commercial relationships based on market information; exploiting the market opportunities to generate profits).
- Why we engage with you and what we ask you

Broad Initial Questions

- What is your first initial reaction relative to this Seafood CRC project?
- Would you consider this Seafood CRC project as a successful process or not? Why?
- What worked and what could have done better within this Seafood CRC project process?

Industry Usage of the Research

- a) Extent and Nature of Industry Usage
- How would you describe the use that you made/are making/ intend to make of the Seafood CRC research output?
 - How does the Seafood CRC marketing research project fit within your overall company/association marketing strategy? Did it bring the contribution to your overall strategy that you expected?
 - Specifically, how has the market information garnered from the Seafood CRC project process and from the research output been used:
 - The information was not even evaluated (why? Because already known, not understandable, impossible to put in practice) and no learning process by the industry occurred
 - The information was evaluated and you perceive that you/your industry members changed their attitudes/capacities from this process (in terms of understanding buyers' requirements and consumers' preferences, how to change the product/process to respond to these opportunities, how to make a profit from these opportunities); but the industry is taking/is intending to take NO action (investment of time and/or money) to meet these market opportunities (why no action?)
 - The information was evaluated and the industry is taking action to meet the opportunities and you perceive that the industry learnt about it (how do you realize that change is occurring?)
 - The information was evaluated, the industry took action to meet these opportunities but you perceive that no learning process in terms of changing attitudes/capacities in occurring (why?)
 - To sum up, do you perceive that the Seafood CRC project research output was/is being useful for the general purposes of your association/company?
- b) Qualitative and Quantitative Evidence of Industry Usage
- You mentioned that your company/your association used the research outputs to a certain extent and in a certain way/ways. What gave you this idea? How could you provide evidence of it? Could you give us a few examples showing how you used the information in the way/to the extent you mentioned?

Factors Influencing Industry Research Usagea) Broad Initial Questions

- Why you decided to use the project outputs in the way/to the extent you are using it?
- What are the factors that in your opinion were crucial for you to take the decision of using these research outputs? Which factors were also important?

Along with the factors and reasons for usage that you have just mentioned, we would like to brainstorm to explore if any of these other factors were important in your opinion:

b) Sector Characteristics

- Vertical Coordination (from disintegrated to integrated): maybe the way your relationships, transactions, knowledge and info flow along your industry chain (with your buyers, suppliers, final consumers) played a role for your usage? Could you please describe your vertical coordination with buyers and suppliers anyways?
- Focus (from local to global): Maybe your exposure to different markets played a role? Where do you sell your products?
- Market opportunity perception (from low to high): maybe your perception/sense/intuition that out there in the market there are opportunities that need to be exploited played a role? If yes, which opportunities?
- Competitive threat perception (from low to high): maybe the fact that you felt/feel threatened by competitors either locally or globally played a role? Who are the competitors that you see in your market?
- Perception of profitability change (from negative to positive): maybe the feeling that your profitability is decreasing or is not increasing as expected played a role? How are your profits going in the latest few years (profits = revenues – costs; revenues = prices*quantities)

c) Project Characteristics

- Extent of consultation with CRC staff and stakeholders (from small to large): maybe the fact that your association/your company works since a certain time with CRC and other public institutions played a role? Could you please describe your consultation and previous market development projects briefly?
- History of collaboration among organizations (research and industry): maybe the fact that your association/your company works since a certain time with this research provider or other within its same institution played a role? Could you please describe your consultation and previous projects with same research provider briefly?
- Presence of previous CRC projects (or other govt programs and industry): maybe the trust built in previous CRC projects was crucial to undertake and use the project output that is object of this study?
- Resources Needed to Use Project Output (from few to many): maybe the fact that you do/do not have enough resources determined your project output usage? What are the resources you would need to use this research output in practice?
- Level of Shared Procedure (from not shared at all to very shared): maybe the extent the project investigators shared the research procedure and came to their results engaging the industry contributed to the project output usage? How would you describe the procedure used by the research providers to reach their project outputs? Do you think that a different research method would /could have given more useful results?
- Time range of value creation (from short to long): maybe the expected time length or/and uncertainty that benefits from the CRC project are generated played a role in your decision of using the project output? What are your estimates of benefit generated by this project in the next 15 years and how are distributed over time?
- Extent of Initial investment of End-Users (from small to large): maybe the money and timing of the initial investment needed to effectively use the research outputs influenced your choice of using them?

d) End-User Association Characteristics

- Organizational ability of the association to change strategy when needed (i.e., organizational flexibility) (from low to high): maybe your ability of changing strategy when needed/decision-making process played a role? Could you please describe in detail how your decision-making processes work? In your opinion, what are the causes behind this low/high organization flexibility?
- Perceived risk of industry leader/association manager (from low to high): maybe the way the governance within your association played a role? In particular, how much responsibilities/risks in taking strategic decisions are on the industry leaders versus the other members? In your association, risk/responsibility is shared or in the hands of only one person?
- Number of firms within association (from few to many): maybe the number of members within your association played a role? How many are they?

e) End-User Individual Characteristics

- Innovation in recent product/processes (from low to high): maybe the research output usage depend from the fact that your association members were already inclined to make changes to their product, processes, relationships in the attempt to generate more profit? In your opinion how did they acquired this ability/attitude?
- Interest in markets (i.e. from studies, participation to workshops, personal info) (from low to high): maybe the research output usage depend from the fact that your association members were already inclined in observing, discussing and somehow using market information on their own about consumer tastes, buyer requirements and products from competition? In your opinion how did they acquired this ability/attitude?
- Level of collaboration (from low to high): maybe the research output usage depend from the fact that your association members were already inclined in taking strategic/operational decisions jointly among them or with people outside the association?
- Exposure to environment external to business operation (from low to high): maybe it depends on the fact that association members are naturally exposed to external information outside their business so that they are more used to listen and use information from other sources?