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Abstract

Quality assurance and safe handling standards for perishable sea-foods are widely deployed by Australian harvesters, processors and exporters (H.P.E.). But numerous challenges exist in extending these quality and safety procedures along perishable seafood distribution cold chains. Active RFIDs open-up the possibility to dynamically monitor factors such as time, temperature and product location as well as support compliance verification processes. However adoption along the distribution cold chain has remained slow.

This case study corroborates existing research on individual firms that return on investment (ROI) is a critical decision factor in justifying on-going adoption and utilisation of active RFID technology. However, significantly the analysis also reveals that the difficulty in determining tangible ROI/pay back is intimately related to the response of other supply chain participants and the lack of clearly articulated business models for how supply chain participants should respond to the new information that active RFIDs make available along cold chains.

Keywords

Perishable foods, Active RFID Technology, ROI, Post-positivism, Qualitative Analysis

Introduction

Perishable seafood has the potential to begin deteriorating the moment it is caught, harvested, processed and/or exported. Australian perishable seafood harvesters, processors and exporters (H.P.E.s) are required to comply with quality assurance and safe handling standards based on the internationally recognised Hazard Analysis of Critical Control Points (HACCP). Unfortunately, extending these quality and safety procedures along perishable seafood distribution cold chains is difficult, not least, because other distribution cold chain participants are not under the same Australian food quality and safety standards when transporting cold or chilled seafood products. Unsurprisingly, the result is that transportation of perishable seafoods is an area where there are many potential breaks including cross-docking, outbound consolidation and break-bulking that can impact unfavourably on the product. In an increasingly competitive international landscape with ever-more demanding consumers these impacts are problematic not just in terms of the acquisition of optimum prices for produce but also for brand reputation and the future sustainability of markets.

From a technological perspective, the ability to monitor environmental factors including time, temperature and shock as well as product location and compliance verification across the whole distribution cold chain is now possible through the deployment of active RFIDs. Numerous research projects involving pilot tests have illustrated how active RFIDs can offer opportunities for supply chain participants to acquire benefits but adoption of active RFIDs remains slow. A review of the research literature indicates that most of the pilot tests continue to be conducted in the retail and manufacturing sectors (O'Connor, 2005). Indeed, despite considerable

recognition within the research literature of the need to develop a substantial theory on the economic impact of active RFID technology for quality assurance in food safety and for clear business models that identify ROI/pay back these have not been developed to date (Collins, 2004, Fontanella, 2004).

This paper presents a specific case study from an international aquaculture company in Tasmania. The purpose of this study is to analyse the use of active RFID to effectively measure and maintain product quality and shelf life of perishable foods in cold chain management. The logistics and production manager perceived that the adoption of active RFID technology had been very successful in internal processes. However, the limitation of the technology, the resistance from supply chain partners and the understanding of the nature of the technology are considered to be external drawbacks to the adoption of the technology. The analysis of this case study also indicates that ROI is a critical factor in determining the adoption of active RFID technology. Significantly the analysis highlights how the difficulty of determining tangible ROI/pay back is intimately related to the response of other supply chain participants and the lack of clearly articulated business models for how supply chain participants should respond to the new information that active RFIDs make available along cold chains.

This research paper is part of a larger study that is investigating the development of an economic model to predict the Return on Investment (ROI) on the adoption of active Radio Frequency Identification (RFID) technology for quality assurance and safe handling purposes (Keen & Thamworrawong, 2006, Thamworrawong, 2007). This broader study is seeks to understand the nature of the case for the adoption of the technology for the adoption of active RFID for environmental monitoring of perishable foods within segments of a number of supply chains. The cases cover red meat, seafood, vegetables, dairy, confectionary, food safety research, and technology service providers. In each case, at least two semi-structured interviews have been held with a company's logistics and production manager, quality assurance manager, and owner in order to determine the concerns, expectations, and desired changes of these people using active RFID technology in the supply chains of perishable foods. Analysis has revealed a variety of responses linked partly to the type of food product and particularities of the cold chain. However, this broader study has already revealed that across all cases there is limited work focused on how to implement quality assurance measures beyond individual firm boundaries along the distribution chains of these perishable foods.

All these companies recognise the critical importance of adopting HACCP compliant handling, processing and reporting procedures within the harvesting, storage, processing and exporting phases, but they do not have the capacity to do so for the planning and monitoring the distribution phases, including transport, handover to distribution centres and flow-through to retail sale. As one manager stated:

> *"I think it will do in the future … you've got to have a HACCP plan, but the transport's almost missed in the HACCP's plans at the moment"…. "What it would take is someone to get sick and it would come down to a transport problem, and then something will happen"*

Another manager also viewed that any change in quality assurance of food during transportation was likely to be driven by large retailers or by government regulations, rather than by food processors or suppliers:

> *"The new food safety standards come in later this year [2006-7] and Tasmania is actually leading the way, going to be leading the pack, that's going to prevent that from happening, they [supply chain participants] won't be able to move their products in unchilled trucks"…. "It's not going to be long before someone like a Woolworths or a Coles says for every pallet of goods delivered to our warehouse we want a chip on the pallet, I mean some of them now are receiving goods that have a little chip, radio chip that when it crosses their dock tells them what's on the pallet. It's not going to be long before that carries the same information, and they will monitor that before they receive the goods, and if it's been outside a spec they just won't accept it. That's where it's going ultimately I believe. I really do, and that is going to force it all back down the supply chain"*

Background of RFID Technology in Cold Chains

RFID technology can be divided into three types including active tags, passive tags and semi-passive. Active tags have their own power source and can transmit signals synchronously over long distances. These tags tend to be heavier and more expensive than passive tags and have an operational life of more than 5 years depending upon operating temperatures and battery type. The acceptance of active RFIDs as a sophisticated tool for global supply chain has generated commercial interest in supply chain networks as a method for potentially improving supply chain efficiency by providing effective communication across the value chain – from the point of harvest to the consumer. However, despite the potential adoption of active RFIDs has generally been slow. This may be in part due to potential barriers such as cost, global standards, frequency ranges, security and privacy concerns, legislative concerns, intellectual property rights issues, accuracy of the use of RFID, and possible health risks. It is worth emphasising that the issue of global standards remains a significant obstacle to widespread RFID

implementation. This is because numerous different standards and regulations on frequencies and radio spectrum have been adopted in different countries, which in turn has inhibited a global standard for RFID.

The focus of many installations under way in Australia is on the supply chain in retail and manufacturing. There has been greater flexibility and efficiency to production lines, warehousing and transport operations with the application of RFID. There are a few pilot tests that have been done in Australia, such as in logistics and supply chain management (Collins, 2006), animal tracking (Harrop, 2006), access control and personal identification (Mills, 2004), as well as military (Wiland, 2005). However, widespread adoption has generally been slow. As Jeffrey Russell has recently commented "a lot of our clients are still working on pilot projects at the moment… the business community here is a little conservative (when it comes to RFID)" (Jones, 2007: 1). In this context, this paper presents a case study on a Tasmanian company that processes aquaculture products and investigates in detail the factors associated with the adoption of active RFID technology for quality assurance. The case examines factors internal the firm and along the cold chain.

Company Description

ABC is an Australian owned producer and exporter of aquaculture products. The organisation has been trading for over 10 years and has a major market share of the Australian aquaculture industry. The organisation specialises in the production and processing of aquaculture products. These include both raw and smoke seafood. The products are packed in cardboard containers that are stored in a chilled environment before they are shipped via air and sea freight. The organisation produces approximately 4,500 tonnes of goods each year, with around 1,500 tonnes being exported to Asia Pacific areas outside of Australia. The organisation operates under a number of internal and external standards, but the primary one is the export control of meat, eggs and fish products, including the Australian Quarantine Inspection Service (AQIS) requirement (DAFF, 2006), SGS International Certification Services (SGS, 2006) and ISO 9002 requirements (ISO, 2006). The cold chain guideline standard applies to chilled products, that must be maintained in an environment of between -1º and 4º during transportation (AFGC, 1999). The maintenance of temperature is a prime concern in the quality control of the products. The ultimate goal of the supply chain of ABC is to add value and manage risk for customers. The supply chain of this organisation starts when fish are harvested in 1,000 litre bins. These are then processed, chilled, packed and sent to receivers. ABC operated 60 active RFID tags and 3 active RFID readers. The company had been using the technology along the entire cold chain that was from processing to the arrival at the end market destination of the various products. For the processing process, active RFID tags have been placed inside the products and data loggers are strapped on the outside to detect the internal (core) and external temperatures. ABC has also placed another active RFID tag on the outside of shipping containers in order to monitor environment factors.

Methodology

The research approach was exploratory in nature and adopted an objective ontology in conjunction with a post-positivist epistemology employing critical analysis. The objective ontology was applied as the research aims to generate a descriptive cause and effect model through an empirical explanation of the social process (Fischer, 1998). The researchers also seek to establish procedures and criteria that can support commonly adjudicated truth claims from the participants that do not depend solely on those subjectively experienced or believed realities (Phillips and Burbules, 2000). This research uses a deductive approach to understand how and why processes or phenomena occur. This is an environment in which the experiences of individuals and the contexts of actions are critical (Darke *et al.*, 1998, Silverman, 2001). A post-positivist epistemology was used due to the lack of quantitative data available because so few companies have actually implemented the technology; therefore, the researchers needed to rely on the material gathered from the participants through semi-structured interviews. Rapport building with participants was critical to the effectiveness of the information gathering, so that participants would be forthcoming in providing rich information. While, the researchers were striving for correctness and completeness in the gathering and analysis of the data, it was recognised that the knowledge of participants and the analysis techniques are imperfect and cannot produce an absolutely correct model of the impact of the adoption of the technology (Fischer, 1998) . As a result a critical analysis approach was also used to allow the researchers to differentiate things that were tangible, measurable and know-able and things that were intangible and /or not measurable.

Post-positivist analysis of case studies can employ qualitative methods as follows:

- Post-positivist case study analysis can be applied to the development of economic models, within the scope of the cases being considered (Patomaki, 2000, Demetrion, 2004);
- A range of qualitative modes of analysis can be employed: pattern-matching, explanation-building, effect-outcome explanatory matrices, critical analysis and analytic model construction (Yin, 1994);

- Deductive analysis can be used to formulate propositions and then critically evaluate these propositions against the available data. These propositions are natural language explanations of the effect-outcome relationships identified and form the basis for specification of models of relationships between identified independent and dependent variables or laws of interaction (Shanks, 2002);
- Specific techniques employed are: identification of key dependent & independent variables; characterisation of the relationships between variables; formalisation of relationships as propositions;
- An outcome is the development of normative models of behaviour, that can be expressed as models of relationships between identified independent and dependent variables (Alexander and Reed, 2006); and
- The researcher makes the effort to detect and eradicate bias by attempting to tease out the valid from the invalid uses to improve the validity of the research (Phillips and Burbules, 2000).

During the interviews with the logistics and production manager, a portable digital recorder was used as it is an essential part of the canonical practice of conversation analysis. The researcher checked the major points at the conclusion of each interview in order to avoid misinterpretation. Transcription of the digital recording was done as soon as possible after the completion of each interview, complying with what is referred to as the 24 hours rule (Yin, 1994), which ensures that the interview is transcribed while the interview is still fresh in the mind of the researcher. In order to maintain validity and rigours of the interview the data analyses of the first round interview were sent to the logistics manager before the second round interviews were conducted. This approach was adopted to confirm the accuracy of the data analysis. These interviews were transcribed, and coded using open coding, axial coding and selective coding processes (Strauss and Corbin, 1990). In addition, analytic notes made by the researcher were developed during the coding process to add clarity and meaning to the transcript, as well as helping to revise and improve the coding structure (Miles and Huberman, 1994). Then data was analysed using qualitative analysis methods (Miles and Huberman, 1994) that developed detailed interpretations of the data and considered multiple explanations of the phenomena being described in the interviews. These interpretations and explanations were then critically analysed to assess the extent to which they were grounded in the data, and also the extent to which they were mutually self-consistent and provided viable explanations of the processes and issues raised by the interviewee.

Miles and Huberman (1994) advocate the use of display formats, namely matrices and graphical networks, to support these two processes of description and explanation. In this research, cause and effects matrices have been developed to assist in the formulation of descriptions by breaking the codes derived from the data into entries in tables. The rigorous analysis of the data required in order to meaningfully populate these tables enabled the researcher to uncover many aspects of the data that were not immediately evident from reading and listening to the transcripts. Table 1 (Appendix 2) displays the Effects Matrix: Direct, Meta, and Side Effects based on analysis and discussion of the uses of active RFID technology in ABC. To assist in further analysis and to formulate explanations, a network diagramming convention was used, based on a combination of concept diagrams and causal diagrams. The causal diagrams provided greater insight into the structure of the relationships present within each case study and in particular, the development of an understanding of what was happening within each case study. In this case, an extensive analysis was conducted of the relevant transcripts in order to saturate the tables and networks with information derived from the case study data.

Analysis

Two semi-structured interviews were conducted with the logistics and production manager of ABC over a period of four months. The logistics and production manager had taken part in the initial trial implementation of active RFID technology and was building a business case for its adoption by the organisation ABC. The main reason for conducting the pilot studies was to enable temperature monitoring. It was seen as a critical factor in ensuring that the products were kept below a certain temperature at all times throughout the supply chain in order to be able to deliver products in premium condition. RFID technology has used in internal processes for monitoring environmental conditions and product core temperature from point of harvesting in order to be able to comply with the organisation and export standards and protocols on product handling. Having already moved to a more customer and quality focused approach; the implementation of this technology did not require significant change:

> *"We've used all sorts of RFID to measure the various bits of the processes. What RFID has done is make that more accessible. So it hasn't, it probably hasn't created, it hasn't prompted any processing changes, what it has done is made it much easier to confirm that what we are doing is right and it does work"…"What we manage to do is confirm what we are doing is right, and we've been able to do it repeatedly and at low cost and fairly easily"*

RFID has been used in external processes for specific issues, other than for general consignment monitoring:

> *"We use them quite a lot internally, to track products between our harvest site and here, or within our processing plants, externally use as far as the actual cold chain from here to customer, it's limited, we use them if we have a specific issue"*

However, the manager was not directly involved in the strategic decision marking; the initial adoption of the technology was beyond his control. Due to the lack of support, interest and commitment from senior management, this had negative implications for the adoption of active RFID technology. The logistics and production manager indicated that he was becoming frustrated with the lack of finances to adopt the technology:

> *"The economic rationale for RFID is essential but it's almost impossible to calculate and that's why I'm so excited that somebody is having a hard look at how to mount that argument. Ok it is a critical issue, we're asking to spent money, and I go to MD or whatever and I say I want to spend, even $5,000 or 10, 50 or 100 first question is, what are we going to get back? What's the payback? And at the moment that's a question I can't answer"*
>
> *"Well we need to know what the return is, and at the moment we have no measure of what the potential benefits are, it's a question of valuing information and putting a dollar value against information and that's very, very difficult. If we can guarantee our cold chain, will that increase sales and increase profitability? Absolutely! By how much? I've got no idea, and this is the very hard bit, this is where it becomes so difficult. So the important issue is, what's our return? How to measure our return on this investment? And measuring the cost the investment is very easy, measuring the return is the killer"…."I am a huge fan of RFID, I think it's got enormous potential, but it's demonstrating to people who don't have that background and that knowledge what the pay back is how we actually recoup our investment"*

The initial perception of the active RFID technology initiative amongst ABC was frustrating. This related to an on-going software fee, the numbering system, the inaccuracy of tags resulting in errors and labour intensiveness. The piloting also revealed a number of problems associated with the use of the technology. In particular, these involved the loss of tags, the understanding of the technology, co-operation with transporters/supply chain partners, as well as the limitations of memory and RF frequency range. At the time of the pilot, first generation of active RFID technology was involved that meant only limited storage of data points was possible. This consideration was supported by the logistics and production manager:

> *"We have had some issues with the accuracy of them. The numbering on the system is bloody hopeless, trying to refer to, find the tag oh it's the tag no. eea74b it's absolutely hopeless. So we actually set out our groups of 10 and our first group is A0-A9 and our second group is B0-B9 then group C0-C9 and so it goes, and then makes it easier to refer to"*

The logistics manager identified technical problems with the active RFID tags to be as follows:

- Numbering system was not convenient, and so the organisation used their own labelling;
- Not all tags were not correctly zeroed and while some were up to 0.5 degrees out, which was an acceptable level;
- Others were found to be more than one degree out. Some tags did not work correctly;
- Accessing system to the service provider's web site was not convenient;
- The time-based cost of access to the service provider web site, when an alternative would be to purchase the tags and the right to use the software to directly read the tags;
- The tasks to set up a active RFID tag to log was inconvenient;
- Similarly the user needed to login each time to read an active RFID tag;
- Some tags could not be reinitialised, but kept running; and
- Some tags could not turn off.

While the company did not see the loss of tags as a cost issue, the loss of the information they contained was critical. Therefore, the recovery of tags was a main issue for the company because of the value of the data they had collected. In terms of specific examples, the logistics and production manager went on to say:

> *"Getting them back and get these $18 each, if you lose them it's doesn't matter. Losing the information is critical and what we have had a lot of trouble with is actually getting the information back because getting them back or having someone with a card reader at the other end and that's a major problem, it's actually getting return information"*

In addition, the results from the logistics and production manager's comments appeared to indicate that many people fail to understand the importance of the information that active RFID provides:

> *"With these credit cards, people who receive them do not recognise the value of them. Because they see the physical object and they do not understand the value of the information in it. So they do not recognise the real value of it, so they do not treat it as an object with great value"*

Furthermore, it was thought that there had been a considerable negative attitude from supply chain partners towards active RFID technology as the logistics and production manager stated:

> *"People who aren't receivers and transporters are not prepared to handle the data loggers [RFID technology]. They see it as an imposition and they also see it as probably giving us an undue insight into their business and they are not particularly happy with in fact being asked to spy on themselves. It's pretty much how they see it"*
>
> *"The receivers and transporters are very unwilling to do that [use RFID technology] because it is seen as being intrusive; there is a mindset there that we have to get over if we have to make this work"*
>
> *"The issues with these credit card data loggers is the people who receive them don't recognise the value of them ok. Because they see the physical object and they don't understand the value of the information in it so, they don't recognise the real value of it, so they don't treat it as an object with great value"*

Discussion of Findings

The initial focus of the research was to seek to identify factors and their relationships to the core issue of ROI on the use of active RFID technology. In this organisation it became apparent at an early stage in the interview that ROI was considered to be the most important dependent variable when considering adopting active RFID technology. In terms of the benefits of the technology were not immediately experienced and it was seen more of a long-term benefit. Once again, due to the relatively short timeframe that the initiative had been implemented in the organisation, it was considered too early to tell whether a tangible ROI could be expected. These findings also identified that senior management should support and drive implementation of the technology in order to better facilitate the adoption process. The most significant benefits of the technology could be achieved in businesses that integrate logistics activities directly into existing business processes. This often requires changes to internal business processes. The magnitude of these changes was dependent on how active RFID was used by the organisation. With respect to the external processes, the organisation has not done as much consignment monitoring as they would like to have done due to the limitation of the technology, co-operation of supply chain partners and lack of understanding of the nature, type and range of information that can be held by active RFID technology.

From reviewing the preceding discussion the common theme regarding ROI on active RFID technology was that it was a long-term investment and the organisation should not expect to see high level returns in the immediate future. The other aspect of ROI that was prevalent within ABC was the view that the benefits of ROI were experienced through more indirect meant that than the results that active RFID delivered. The ROI for the organisation undertaking active RFID technology should be assessed through both traditional and more intangible benefits, as the intangible benefits may have follow on effects that may deliver returns through efficiency gain within other business activities.

The logistics and production manager identified the issues associated with ROI on active RFID technology as below:

- ROI was absolutely an important issue with active RFID technology;
- The company needed to balance the investment decisions on RFID technology with capital expenditure, development of new products and the expense of marketing campaigns;
- The up-front cost of implementation of active RFID monitoring was only part of the cost;
- The intangibles associated with active RFID technology made it a more difficult investment decision;
- There was a concern of how to effectively evaluate the ROI and pay back period;
- The economic rational for active RFID technology was essential, but was impossible to calculate; and
- All questions of investment in the technology ultimately came back to estimating the extent of ROI.

Key issues identify the factors in the determination of ROI are:

- The measurement of potential benefits;

- Question of the value of the technology;
- The value of the data collected by active RFID; and
- The ability to increase sales and profitability by monitoring the quality control of the company's cold chain.

The logistics and production manager identified the following issues:

- He was aware of the use of active RFID technology for time-temperature monitor of perishable in transport and had conducted limited trials with that technology;
- He appreciated the potential such time-temperature monitoring offered the organisation, both in terms of quality assurance during transport and also to manage the risk of loss or spoilage of food and the risk to public health of incorrect handling and storage;
- He understood that there was a need to develop a business case to financially support the adoption of time-temperature monitoring, but had taken only limited steps to formulate that business case;
- He considered that the current quality assurance measures in food processing were adequate and did not necessitate the expansion of these to cover the handling and storage of processed food during transportation; and
- He saw resistance to the introduction of active RFID technology from both logistics service providers and supply chain partners; because they feared that their operations could also be monitored.

Most notable were the positive attitudes toward active RFID technology. It appeared that the drivers of the adoption of the technology were business objectives and corporate strategies. Being interested in the use of the technology, Organisation ABC had begun an extensive planning process. However, the logistics and production manager identified negative aspects of active RFID technology, such as the limitation of the technology and the difficulty in determining a real ROI. In addition in his view, the technology was relatively new and supply chain partners did not see the value of the technology and also the value of the data inside RFID tags.

Key Effects-Outcomes

An analysis of the interview with the logistics and production manager is shown as a network of cause and effect relationship in Figure 1 (Appendix 1). Each of the nodes in this network was derived from concepts identified from the coding of the data. Causal relationships were used to link these concepts, based on a detailed analysis of the transcript of the interview with the logistics and production manager. Only causal relationships that had been identified by him were included in these diagrams. The strength of these causal relationships was coded as "very strong" and "strong". These were established on the extent of emphasis placed on the relationships by him.

- The internal input factors identified in the analysis of the interview for the ROI part of the overall costing model, includes balancing retail price setting against consumer demand; measure of potential benefits; and value of RFID technology.
- The internal outcomes identified in this analysis are the ability to: monitor the core temperature of the products; monitor temperature during processing; monitor the environmental temperature; guarantee correct handling procedures have been followed; and to repeat monitoring at low cost and ease of use
- The external input factors identified in the analysis of this interview are: value of the data collected by the tags; recovery of the tags in shorter times is more useful; opposition from transport carriers; the ability to estimate the value of the data in RFID tags; and frustrations with the limitations of RFID technology.
- The external outcomes identified in this analysis are the ability to: maintain the temperature; confirm the current handling conditions are correct; improve supply chain management of products; and the ability to increase profits.

From previous experiences with the pilot test studies with active RFID technology, the logistics and production manager saw the technology as a means effectively doing business. From having an intensive with the pilot test he was preparing a business case to support the adoption of the technology. ABC operated in a high risk environment where the level of risk was not only confined to internal processes but could include the external supply chain as well. While it had implemented active RFID technology for a short period of time the overall perception within the organisation was resoundingly positive and enthusiastic. However, the limitations of the technology were seen as a barrier to the adoption of the technology; therefore, the organisation was waiting for the next generation of active RFID technology.

Conclusions

This case study describes an international aquaculture producer that has a well defined quality assurance strategy and customer orientation. The case demonstrated that the difficulty of being able to clearly demonstrate a ROI based on the adoption of active RFID technology was a key issue put forward by the support from senior management. The overall perception within the organisation regarding their active RFID pilot test was resoundingly negative with the technical limitations of the technology, the resistance from supply chain partners and the understanding of the nature of the technology. More generally, while the finding of ROI remains a major inhibitor to adoption and utilisation of active RFID technology, it is evident that many researchers/organisations are attempting to develop a clear documented case for calculation of ROI. There is recognition that there are cold chain quality assurances and safety issues problems for sea-foods, but all partners in the cold chain must be prepared to embrace RFID technology which still has some problems but is evolving rapidly. As well, the use of RFID technology must be approached from a business perspective, whereby financial models such as ROI can be applied.

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Appendix 1

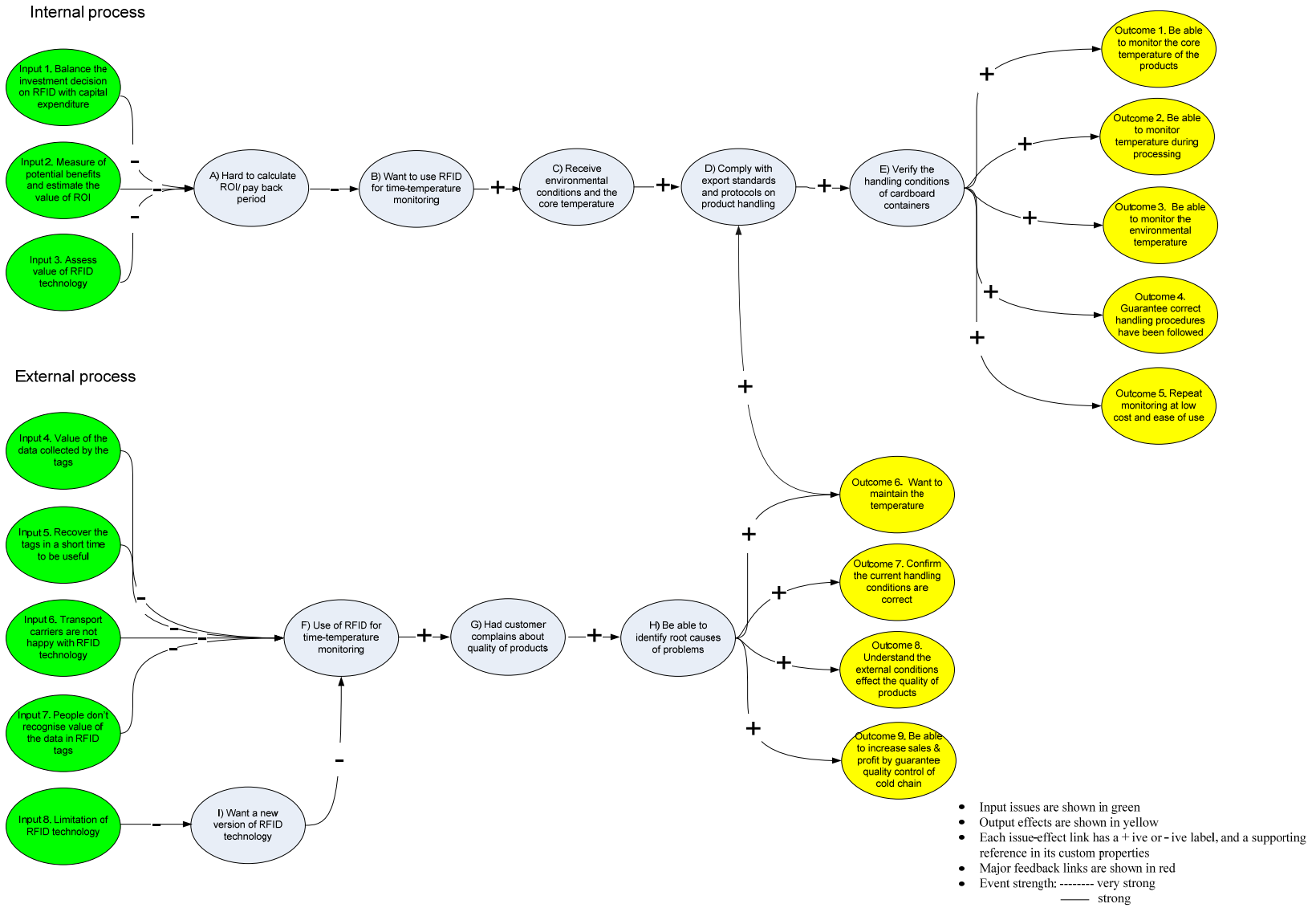

Figure 1: Model of issues-outcomes showing graphical relationship between above issue

Appendix 2

Table 1: Effects Matrix: Direct, Meta and Side Effects: Organisation ABC

Perspective	**Direct Effects**			**Meta Effects**			**Side Effects**		
	negative	**neutral**	**positive**	**negative**	**neutral**	**positive**	**negative**	**neutral**	**positive**
Application objectives (as interpreted by the researcher): *Systems*	*But it is demonstrating to people who do not have that background and that knowledge what the pay back is; how we actually recoup our investment (15-18)* *(The payback period on RFID is the key issue)*		*I am a huge fan of RFID, I think it has got enormous potential (15)*	*The problem is it's very difficult to establish what the economics of it are. . I couldn't mount the another side of the argument I couldn't make the other side of the case (361-362)* *(The calculation of ROI is not simple)*					
Relationships	*With these credit card data loggers, the people who receive them do not recognise the value of them (122-123)* *(People do not recognise value of data loggers)*			*Because they see the physical object and they do not understand the value of the information in it so, they do not recognise the real value of it, so they do not treat it as an object with great value (122-126)* *(People discard value of data loggers)*					