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AQIS, EXDOC and the 'Meaties': An Interpretivist Case Study of an Australian Export Documentation System Implementation

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Abstract

EXDOC is an on-line export documentation system implemented by the Australian Quarantine Inspection Service [AQIS] and used currently by 90% of meat exporters. At a time when governments world-wide are increasingly committed to introducing electronic service delivery [ESD], this is a timely exemplar of innovative practice. In this paper, we consider the initial implementation of EXDOC in the meat export sector in order to identify the factors that led to the successful adoption of this system.

We consider these factors in the context of diffusion of innovation literature supplemented with Bijker's social constructivist framework. The theoretical flexibility provided by this combination of approaches enabled us to draw out a number of implications from the data that bear on strategy formulation.

Factors found to have significant bearing on the early adoption of EXDOC included: (1) idiosyncratic factors precipitating the initial implementation (2) the constraints based on accommodating user capabilities (3) the organisational role taken by AQIS (4) diffusion as a self-reinforcing and value-adding effect.

A standard represents both a problem *as a requirement of such a system and a* problem solving strategy *eliciting compliance to the system requirements. Over the period of shaping and stabilizing of the industry standard, AQIS was required to act as facilitator in the coordination of the actors.*

The implementation of systems like EXDOC enables users to identify what they want from a system, specifying their preferences and tradeoffs. Such implementations offer opportunities for systems redesign within export business sectors with major strategic implications for the industry.

1. Introduction

Governments worldwide have been developing Electronic Service Delivery (ESD) systems of one sort or another for nearly two decades, both in an attempt to cut costs and with the intention of improving the quality and value of the services they provide to their citizens. Since the development of the World Wide Web, such systems have been developed in ever increasing numbers, although many of the most significant such systems actually pre-date the Web.

In this paper, we consider the way in which individual meat exporters implemented EXDOC, an Australian government export documentation system, over time. We also analyse the cultural and organisational contexts in which the system and its users exist. AQIS, the Australian Quarantine and Inspection Service, uses the EXport DOCumentation (EXDOC) system to demonstrate that export products have been subjected to its inspection and to ensure product meets Australian and importing country standards.

AQIS has operated EXDOC since August 1992 for meat inspections (more than 90% of meat exporters are now EXDOC users) and the system is now being extended to other export sectors, principally dairy, grains, fish and horticulture. It has been piloted in the dairy sector since July 1998. The EXDOC system accepts details of proposed exports from exporters, links these with the results of on-plant inspection of product and, where product is eligible, issues export permits and health certificates to enable export. The central documents involved are the Request for Permit (RFP), provided by the exporter, and the Export Permit Number (EPN) and health certificate, both provided by AQIS. Export information can be submitted as a single transaction, or incrementally as it becomes known (see Figure 1). The overall impact of electronic transmissions of health certificates [SANCRT]is evident in reducing costs, facilitating data flow and increasing security of both documents and products.

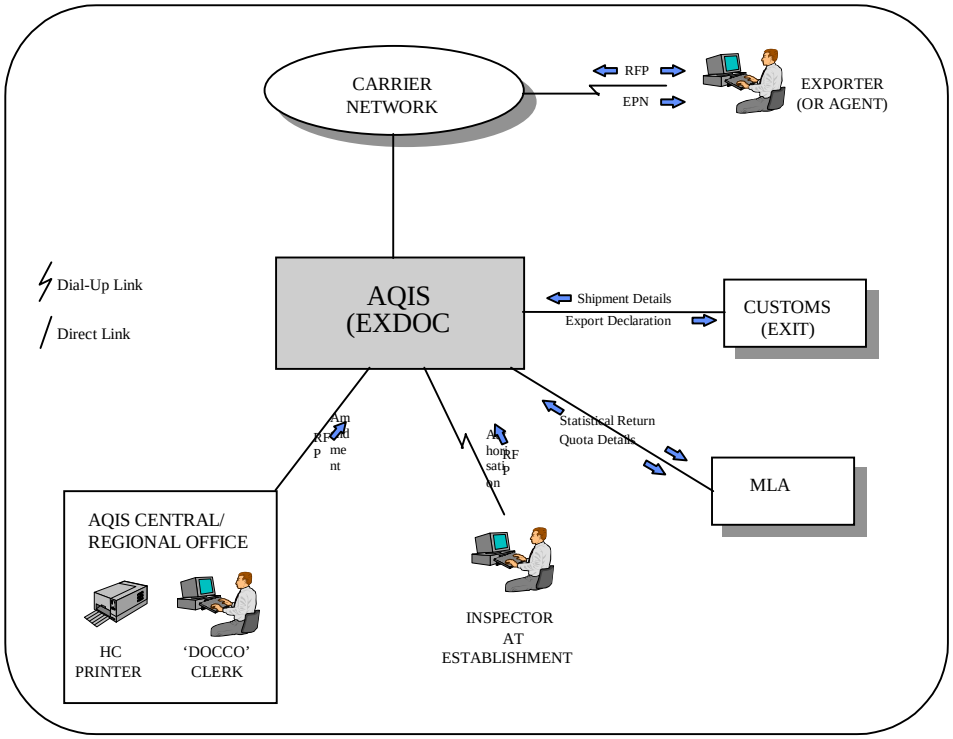

Figure 1: *EXDOC system overview, 1999, AQIS*

The overall research objective of this investigation is to achieve a better understanding of the implementation of Internet-based eCommerce applications in Australia. This investigation required detailed case research of Australian organisations to develop a model of the process and an understanding of the most useful theories for future researchers in this field. The EXDOC study provides essential insights into the transitional requirements for moving from a traditional paper based system to one which is electronically enabled. Additionally, we consider the potential of Internet technologies such as eCommerce to provide an infrastructure for business redesign.

The organisations in the meat export sector were chosen for the study because they were known to be advanced users of EXDOC. An important element in the implementation was the definition of a standard for the fresh food export sector. However, studies of both proprietary and mandatory standards have established that arriving at a definition of a standard involves much more than simply designing a technological system (Swatman, 1993; Monteiro and Hanseth, 1996). Consequently, we needed to understand the processes involved in its adoption and diffusion, how the standard acquired stability and became increasingly irreversible. We also needed to gain an in-depth knowledge of what the government agency intended to achieve and the views of the stakeholders concerning the use of the

technology and the contexts within which the attempted technological introduction was taking place.

2. Research Approach

'The more standardised the technical solutions to the problem of system integration can be shown to be, the clearer it becomes that organisational issues are the true crux of the matter' (Swatman, 1993)

Empirical studies which collect data on stakeholder views can be broadly classified as 'interpretive case studies' (Walsham, 1995). An increasing body of work in the IS literature is based on this approach (for example, Markus, 1983; Boland and Day, 1989; Orlikowski, 1991; Walsham,1999). However, under the broad interpretive case studies label, there remain significant differences of methodology, theory and method.

The foundations for our review of the EXDOC implementation derived from diffusion theory, which provided a basis for investigating relationships between and within organisations (Cooper and Zmud, 1990; Rogers, 1995). Diffusion theory develops understanding of the communication, spread and adoption of new ideas. Rogers (1995) describes diffusion theory as particularly suited to investigating the specific characteristics of an innovation or the social networks, which enable the idea to be communicated to communities of organisations. EXDOC fits this description well, being an innovation diffused to a 'community' of meat exporters in the fresh food sector. In the diffusion literature, there are numbers of longitudinal studies -see for example, Reich and Benbasat, 1999; Robey and Boudreau, 1999; Dos Santos and Pfeffers, 1998; Fichman and Kemerer, 1997 - which consider factors influencing the decision to adopt internet-based eCommerce applications. These studies provided a foundation for analysing our own data. We then considered the initial implementation of EXDOC in the meat export sector in terms of the following question:

What determines the adoption of new IT applications by firms in an industry?

Interpretive research in information systems has moved away from treating innovation as a fixed entity or 'black box' to be diffused towards viewing it as a interactive process. The social dimensions of planning and organisational decision-making need to be integrated into theoretical constructs (see, for example, Reich and Benbasat, 1999; Orlikowski and Robey, 1991). Social constructivism is a theory which integrates detailed case studies with theoretical concepts of issues such as notions of power, involved in sociotechnical change (Bijker and Law, 1992; Bijker, 1995). The concept of technological frames (Bijker 1995:125) enables the researcher to organise and facilitate interpretation of data from case studies. Within the frame, the researcher is able to account for change, encompass individual strategies such as those of technology champions as well as late adopters, consider structural constraints such as a mandatory standard and avoid a priori assumptions such as the expectation that certain export sectors were likely to implement more smoothly or faster than others.

The frame provides problem-solving strategies, theories and testing practices. For example, the practice of power and its role in the diffusion of innovation, is defined as 'the transformative capacity to harness the agency of others to comply with one's ends'. Bijker explicitly utilises this definition of power as capacity from Giddens (1979) because 'it will make it easier to analyse interactions as governed by more than only conscious strategies'. Whilst Bijker utilises this formulation of power to consider the effects of inclusion and exclusion on types of innovation, in this paper we will only consider those aspects of power defined as transformative capacity in relation to the role of government in providing a universal standard.

3. Definition of a Standard: Variations and Constraints

Electronic Service Delivery (ESD) has been described as simply adding new delivery channels (Canada Customs and Revenue Agency, 2000) or more broadly as 'the provision of services with the assistance of telecommunications and telecommunications-based tools' (Clarke, 2000).

Incentives	**Features**
Cost reduction	Enables tax revenues to go further by reducing inventory and cutting purchasing and fulfillment cycles. For example, the Canadian Customs and Revenue Agency has introduced scanning technology to reduce paper storage costs (http://www.ccra-adrc.gc.ca).
Accessibility	Provides information from various agencies on one searchable Web-accessible site such as electronic reporting of exports
Changing standards of timeliness	The overwhelming benefits to conducting eCommerce transactions online are 'convenience, speed and time savings'. Business customers dealing with government agencies appreciate the improved competitiveness resulting from ESD
Improved competitiveness	Faster response times to requests increases the customer's speed to market leading to higher efficiency and cost savings. ESD offers increased opportunities for business to government links - for example, in developing new risk-sharing and funding models
Technological feasibility	Systems are already in place to provide secure, linked and integrated services eg procurement, payment
Increased accountability	Government needs to match rising expectations of service in the community in regards to availability, convenience, fast delivery, personalisation, one-stop service and customer focus Governmentswhich introduce ESD gain the public relations advantage of improved quality of relationship and accountability to citizens as well as assisting the community to bridge the skills gap
Promotes a universal standard	This is one of the strongest arguments for the uniquely important role of government in ESD

Table 1: *Incentives for Government to move into Electronic Service Delivery*

ESD at the functional level satisfies the desirable and significant aims of reducing redundant manual documentation and increasing the efficiency and accuracy of data processing and provision of management information. Outcomes that can result from this approach are streamlining and improvement in services leading to increased revenue and reduced fees for citizens.

ESD at the strategic level can also be seen as a method for reducing barriers and maintaining a competitive position. Such an advanced eGovernment approach provides incentives for government to adopt ESD even when the cost benefits cannot be fully justified in the short term. (The Economist, 2000, Wyckoff and Colecchia, 1999).. For example, governments want to be seen as progressive and capable of exploiting leading-edge technology (see Government Online, 2000). Consumers expect similar levels of service when the private sector or other governments provide access to emerging electronic services. (The Economist, 2000)

In Table 1 we have summarised a number of incentives for governments to move rapidly into ESD. These incentives have been reported in a number of international reports and surveys (see for U.S.A, Benchmarking 2000: for U.K., Deloitte 2000: for Canada, Strategy for ESD 2000: for Australia, Government Online, 2000).

We have considered some of the incentives for governments to push ahead with electronic service delivery. For individual government sectors, these incentives are matched by the potential risks associated with failing to adopt electronic service delivery at the same pace as other agencies. For example:

- Prohibitive costs of delivering services using traditional channels including operating costs for labour, postage, and capital replacement of legacy equipment
- Prohibitive costs of keeping non-electronic procedures and processes active for large enterprises
- Retaining a large casual work force and attracting workers to jobs that are repetitive in nature could become more challenging in the years to come
- Retaining skilled people who will increasingly prefer to go where the benefits of egovernment are available
- Maintaining a reputation as a leader in domestic and international communities may become more difficult
- Emerging electronic services provided by the private sector or other government organizations will become the norm for business leaders and citizens who could lobby for similar services from specific government agencies
- Failing to move at the same pace as other government agencies will increase the potential for inconsistencies and duplication between solutions of the Government (The Economist, 2000).

Whilst the promotion of a universal standard is closely linked to effecting the introduction of ESD by government, significant problems remain in making standards actually work in practice. Ideally, standards for hardware, software or procedures should be the means of achieving inter-operability within and between organisations, across industry sectors and amongst major world economic trading blocs. However, in the history of attempts to impose standards on various groups of users, failures have significantly outweighed success (see for example Myers, 1994; Mitev, 1996). Ensuring commonality of use and interpretation within and across industry boundaries remains problematic. There is growing recognition that the challenges in this area are not uniquely technical problems but require a strategic organisational approach to developing guidelines for industry.

Standards that work require input by organisations across industry groups (Swatman, 1993). Without such guidelines, standards develop that are selected without reference to any other industry group on the sole basis of incorporating what is seen as most appropriate to the transactions and type of business involved. For example, in extending EXDOC to the dairy sector, it would be extremely easy to develop subsets of optional data elements within this industry group which would have few if any common elements with those developed for meat.

So whilst an officially determined standard for electronic service delivery needs to accommodate differences *amongst* users, it will also require adaptation by users *to* the technology. Accommodation of difference starts from the fundamental issue that since governments cannot choose their customers, the services they provide must be for everyone.. Officially determined standards must be the lowest and most inclusive available to ensure they address the capabilities of users. To be truly inclusive, the timing of the introduction of the technology requires careful consideration. If advanced technologies are prematurely deployed they will fail. The standard also has to be accessible to late adopters and provide appropriate entry points. Technology selection can be problematic in fast developing fields such as eCommerce.

AQIS, in its role as a government service provider, had to address the capabilities of EXDOC users across the sectors. Such considerations of inclusiveness eliminate the option to introduce cutting edge technology and narrow the decision-space for users. Building networks involves 'enrolling' actors in a network (Sauer and Yetton, 237:1997). Whilst benefits may accrue to all from establishing a formal industry standard, the parties or actors are likely to have differing expectations. Government expectations of electronic service delivery will include reduction of redundant manual documentation and increased efficiency and accuracy of data processing and provision of management information. Private sector expectations place priority on reduced fees, quicker turnaround and a simplified documentation system.

Bijker's technological framework (see Table 2) enables us to recognise the complexity of establishing a universal industry standard. Evidently, a standard represents both a **problem** as a requirement of such a system and a **problem solving strategy** eliciting compliance to the system requirements.

Elements of a Technological Frame	Technological frame for AQIS and Exporters
Goals	Introduce on-line documentation system between government and exporters
Key Problems	Acceptance of new system and its requirements within set time frame
Problem Solving Strategies	Timing of mandatory compliance
Requirements to be met by problem solutions	Compliance of majority of exporters in sector
Tacit knowledge	Awareness of specific terminology in sector
Testing procedures	Training and accreditation for applicants
Perceived substitution function	Paper-based documentation & signatures
Exemplary artifacts	EXDOC forms

Table 2: *Bijker's Technological Framework and the EXDOC Implementation*

4. Findings from the Case Studies

Bijker's technological framework (1995) specifies how discretion is distributed amongst actors and objects. It enables the researcher to organise and facilitate interpretation of data from case studies. In this section of the paper we review and interpret the role of AQIS and the meat exporters, the major actors in this implementation.

The meat exporters interviewed included single owner/operators, small to medium-sized operators with their own boning room and larger firms having their own abattoirs. We collected data from AQIS personnel at regional and central government level and from a software provider who had worked on the EXDOC implementation with the majority of meat exporters. The principal data collection method was semi-structured interviews conducted with the staff member responsible for administering the EXDOC system. All interviews were taped and sessions were transcribed before the data were analysed. The transcripts were mailed to the participants following each interview session. To enhance the validity of the answers, summaries of the major findings of each interview were verified by the participants from these transcripts. Furthermore to ensure consistency and reliability, structured interview guides were used for all interviews. The interview guides included several open format questions to allow the participants flexibility in their response.

4.1 The Impact of the EXDOC Implementation on AQIS

From its inception in the meat export sector, AQIS was looking to EXDOC to achieve more efficient methods for keeping track of documents. As Table 3 demonstrates, the outcomes appear to have fulfilled these expectations. An AQIS regional manager summed up the benefits*: 'EXDOC certainly is a saving for the Government. They require the same number of people in their regional offices, they*

get information and they get it quicker before anything happens and most of it is done electronically without interference.'

Current	Potential
Faster turnaround Export and health certification time reduced from up to 2 days to within 20 minute.	
Reduced paperwork: AQIS and Japan use SANCRT transmissions as the primary edible meat import clearance document comprising 25 per cent of meat health certificates delivered via SANCRT	Implementation of SANCRT with Australia's four major meat-trading partners would reduce the amount of paper generated in AQIS regional offices by 60 per cent. Future projections are for a paper-free export certification system
Reduced staff time processing export requests: EXDOC facility for facsimile signatures currently used on 80 per cent of paper health certificates Full time staff providing certification down from 16.5 to 12 with vet officers down from 6 part time to 1.2 veterinary staff equivalents	More focus on developing computer literacy and less on clerical skills
Reduced internal and external costs: Significantly reduced support requirements for IT improvements to the initial 1998 EXDOC system	Integrating capture of data for AQIS and Australian Customs in a Single Electronic Window

Table 3: *Impact of Introducing Electronic Documentation at AQIS*

AQIS is aware of the interest in the implementation from other export sectors. The implementation with the meat sector has generated repeated enquiries from other export sectors. '*Skins and hides are asking for information about going onto EXDOC…lots of people are hooking up their dot matrix printers so the information is already stored in there*' (AQIS informant). In a number of export sectors requiring AQIS documentation, low levels of computer literacy and difficulty in understanding electronic commerce demonstrate an inadequate level of preparedness for on-line documentation (see Commonwealth of Australia, 1999). However, when other export sectors do take on EXDOC it *'will be an incredible change in the way they do business'* (AQIS informant).

In the longer term, as the EXDOC system is adopted more broadly, these intangible gains could also facilitate the transmission of commercial information to other players in the export chain such as the transport, insurance and banking industries. Improvements in security and delivery mechanisms provide a network for expanding the conduct of AQIS information transfer and business outside the arena of export documentation. These changes *'will increase the EXDOC revenue base without considerably increasing the fixed cost of providing documentation services. The outcome will be both cheaper user registration charges and lower per documentation charges'* (Commonwealth of Australia, 1999). Improvements in

security and delivery mechanisms provide a network for expanding the conduct of AQIS information transfer and business outside the arena of export documentation - an option being actively pursued by firms in the dairy sector.

Metcalfe's Law states that a network becomes more useful in proportion to the square of the number of users (Shapiro and Varian, 1999). Sometimes described as network externalities, the concept has been applied in the literature of standards where a primary concern is the choice of a correct standard. The critical aspect of the Web for eBusiness involves the network effect where the value of joining a network increases as more people join. Thus as more people use a network its influence increases and the connection becomes more and more valuable. As the value for the users increases with the diffusion of the technology it creates lock-ins and self-reinforcing effects. Expanding the installed base of a standard gives rise to an accumulated 'momentum' of the standard so it becomes irreversible (Monteiro and Hanseth, 1996).

The operations of Metcalfe's Law are apparent in the broader implementation of EXDOC which AQIS is currently extending to non-meat commodities. This will offer AQIS value-adding opportunities to:

- Increase productivity with the current 400 meat users growing to around 1600 to 2000 users
- Increase output from 12,000 to around 290,000 documents per year
- Use of existing infrastructure to accommodate this increase

4.2 The Impact of the EXDOC Implementation on Meat Exporters

'For [exporters] the benefit [of improved supply chain management] can be realized in a number of ways. It can be realized in speed of transaction, or, in the longer term, we also believe that it will give us cost savings in terms of administration within the export business'

Mike Newman, Unilever Australia's
export development manager
(Supermarket to Asia,2000)

EXDOC was initially set up in a test environment, with Canberra generating dummy notices of intent [NOI] documents, for staff to validate electronically. In 1992, meat was selected as the first fresh food export sector to go on-line. This decision followed shortly after mounting public concerns about product and documentation security in the fresh meat export sector.

In 1990 training commenced with 15 meat inspectors in sessions each day. Training consisted of a computer awareness component and EXDOC validation procedures. At this preliminary stage of the implementation a number of problems had to be overcome. 'Because they [the inspectors] moved often and many sites had no computer, they had to relearn how to use EXDOC.' Once establishments had a

trained operator there was still a problem with staff turnover. 'The 'previous people did not pass on their knowledge'. Many exporters were reluctant to invest in the required software, particularly those exporting small amounts. AQIS were aware that to get the commitment of a sufficient number of end users in the meat sector they had to address their (limited) capabilities. Thus it was only after the majority of meat exporters had chosen to go on-line that EXDOC was declared a mandatory requirement for AQIS certification. Despite these 'teething problems', an AQIS interviewee closely involved in the implementation and training procedures at the time recalled that: 'Meat went on [EXDOC] relatively smoothly'.

By 1995, the first company to have certificates produced on-line, R.J. Gilbertsons (now SBA Foods), relied exclusively on electronic submission of documents to collect data from the loading docks. Currently 90% of EXDOC meat certificates are signed electronically. Japan, a major trading partner, also accepts electronic transmission of health certificates for meat (SANCERT).

4.3 Factors Determining Adoption of EXDOC in the Meat Export Sector

Moving the documentation of statutory forms to EXDOC was a major benefit of computerisation. Exporters no longer had to worry about having to deliver papers, especially the export permit, saving on courier costs. The Meat Industry Association [now known as Meat and Livestock Australia or the MLA] reduced their control costs significantly and AQIS was able to exert more control over exports and grow EXDOC to other sectors. A manager in a leading meat industry exporter at the time of the changeover recalls: '*It was the way things were going anyway…we could see it would save us a lot of time down the track'*.

In the case of export documentation for the Australian Quarantine and Inspection Service, pressure for change from the paper-based system came from two sources. Industry was looking for simpler, more cost effective methods and government wanted to keep track of documents and improve efficiency. EXDOC was intended to lower the costs of existing exporters by making transactions easier and faster to process. EXDOC was promoted to exporters as a service supporting current systems of business rather than overtaking them.

Within the meat export sector, a strong push for change came from larger firms and representatives of the MLA. They were keenly aware of the benefits EXDOC would confer on them:

- Registration fee cut by 50% (in some cases amounting to a saving of some $40,000 p.a.)
- Communication costs cut by up to 50%
- Paperwork reduced significantly (with consequent redeployment of clerical staff)

- Data for quotas, statistical purposes available online (representing significant time savings and improved industry forecasting)

The majority of meat producers at the end of the 1980s were only *ad hoc* exporters who felt they had no choice in the matter. Whilst the small 'meaties' were '*still part of the game'* many of them were not computer-literate and could ill afford the cost involved in purchasing software and hardware. Some of the IS literature suggests that smaller companies are able to absorb technology more quickly and completely than larger enterprises (see, for example, Kaye and Little, 1996), but this was not the case for Australian meat exporters at the time of the EXDOC implementation.

There was scant evidence of a relationship between organisational readiness and adoption. As a government informant recalled *'In the early 1990's 'managers in the smaller companies had no idea of technology at all – there would not have been one computer on their premises.'* Iacovou et al, (1995), in undertaking an investigation of four firms where there was little relationship between organisational readiness and adoption of an IS implementation, explained this finding by what they termed the 'partner dependency effect' – that is, the power of a stronger partner to enroll a weaker partner in a network. The history of the EXDOC implementation strongly supports the effect a partner dependency situation can exert on the decision to adopt, *regardless* of organisational readiness.

The immediate political and social context should not be overlooked in any review of factors leading to adoption of an innovation (Sauer and Yetton,1997). In the case of the meat export sector, problems with product and documentation security were widely publicised just prior to the first implementation of EXDOC in the export sector. EXDOC thus provided a problem-solving strategy acceptable to the meat exporters *at that time*. Their initial acceptance of the EXDOC on-line documentation system and its subsequent development for the sector, (as set out in Table 4 below), provides a model of the implementation process for other export sectors and agencies.

Developmental Features of the Innovation Process	**Application to EXDOC implementation**
More elements are fixed	Electronic signature for 90%+ of meat exporter documentation
More people enlisted in relevant group	All meat exporters now on EXDOC and increasing percentage in other fresh food sectors
New relevant, social groups enrolling	Other fresh food sectors now going on-line eg dairy,fish or preparing to do so horticulture,skins, hides
Elaborating the meaning of the artifact	Subsidised education programs for other countries to utilize EXDOC eg Singapore

(after Bijker, 1995)

Table 4: *Development of the Innovation Process*

5. Conclusion

This study identified a number of factors which shaped the initial adoption of EXDOC in the meat export sector including:

- security issues at the time of the implementation
- constraints based on accommodating capabilities of all users
- the organisational role taken by AQIS
- diffusion as a self-reinforcing and value-adding effect.

Whilst the initial impetus came from the particular pressures operating at the time, other issues had an important impact on the speed and success of the implementation. The larger meat exporting firms who first took on the EXDOC system, used their dominance in the industry to 'enroll' others. Their effect on adoption was constrained by the need to accommodate the capabilities of all users and the difficulties involved in changing established trade practices in the sector.

Social networks and organisational behaviour also influenced the processes shaping the implementation of the industry standard EXDOC provided to exporters. Successful implementation of these standards required coordination of the surrounding actors, institutional arrangements and work practices. In the introduction of a technology such as EXDOC that brings benefits to all players, government agencies can choose a regulatory approach. The focus is then primarily on a transformation of the technical infrastructure of the office. Alternatively, they can act as AQIS did – as facilitators of the activities and relationships of the office-holders.. Studies of an explicitly facilitative or regulatory approach by a coordinating agency such as AQIS and its effects on implementation outcomes could provide some interesting research opportunities.

A number of opportunities also exist for wider diffusion of the EXDOC system. Organisations are influenced by developments and practices in comparable organisations in other countries. Secure on-line documentation systems for regulating meat imports and exports are likely to be of growing interest to Australia's trading partners – particularly following international health concerns related to beef imports.

Where governments implement systems such as EXDOC, the change to electronic service delivery may be perceived by business as a requirement which must be grudgingly met. It can also represent an opportunity for taking a strategic organisational approach to develop guidelines for industry. Existing internal processes can be redesigned, and company software can be integrated as a whole to interface with the organisation's own internal applications and practices. The implementation of EXDOC for exporters then becomes a means of defining what users want from a system, specifying their preferences and tradeoffs. Instead of tweaking the system to fit their part of the industry, companies can develop business rules from these definitions. Standards which work require input by organisations across industry groups. EXDOC provides exporters with an opportunity for that input.

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