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A Socio-cognitive Perspective of Industry Innovation Initiatives

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ABSTRACT *This article contributes to the emerging theory of industry belief systems and the social construction of innovation by examining how industry actors conceptualise and negotiate industry transformation through the development and diffusion of new technologies. In a qualitative study of innovation in the Australian wool industry, we found that the social construction of industry belief systems and new technologies was an evolutionary process of social sensemaking in which there was reciprocity between individual and collective meaning-making that reflected conflict, consensus and compliance between industry actors about new technologies and industry beliefs.*

Keywords: wool; innovation; sensemaking; industry belief systems

1. Introduction

Social sensemaking has emerged to help explain how people make meaning of situations. Sensemaking is a socio-cognitive process of organising and constructing shared beliefs.[1] At an industry level, sensemaking represents the socio-cognitive processes and beliefs of industry actors engaged in the social construction of industry structure, strategy and innovation.[2] Studies of how actors make sense of innovation have tended to concentrate on socio-cognitive processes at an interpersonal and an organisation level,[3] but sensemaking also occurs at an industry level where the socio-cognitive dimensions of the innovation process may differ.[4] However, little research has examined how the activities that lead to industry level sensemaking influence the outcomes of innovation initiatives. An intensive qualitative study of an industry innovation initiative that examined sensemaking at an industry level and explored how industry beliefs influenced the outcomes of innovation initiatives was used to fill some of this gap. The empirical case, which was a qualitative study of the reciprocity between the social construction of industry beliefs and innovation initiatives in the Australian wool industry, also examined how innovation initiatives influenced the social construction of industry beliefs. We conducted

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a qualitative study for a number of reasons. First, sensemaking as a socio-cognitive process of industry organising is not well understood. Second, existing understandings of how people make sense of innovation initiatives did not appear to explain the situation that was examined as the innovation initiative occurred at an industry level and was not instigated by an individual or an organisation. Instead, the success of the innovation initiative was determined by a broad range of industry actors and their interpretation and reconstruction of industry belief systems. Third, we wished to develop a contextualised understanding of the socio-cognitive processes and beliefs of industry actors engaged in industry innovation initiatives, which, as our findings show, involved actors creating and using conflict, consensus and compliance to socially co-construct and diffuse new technologies and industry beliefs.

This article makes several contributions to the study of industry sensemaking and innovation. First, it contributes to our theoretical understanding of the social construction of innovation at an industry level by providing a more nuanced, contextualised view of the activities of industry actors in the innovation process that highlights the reciprocal nature of the interpretation and construction of industry beliefs and innovation. Studies of industry sensemaking have been limited to the examination of the evolution of new product markets and categories[5] and industry strategy.[6] Little is known about how industry beliefs and innovation are socially co-constructed. Second, by relating the socio-cognitive construction of industry level innovation initiatives to specific industry sensemaking categories and juxtaposing our findings with existing research, we are able to suggest some of the characteristics of sensemaking in the context of industry innovation initiatives. Third, our study illustrates how industry actors use their power and influence to impose their beliefs in order to influence innovation outcomes at an industry level.

2. Industry Sensemaking and Innovation

Weick[7] argued the equivocal nature of new technologies requires specific cognitive models and sensemaking capabilities that enable a user to represent and understand the events associated with them. Sensemaking is a cognitive and behavioural response to situations involving ambiguity, uncertainty and arousal that interrupt the ongoing flow of events.[8] Under this definition, ‘sense’ is the meaning ascribed to an event, and ‘making’ is a creation or construction activity.[9] Sensemaking seeks to describe the disparity between what people intuitively expect and what actually happens. Therefore, sensemaking concepts can provide a deeper and more elaborate understanding of complex socio-cognitive phenomena, such as innovation.

Sensemaking occurs at all levels of a social system, ranging from an individual to a transnational level[10] and can be examined at an industry level as the social construction of industry belief systems.[11] Industry belief systems form part of an industry’s collective cognitions and influence the role innovation plays in the evolution of industry strategy, structure and culture. Industries are held together by actors’ ‘beliefs about products, market structures, ways of doing business and participant quality’, which are externalised and enacted through industry discourse and the strategic choices industry actors make.[12]

Porac *et al.*[13] identified four types of interrelated industry beliefs. First, *Product Ontology,* which relates to beliefs about the nature and use of products that define and differentiate product markets. Product ontology is externalised through market stories, documents and texts that encourage industry actors to categorise products and services in a certain way.[14] Second, *Boundary Beliefs*, which define competitors and establish the boundaries of a market space, shaping organisational strategies and competition.[15] Third, *Industry Recipes*, which refer to industry participants' shared assumptions about the nature of work relationships, the relationships between the industry and its environment and how actors think through strategic problems. Industry recipes are the bedrock of justifications for competitive actions.[16] Finally, *Reputational Rankings*, which describe an industry actor's relative success and are articulated through the formation of formal and informal opinions and comparisons of organisational performance.[17]

Despite the considerable emphasis placed on shared understanding and common sense in organisations and industries,[18] sensemaking may also result in ambiguity,[19] compromise and duress.[20] Lant[21] and Porac *et al.*[22] raised a question as to whether shared beliefs are a prerequisite for collective action and, indeed, whether the concept of collective beliefs is meaningful. Porac *et al.*[23] called for further research into tensions in the social construction of industry beliefs and how they are externalised through conflict, consensus and compliance. Therefore, the present study focused not on stable consensus around industry innovation initiatives and industry beliefs at a particular point in time but, rather, on changes and constellations of beliefs over time and the links between those beliefs and the social construction of industry innovation initiatives.

3. The Research Questions

These unique aspects of industry level sensemaking and the social construction of innovation led us to consider three research questions. The first involved identifying the socio-cognitive processes actors engaged in to influence the outcomes of industry innovation initiatives. Accordingly, our first research question was: in industry level innovation initiatives, how do actors influence the social construction and diffusion of industry beliefs and new technologies? Our second research question concerned the reciprocal nature of the construction of industry beliefs and innovation initiatives. Consequently, our second research question was: how does the evolution of industry beliefs influence the social construction of new technologies and how does the social construction of new technologies influence the evolution of industry belief systems? These research questions were asked with a particular emphasis on industry discourse about innovation initiatives as a way to identify actors' changing beliefs and actions over time and the relationships between the meanings they made of innovation initiatives and industry beliefs. Thus, our third research question was: what is the nature of the interactions between industry actors in the social construction of industry innovation initiatives?

4. Research Method

This research draws on a qualitative case study of innovation in the Australian wool industry. Our aim was theory elaboration by extending and refining current understandings of sensemaking in industry innovation initiatives. Qualitative case study research is well suited to examining poorly understood phenomena.[24] Consequently, the present study was based on a single, longitudinal, historical case study, which investigated how Australian wool industry actors made sense of a major industry innovation initiative: the introduction of the Objective Measurement (OM) of raw wool fibre.

The introduction of OM into the Australian wool industry has unique characteristics that made it an ideal candidate for theory development.[25] The development and diffusion of OM is a natural experiment as, before 1957, the objective measurement of Australian wool was not undertaken. Further, data on OM innovation initiatives in the Australian wool industry are readily available as technological developments and industry issues relating to OM technologies were well documented.

Data Collection

The primary source of case study data was documentary evidence drawn from published research articles, annual reports and technology adoption and use data. We selected documents for review through a search of wool-fibre testing publications held in the Australian Livestock Library and the libraries of Australian wool industry organisations (i.e. Australian Wool Innovation Ltd, Woolmark, the Australian Wool Testing Authority and the International Wool Textile Organisation). In total, 522 publications and reports relating to OM in the Australian wool industry were identified and reviewed. These documentary data were triangulated with data from unstructured, in-depth interviews conducted with nine representatives of wool industry actors, including researchers, wool selling brokers, processors and policy analysts, as well as informal discussions with farmers. The interviews, which lasted for approximately one hour, were taped and verbal responses were transcribed for analysis. Transcripts from the interviews were typed and sent to the interviewees for review to ensure they were a correct representation of interview content before being used in the analysis.

Data Analysis

The data analysis had three stages. Firstly, we developed a chronological narrative account of the technology and industry events surrounding the development, introduction, adoption and diffusion of OM from the development of the first wool-fibre testing technology in 1957 to the abandonment of a major OM innovation initiative in 2001. The chronology of technology and industry events in the Australian wool industry OM innovation initiative are summarised in Figure 1. Secondly, the narrative account was coded into five broad categories (technology development and diffusion, product ontology, boundary beliefs, industry recipes and reputational ranking), which reflected the outcomes of industry innovation initiatives and Porac *et al.*'s[26] conceptualisation of industry sensemaking. Finally, the sensemaking constructs and relationships that emerged from the case analysis were used to develop implications for theory and practice relevant to industry level sensemaking.

5. Objective Measurements in the Australian Wool Industry

From the establishment of the Australian wool industry in the late eighteenth century until 1957, the attributes of greasy wool (mainly crimp frequency and fibre thickness, fibre length, fibre strength, style, handle and colour) were subjectively appraised by eye or hand by woolgrowers, classers, selling brokers, buyers and processors.[27] The subjective appraisal of greasy wool attributes was used by producers to prepare and class the clip into lines for sale, by wool brokers to market sale

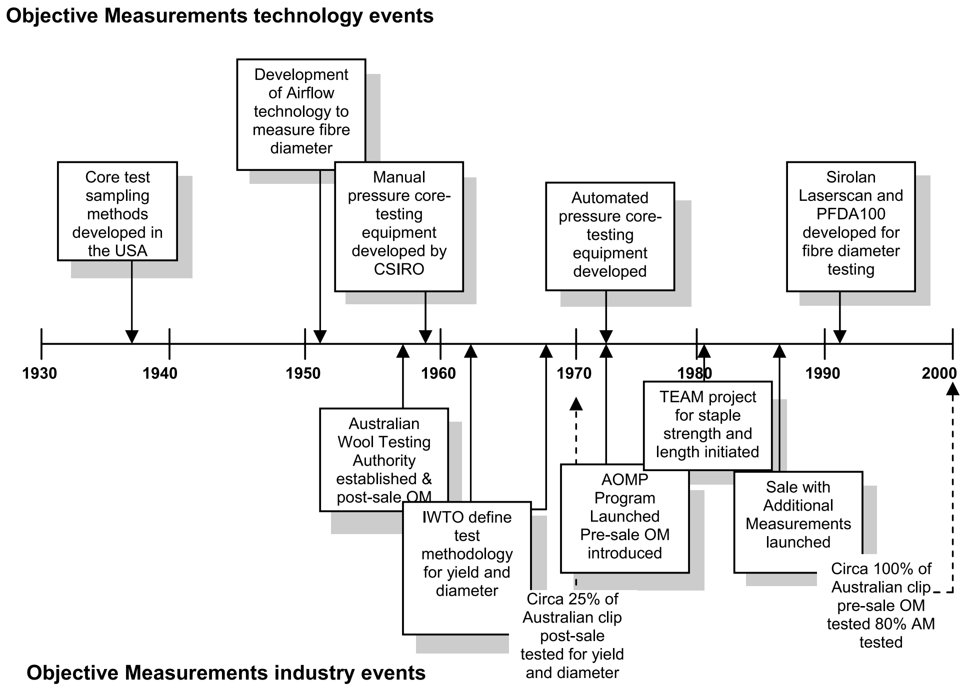

Figure 1. Objective Measurements industry and technology events.

lots, by buyers to value sale lots and to prepare bulk consignments that met processing requirements and by processors to sort sale lots for processing.[28]

The objective measurement (OM) of the physical properties of greasy and processed wool, known as wool metrology, provides a scientific means by which to measure, predict and control the impact of wool fibre variability during processing and, as such, has become a fundamental component of modern wool textile processing and marketing systems.[29] OM was gradually introduced into the Australian wool industry through a range of innovation and policy initiatives that replaced and supplemented traditional subjective wool appraisal practices. The present study examined the co-evolution of innovation and industry beliefs through four major OM initiatives that were introduced from 1957 to 2001, namely: (1) the introduction of post-sale OM in 1957; (2) the development and introduction of pre-sale OM and Sale by Sample (SXS), which started in 1969; (3) Sale with Additional Measurements (SXAM), which was introduced in the mid-1980s; and (4) Sale by Description (SXD), which was initially proposed in 1973, but finally abandoned without being implemented in 2001.

Post-sale OM (1957–68)

In the 1950s and 1960s, greasy wool fibre was increasingly described by its textile properties, rather than by its fleece or staple properties.[30] This shift was driven by competition from newly developed synthetic fibres. At the start of the period there was a broad consensus that competition for Australian wool was coming from synthetic fibres, not from other wool producing nations.[31] There was considerable consensus among Australian wool industry actors for the introduction of post-sale

OM testing to enable wool to compete with uniform, objectively specified synthetic fibres by enabling wool buyers to build uniform bulk processing consignments to objective specifications.[32]

In 1957, the Australian Government established the Australian Wool Testing Authority (AWTA) to provide the industry with more accurate measurement and specification of wool.[33] The introduction of post-sale OM by the AWTA helped reduce contract disputes between buyers and processors as consignments were specified and delivered with objective, independent test certificates. By 1968, around 40% of the Australian clip was post-sale tested for yield and fibre diameter (FD) and it became common practice for wool processors to be supplied with OM specifications.[34]

As the use of post-sale OM increased, so too did Australian wool metrology research. Researchers exposed the inaccuracy of subjective appraisal methods in the preparation and valuation of greasy wool fibre[35] and proposed the use of OM along the wool supply chain from sheep breeding and selection to processing.[36] However, a wider use of OM was rejected by the wool industry statutory authority [the Australian Wool Board (AWB)], brokers and buyers.

The 1950s and 1960s was a period of technological change and uncertainty as numerous competing wool testing technologies were developed. In the 1960s, researchers from Australia and New Zealand developed manual pressure core-testing equipment that allowed the high volume objective testing of greasy wool to be undertaken in wool stores.[37] Various instruments and methods were developed to objectively measure FD but, eventually, Airflow emerged as the dominant testing technology.[38] A number of test methods for clean yield were also used in this period.[39] However, a lack of industry consensus around OM technologies caused a great deal of frustration among wool buyers.[40]

In 1961, the Australian Government entered the wool marketing debate. In response to criticisms about clip quality, increasing competition from synthetic fibres and falling wool prices, a Committee of Enquiry was established to examine the wool marketing system. The Committee recommended the establishment of pre-sale OM for the central appraisal and sale of Australian wool and that Australia take the lead in the development and commercialisation of OM technologies.[41] However, the AWB rejected the Committee's recommendations for a central appraisal system and the introduction of pre-sale OM and, instead, focused on improving clip preparation standards and practices through the introduction of a voluntary register of wool-classers, a clip inspection service and new clip preparation standards.[42]

Despite the lack of industry support for pre-sale OM, a small number of woolgrowers began to provide objective yield and FD tests in the mid-1960s. However, wool brokers and buyers prevented pre-sale OM test results from being published in sale catalogues, constraining the flow of information between growers and processors.[43] This resulted in the emergence of two different nomenclatures for wool fibre as researchers, processors and buyers increasingly used objective descriptions of wool, whereas woolgrowers and brokers continued to use traditional subjective descriptions in clip preparation and marketing.[44]

Pre-sale OM (1969–79)

In 1969, the AWB finally bowed to pressure from researchers and the AWTA and investigated the feasibility of introducing pre-sale OM.[45] However, the AWB, buyers and brokers continued to oppose the introduction of pre-sale OM. In 1970, the Australian Wool Commission (AWC) replaced the AWB and attitudes towards pre-sale OM changed. The AWC launched the Australian Objective Measurement Project (AOMP) to investigate the feasibility of pre-sale OM.[46] The AOMP concluded objective preparation and pre-sale OM testing were applicable to much of the Australian clip and were technically and economically feasible.[47]

Pre-sale OM was offered on a voluntary basis to Australian woolgrowers in 1972, enabling significant changes to be made to the Australian wool marketing and selling system. Under the subjective appraisal system, show bales were displayed in the brokers' stores for buyers to appraise. With pre-sale OM, test results were printed in the sale catalogue and only a small, representative sample of the sale lot was displayed for the buyer to subjectively appraise unmeasured characteristics.[48] This new marketing system was called 'Sale by Sample' (SXS). By 1979, 86% of the Australian clip was tested and sold in this way.[49] However, wool buyers viewed SXS as a threat to their role in the wool industry. They continued to question the accuracy of OM and opposed the introduction of further pre-sale tests.[50] In response to opposition from buyers the AWC and AWTA concentrated on generating market demand for OM among wool processors in an attempt to force buyers to adopt pre-sale OM.[51]

The AOMP presented a significant opportunity for wool metrologists to expand their research and development activities.[52] In this period, researchers developed a new washer/dryer for clean yield testing, a sonic fibre fineness tester, prototype core and grab sampling equipment, wool base analyser, Fibre Diameter Analyser (FDA), Fibre Diameter Video Analyser (FIDIVAN) and the Almeter for measuring staple and fibre length.[53] Of the technologies developed in this period, FDA, FIDIVAN, grab sampling and colour measurement became platform technologies for future innovation. However, many of the technologies developed, including the sonic fineness tester, were not commercially successful and were later abandoned.[54]

In 1973, the Australian Wool Corporation (AWCorp) replaced the AWC. The AWCorp argued OM should replace subjective appraisal practices and that Australian wool should be sold by description only (SXD).[55] The introduction of SXD was supported by wool metrologists and textile researchers, who believed the transition from SXS to SXD was inevitable and was only constrained by technological limitations.[56] However, SXD was strongly opposed by buyers and brokers and became one of the most contentious issues in the wool industry in the 1980s and 1990s.

Sale with Additional Measurements (1980–90)

In the 1980s, over 90% of Australian wool was sold by sample with OM, suggesting the Australian wool industry had reached a consensus about the use of pre-sale OM and SXS. In 1980, the AWCorp begin investigating the feasibility of introducing Sale with Additional Measurements (SXAM); the pre-sale testing of individual lots for Staple Strength (SS) and Staple Length (SL), as an incremental step towards achieving SXD.[57] The SXAM trials were relatively successful. However, the significant reductions in marketing costs achieved by SXS were not replicated. Moreover, SXAM required the adoption of new technologies and increased testing costs. As such, there was little initial demand from woolgrowers, brokers or buyers for SXAM.[58] The AWCorp recognised that, for SXAM to be accepted, they needed to generate demand for AM among wool processors.[59]

In 1981, the AWCorp launched TEAM (Trials Evaluating Additional Measurement) to evaluate the potential of AM in predicting the processing performance of greasy wool.[60] The aim of TEAM was to establish procedures for sampling and testing wool for staple length and strength and to develop general processing performance prediction formulae based on those tests.[61] The TEAM project developed general processing prediction formulae for the fibre length of the wool top (Hauteur) and fibre wastage (Romaine), which was the basis for the commercialisation of SXAM in Australia in 1986.[62] The relationship between the prediction of Hauteur from AM and the Hauteur achieved by processors changed significantly after the TEAM formulae were published in 1985.[63] In July 1988, the TEAM-2 project was initiated to extend and improve processing prediction formulae with additional consignment data.[64]

Prior to the commercialisation of AM in 1986, the potential benefit of SXAM for Australian woolgrowers was estimated at four cents per kilogram of greasy wool compared with testing costs of around 1.6 cents per kilogram.[65] However, when AM were commercialised in 1986 there were no positive market price signals for tested wool as AM had not been widely adopted by wool processors. In order to increase the adoption of AM, the AWCorp placed a fixed premium of two cents a kilogram of clean wool with AM purchased under the industry funded floor price for Australian wool [Wool Reserve Price Scheme (WRPS)].[66] In 1987, this premium was increased to five cents a kilogram and the proportion of Australian wool sold with AM at auction increased to around 6%. In 1988, the premium was increased to 10 cents a kilogram. The proportion of wool offered at auction with AM grew from 10% in 1988 to 37% in 1990. In 1990, despite an increase in the proportion of Australian wool with AM, it was estimated tested wool received an additional three cents a kilogram in the market compared with test costs of five cents a kilogram, resulting in a net loss of two cents a kilogram.[67]

In this period a range of new testing technologies was developed, including the Automated Tester for Length and Strength (ATLAS) and PERSEUS, an alternative instrument for testing SS and SL.[68] During TEAM, the AWTA developed a Mechanical Tuft Sampling (MTS) machine to draw staple tufts from the display sample for AM tests.[69] The AWTA adopted ATLAS for commercial pre-sale AM and together ATLAS and MTS technologies enabled large-scale SXAM to be undertaken.

A decade after expressing support for SXD, the AWCorp published a formal plan for the introduction of this selling system, estimating SXD would save the industry around 13 cents a kilogram of greasy wool.[70] The AWCorp and researchers believed the development of appropriate testing technologies and methods was a major constraint to the achievement of SXD and intensified their efforts to develop technologies that would measure the style attributes of wool.[71] Despite industry consultation, SXD met with mixed reactions. Wool processors expressed concerns about the move without improvements to the quality of clip preparation,[72] some woolgrowers and brokers supported SXD as they believed it would significantly reduce wool marketing and distribution costs,[73] while buyers continued to oppose the system.

On-farm Testing (1991–2001)

In 1991, the WRPS was abandoned by the Australian Government, leaving a stockpile of 4.7 million bales of unsold wool, debts of AUD$4 billion and woolgrowers facing volatile market conditions without price protection.[74] The fixed premiums for wool with AM purchased under the scheme disappeared and the proportion of wool with pre-sale AM dropped from around 38% in 1991 to around 28% in 1992. Wool processors began to publicly support SXAM and urged woolgrowers to undertake testing and market price premiums for tested wool gradually emerged. In 1993, Gleeson *et al.*[75] reported a price premium for wool with AM of six cents a kilogram for fleece wool and 7.3 cents a kilogram for skirtings and around 31% of Australian wool was offered at auction with AM.

In 1991, the Australian Government appointed a Wool Review Committee that recommended the Australian wool industry introduce SXD as soon as possible to reduce marketing costs.[76] However, technologies had not been developed to measure the style attributes of wool and SXD still encountered opposition from sections of the trade.[77] Wool buyers, in particular, opposed the removal of the sample from the show floor and opposed AM on the basis that it may lead to the introduction of SXD. Wool buyers argued wool lots sold by description would be discounted as they did not have confidence in objective style measurements and threatened to abandon SXAM if SXD was introduced.[78]

In 1992, a second Committee of Enquiry examined the status of the wool industry[79] and recommended the introduction of a centralised marketing system, improved specifications and wool identification systems, on-farm fleece testing, industry standards for non-measured fibre attributes and SXD.[80] Despite the recommendations of two committees of enquiry, progress toward SXD was slow. The focus of wool metrology research in the mid-1990s shifted to the on-farm use of OM and research was published in industry journals on the use of fibre diameter distribution (FDD) testing on-farm in breeding, selection and animal husbandry.[81]

Despite the turmoil in the Australian wool industry in the early 1990s, researchers continued to develop new testing technologies, including the Optical Fibre Diameter Analyser (OFDA) for the measurement of fibre diameter distribution and the Agritest Staplebreaker for testing staple attributes on-farm.[82] The CSIRO Fibre Diameter Distribution Task Force was established[83] and Sirolan Laserscan was adopted by the AWTA as the standard method for measuring mean FD.[84] However, the technological constraints associated with the objective measurement of the style attributes of wool fibre remained and, in 2001, research into the objective measurement of the style elements of wool was discontinued.[85] Without testing technologies and methods to replace subjectively appraised wool fibre attributes, SXD was not possible and after three decades of research, development and policy supporting the introduction of SXD, the Australian wool industry abandoned the initiative.

6. Discussion and Implications

The Australian wool industry OM innovation initiative was a unique and singular case, but that does not mean we cannot draw lessons from it to inform the management of industry innovation initiatives. As a large scale industry innovation initiative, what the introduction of OM in the Australian wool industry has made clear is that aspects of the innovation process are likely to occur in a more subtle manner in smaller scale innovation initiatives. A mix of different industry actors in the innovation process can result in different innovation outcomes, technologies and industry beliefs. The socio-cognitive and political co-evolution of innovation and industry beliefs found in this case study offers insights for policy makers, researchers and innovation participants who are unhappy with the pattern of the development, introduction, adoption and diffusion of industry level innovation initiatives. For not only was change in the innovation process and outcomes revealed as possible, but the case study highlighted the actions required to bring about that change.

The case study suggests industry level innovation is a socio-cognitive and political process involving conflict, coercion, compliance and consensus among industry actors. In the Australian wool industry, innovation outcomes were negotiated by industry actors with power and interest in OM technologies and a vested interest in protecting established industry beliefs or introducing new beliefs. The diffusion of OM in the Australian wool industry was not a process in which actors passively accepted the superiority of OM over existing industry recipes (i.e. the subjective appraisal of wool). Actors negotiated the outcomes of OM initiatives, socially constructing technologies and reconstructing industry beliefs around them.

The development and introduction of OM opened the 'black box' of subjective wool appraisal, marketing and valuation to woolgrowers and challenged the dominance of buyers as industry information brokers. The development and diffusion of OM were inextricably linked to the evolution of industry beliefs in terms of an objective product ontology, the expansion of boundary beliefs to accept synthetic textiles as part of the competitive environment and the incorporation of post- and then pre-sale OM as in industry recipes for marketing wool.

As researchers renegotiated OM's role and what constituted wool marketing and selling recipes, the politics of power and interest were apparent within the Australian wool industry. Whether OM should replace subjective appraisal became a battle-ground of scientific knowledge against tradition, skill and craft. The struggle between these beliefs was visible in documentary evidence from the 1960s to the 1990s, in which researchers promoted OM and members of the trade criticised it. Objective and subjective nomenclatures for wool fibre became competing normative claims for industry beliefs about product, competition, industry recipes and reputation. The proponents of OM and subjective appraisal competed for allies in their struggle for dominance of the wool production and marketing system.

The notions of power and interest implicit in the OM innovation initiative in the Australian wool industry emphasised actors' ability to manage, manipulate and impose meaning. Industry actors with power and interest in the introduction of OM acted as 'sense givers' as they sought to project their interpretation of technological and environmental events onto other industry actors. For example, the AWB and wool buyers, powerful actors with an interest in maintaining the use of subjective appraisal, opposed the introduction of pre-sale OM in the 1960s. The AWB and buyers dominated industry strategies for wool marketing and selling in this period and attempted to impose their interpretations of pre-sale OM onto other actors. Brokers and buyers controlled the nature and use of information in the auction system and prevented the results of OM guidance tests undertaken by woolgrowers being printed in sale catalogues. Researchers did not have the power to introduce pre-sale OM in the 1960s and were dismissed as 'quacks' by the AWB and other members of the trade.

Power and interest in the Australian wool industry was fluid. Researchers were a united voice in their criticism of subjective appraisal and support of OM and continued to produce evidence supporting pre-sale OM until the AWB responded to pressure and examined its feasibility as a marketing scheme (despite continuing to oppose its introduction). The growing support for pre-sale OM among researchers, test houses, growers and brokers pushed industry policy makers into supporting the introduction of pre-sale OM and SXS. When pre-sale OM and SXS were introduced in 1972 they had the support of all major industry participants, except wool buyers, and were rapidly diffused.

As the example of the introduction of pre-sale OM demonstrates, power and interest and the ability of industry actors to act as 'sense givers' dramatically influenced the fate of this industry innovation initiative. Wool buyers were forced to comply with pre-sale OM in the face of overwhelming industry consensus. The example of the introduction and subsequent abandonment of SXD highlights, once again, the central role actor power and interest have in innovation and how conflict between industry participants can influence the innovation process. The AWCorp and an informal coalition of researchers believed greasy wool could be fully described with objective measurements. This objective product ontology underpinned their beliefs that wool would be a highly competitive textile fibre if the industry adopted SXD. The AWCorp controlled the funding of industry research, development, promotion and the WRPS and, therefore, had the power and interest to act as industry 'sense givers' on the subject of SXD.

The opposition of wool buyers to SXD exposed a clash of industry beliefs in terms of product ontology, boundary beliefs and industry recipes and a battle for control of information in the auction system. Although the AWCorp and researchers were powerful proponents of SXD they had no jurisdiction over the auction system and could not prevent buyers discounting sale lots offered without samples. It was also unlikely that promoters of SXD would have been able to generate demand for this industry recipe among processors who were suspicious of the concept of wool consignments being prepared sight-unseen by buyers. Therefore, the AWCorp were powerful 'sense givers', but were unable to establish SXD as an industry recipe.

The case of the OM innovation initiative in the Australian wool industry suggests the development and diffusion of new technologies does not necessarily result in the rapid and full adoption of the technology by all industry actors. These findings support criticisms of the pro-innovation bias that has been prevalent in the innovation literature.[86] In this case study, OM technologies were given different meanings by different industry participants, resulting in a range of technology characteristics and uses. It seems that the acceptance of new technologies can be uncertain, unstable and intertwined with industry beliefs.

The history of OM innovation initiatives in the Australian wool industry is not only one in which new technologies were successfully introduced and widely adopted, but also one of technology abandonment, reinvention, adaptation, rejection and disadoption. OM technologies were not predetermined, stable or independent of industry beliefs. Conflict over which testing technology should be the industry standard occurred when new OM initiatives were introduced. For example, post-sale OM was introduced in Australia in 1957 before a consensus had been reached as to a standard technology and method for objectively testing greasy wool for clean yield and fibre diameter. Conflict over which testing technology was the most effective and accurate continued until the IWTO specified standards for yield and fibre diameter testing; those technologies that were not certified were eventually abandoned.

This case study shows that, as well as negotiating the attributes of the technology itself, industry actors can renegotiate related industry beliefs by achieving plausibility and authority. Scientific research can be used to establish plausibility and the use of arguments about market equity, competition and control of market information can be used to attain industry authority. Establishing plausibility and authority are important in the social construction of industry innovation initiatives and industry beliefs because actors who emerge as ‘sense givers’ are more likely to win future battles in the same technology space. This occurred when researchers achieved plausibility and authority in the battle to introduce pre-sale OM and SXS. In doing so, they were able to promote SXAM and SXD from a position of strength.

The case of OM in the Australian wool industry highlights the potential for overbearing behaviour from those who have authority over the development of new technologies. The rejection and abandonment of testing technologies in this case suggests that what were deemed to be prudent, beneficial technologies by policy makers and researchers were sometimes seen as an irrational choice by end users. Similarly, what end users considered to be economically rational decisions were seen as imprudent and illogical by researchers and policy makers. The beliefs and responses of members of the trade and woolgrowers were often dismissed, yet were critical when it came to determining the outcome of the OM initiative. Researchers and policy makers engaged in industry innovation should be wary of dismissing end users’ beliefs and need to recognise the role played by industry actors who have power and interest in existing industry beliefs about product ontology, boundary beliefs, industry recipes and reputational rankings. They need to take into account how different industry actors make sense of innovation initiatives within their belief systems, as it is these actors who are likely to determine the success or failure of industry level innovation.

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