Knowledge Value Chain: Implementation of new Product Development System in a Winery

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Abstract: The paper discusses the positive influence that knowledge creation exerts over organizational performance in regard to collaborative learning environmental and quality uncertainty. The paper shows the Knowledge Value Chain (KVC) would be the best means of expressing the environment and quality condition into corporation rather than the normal value chain and the former is thus becoming more important and significant method of implementation. The Knowledge Value Chain (KVC) will be worked as a model of the knowledge management framework. In a sense, KVC will provide more details how being incorporated with the environmental factors to success the corporation requirements. Eventually, KVC will also discuss how it enabled the corporation improve and develop the most competitive advantage position. As such, it will be widely used worldwide in future as an effective means of corporation management and sustainable development.

Keywords: Knowledge value chain, knowledge management, action research, new product development, alcoholic dinks industry, Australia

1. Introduction

In Australia, an increasing number of manufacturers are using New Product Development (NPD) systems not only to enhance quality or reduce their operating cost but also to address a variety of issues relating to environmental management. To this end, these corporations have to collect more intangible information and knowledge related to a more diverse set of engineering requirements. Some corporations have signed up to the voluntary National Packaging Covenant (NPC)[1], which has been endorsed by the Federal Government as a cooperative vehicle for achieving improvements in environmental management. These initiatives are contributing to the development of a renewed knowledge value chain (KVC) that, in turn, underpins the core competencies of the affected corporation. This reinvigorated KVC, as described in this paper, assists the Winery in defining customer requirements, improving conditions for workers and staff, and heightening corporate sensitivities to the environmental policies of governments and the desires of customers and the community.

It is important to distinguish between information and knowledge: the former includes data, graphics, and text, whereas the latter encompasses human feedback and collaborative learning (Wong 2003a). Knowledge is derived from information, through reading, learning-by-doing, and other forms of practice. In addition, if a person does not understand how to apply knowledge in practical situations this means that information still persists in its original, untransformed condition (Ching 2000, Daghfous 2004, Wong 2003a and Powell 2001). Without knowledge implementation, organisations can neither achieve their communicative goals nor protect the environment.

2. Methodology

The exploratory case study methodology was used for this study concerning environmental issues affecting New Product Development (NPD) at a South Australian winery in its packaging supply chain. The case study investigated issues such as International Organisation for Standardisation (ISO) standards, product stewardship, company mission, the "clean and green" image and the National Packaging Covenant (NPC) incorporated in New Product Development (NPD) and in building up a robust framework of KVC for this Winery.

For this research study, the single exploratory case study research methodology and the effective data collection process were undertaken prior to defining the research questions. These research and interview questions focused on the "what" and "how" questions. Yin

[1] The more details of National Packaging Covenant (NPC) can be found by this website. http://www.packcoun.com.au/

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(2003) notes case studies are the preferred strategy for studies dealing with "how" or "why" questions. The classifications of these questionnaires were the first priority for the researcher, and helped to focus the study's purpose. It was not necessary for the purpose of the study to be clarified when research was first conducted; however the stated purpose was the success on which it will be judged. Yin (1994) provides a checklist of the case study research design as follows:

1. A case study's questions;
2. Its propositions, if any;
3. A case study's unit of analysis;
4. The logic linking the data to the propositions; and
5. The criteria for interpreting the findings.

Based on the checklist, these research questions were designated as "what" and "how" and determined the relevant strategy to be used for the study. Yin (1994 & 2003) states the exploratory study may not need to have a proposition. The unit of analysis is a critical factor in the case study (Tellis 1997) and the unit of analysis for the study can be an individual, a community, and an organisation. One of the South Australian Wineries was selected as the unit of analysis focused on the Winery packaging supply chain system. In line with the last two points from Yin's research design above, points 4 and 5 were not well-developed in this case study, as these case studies were fully represented in report format, and in how the data was collected and analysed.

The methodology adopted herein provided evidence of the validity and reliability of the data collected for the study, with reference to everyday situations and problems affecting the Winery. The processes of data collection included the use of semi-structured interviews, the preliminary contact and confirmation of interviews, and the transcribing of interviews. Further, it also involves the respondents, data analysis and the analytical techniques employed for sorting the data. Finally, all the details of information were also carried out in collating and interpreting the data for identifying important themes and patterns of useful knowledge in the study.

The modified KVC model is used to generate the useful knowledge of how being incorporated with the environmental issues to enable the Winery requirements for their new product development processes of the products.

3. Knowledge Management (KM) IS

In recent years, it has become harder to extract the knowledge required to meet customer requirements in mature markets such as those of Japan, Europe, the U.S.A, and Hong Kong etc. Increasingly, benchmarking activities must go beyond issues of cost or sustainable mark-ups to focus on a variety of service criteria. In recent studies, Twigg (1998), Desbarats (1999), Ching (2000), Soley (2003) and McLennan (2000) have argued that the improved supply chain can overcome supply shortages and demand shortfalls by providing information. That information includes time-to-build specifications and direct knowledge of customer requirements that enables corporations to rapidly and effectively differentiate their services, products and brands from those of their competitors. The notion of Knowledge Management (KM) implied by these authors is one involving the constellation of processes that are used to control the creation, dissemination and leveraging of knowledge to fulfil organisational objectives. Berawi (2004) states KM can address the critical issue of organisational adaptation, survival and competence in an evolving environment.

Thus, knowledge management (KM) enables workers and staff at every level of the organization to access and add as much new information as possible to what they already know within their respective fields of work (Claycomb 2001 and Donnellan 2003). Additionally, Gupta (2002) and Roy (2003) states that KM can also reduce complexities in the environment caused by globalisation, address loss of knowledge owing to poor staff retention, and reduce complexities in relation to mergers. It has the potential to improve the quality of life for both workers and customers and to assist in the development of new products and processes. From this perspective it can be seen to encompass implementation of ISO standards on quality and environmental management, in production, waste

management and service delivery. Furthermore, this paper argue that the creation of a robust and stable KVC is thus a reasonable goal of organisational design and operation, which should influence the structure of organisation, and the development and application of new technologies. It should enable knowledge workers to deliberately leverage their creativity and abilities so as to deliver business and community value to the organisation. As a matter of fact, the knowledge assets need to be managed, stored and implemented more effectively in order to achieve the competitive advantages issues for the Winery.

Nonetheless, as I create any new or extended tool for knowledge management, I have account for two different types of the knowledge modes; namely, tacit and explicit. Under this study, the KM system, it enables gathering and storing of useful knowledge and can be representing in both tacit and explicit ways to the expression of knowledge in order to provide a useful resource for locating and contacting with reference to anyone and anywhere within the Winery activities. This distinction will be examined in details in the next section of this paper, drawing on notion of *knowledge creation* as defined by Nonaka and Takeuchi (1995), Berawi (2004) and Ching (2000).

3.1 The distinction between tacit and explicit knowledge

The distinction between tacit knowledge and explicit knowledge has sometimes been expressed in terms of 'knowing-how' and 'knowing-that', and at other times in terms of a corresponding distinction between 'embodied' knowledge and 'theoretical' knowledge (Polanyi, 1958, 1966 & 1974), respectively.

Both tacit and explicit knowledge will be used in a Winery. 'Knowing-how' or embodied knowledge is characteristic of the expert, who acts, makes judgments, and so forth without explicitly reflecting on the principles or rules involved. As such, it is not easy for others to share in their knowledge or for it to be interactive. Under this circumstance, the study is to identify the tacit knowledge in areas such as participants working experiences, and skills to be contributed.

In contrast, 'knowing-that' involves knowledge that is consciously accessible and easy to convey to others through explicit instruction, recitation of rules, or attention to perceived actions, and so on. This then becomes interactive and an agent for change. In this study, the explicit knowledge can be used in encouraging the participants to share their knowledge in such as annual reports, technical documents and standard manual from there manufacturing areas.

Additionally, this Winery's innovation involves both types of knowledge. As identified by Nonaka (2000) and Reber (1995), this study is referred to the knowledge innovation spiral (see Figure 5) that emerges when the interaction between tacit and explicit knowledge is enhanced and thus evolves dynamically from lower levels to higher levels of understanding within any given entity or network of entities.

4. Implementing Knowledge Value Chain model

4.1 Value Chain

As adopted by Porter's value chain model that can be found in his book *Competitive Advantage* (Porter 1985). Generally speaking, it can be defined as a series of related activities that can be combined together to produce end-user advantages as illustrated in the simplified example below:

All manufacturing processes must commence by using raw materials that are transformed into work-in-process at various successive stages of completion (Humpherys 2001), before being turned into finished products to be packaged and distributed overseas or locally. At each stage of the process various components of cost and value-added are accumulated, to meet customer requirements. Obviously, it is desirable that at across the entire value chain more value would be added than cost. Otherwise, each of the stages must be re-engineering.

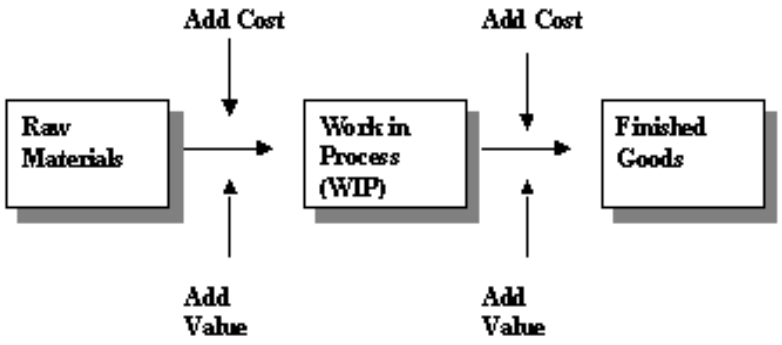


Figure 1: A value chain model

In contrast, the KVC commences with the acquisition of knowledge rather than raw materials or resources and ends with knowledge action and dissemination (Collins 2002, Donnellan 2003 and Ching 2000). Here, the focus is on transforming knowledge into new product development for the Winery within a given time horizon.

4.2 Implication for the modified Knowledge Value Chain model

Adapted from Ching (2000), the modified KVC model in this study, it consists of six different core stages of activities alongside seven key transformation steps (see Figure 2). These steps are knowledge acquisition, knowledge innovation, knowledge protection, knowledge integration (intelligence), knowledge dissemination and knowledge action. Each stage requires the transformation of inputs into outputs, and the latter are becoming the inputs for the next stage in the KVC. Once again, at each stage of the transformation choices can be made to add to or destroy value that depends on the implementation for the study.

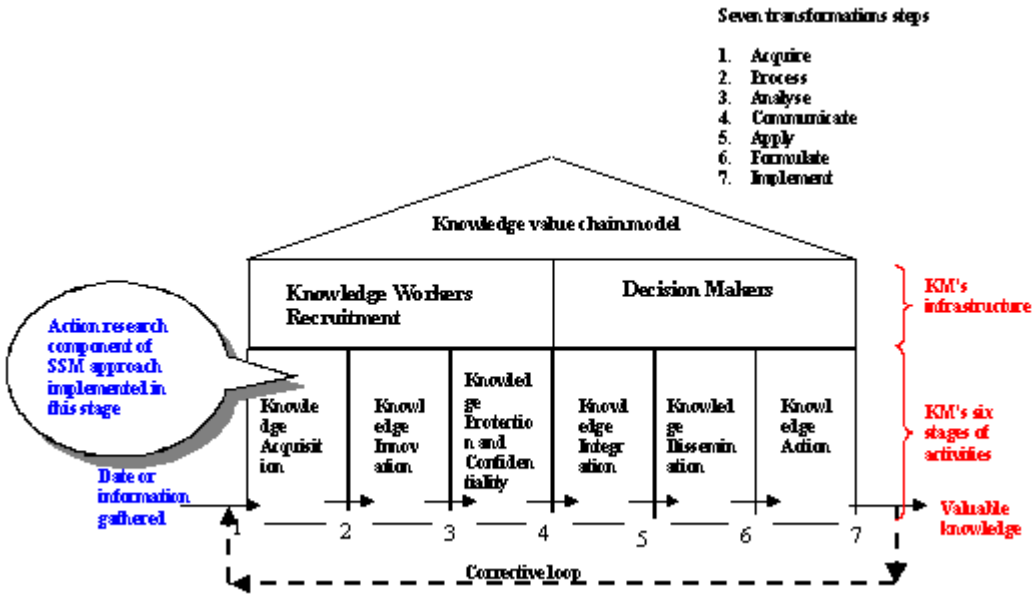


Figure 2: The modified Knowledge Value Chain (KVC) model

Using Yin's Model of the exploratory case study research approach was adopted for the study as mentioned earlier. Yin (2003) states three effective ways of collecting qualitative and quantitative data. These three ways are (1) multiple sources of evidence, (2) collecting relevant data from the semi-structured interview questions, and (3) establishing a chain of evidence adopted for the study. Additionally, Yin (2003) and Stake (1995) strongly recommended the use of this method for

data collection as it enhances the reliability of information of the study by adding value to the research.

Figure 2 shows that the modified KVC model as adopted herein encompasses the mere two key components "knowledge workers recruitment" and "decision makers" of the part of management, with each playing a vital role in the overall knowledge management (KM) process. The six stages of activities will now be reviewed in more detail in relation to the environmental management issue as follows.

4.2.1 Knowledge workers recruitments

In this study, the core component of knowledge worker recruitments of the modified KVC model consists of the external and internal participants who contributed to this study. All external interviewees (suppliers) were qualified with experience in environment and management. All internal interviewees (the Winery's staff) provided invaluable supports and information to the researcher issues such as environment, quality, marketing, packaging, and production in relation to the Winery. Particularly, the Winery also provided some information of how they were working on the reduction of energy consumption areas and the improvement progress of the NPC action plan.

Importantly, recruiting knowledge from the internal and external participants for the Winery is a main activity used for the long run competitive advantage situation. The purpose of this section was not merely to collect relevant and invaluable data from all participants; it also recruited all participants by using their data and knowledge to "tell other people about the story of the study". Therefore, the information or data gathered from all participants, they all are transformed into knowledge when the researcher reads, understands, interprets and applies the information into a specific work for the Winery. Finally, the knowledge workers (and the researcher) involved also have to understand and improve their effectiveness that need to know what happens after all knowledge transfer for the study.

In Figure 2, it shows that core component "knowledge worker recruitments" consists of three stages of activities working together; these are knowledge acquisition, knowledge innovation, and knowledge protection and confidentiality that will be discussed in the following sections of the paper.

4.2.2 Decision makers

Decision makers make reliable and effective decision to acquire the target company and to achieve the corporation mission. In employing the useful knowledge alongside with the modified KVC model, whereby, the study herein gives decision makers the right direction improve the appropriate packaging for the final products and processes with the reasonable environmental and quality standard needed. In addition, the entire term of decision makers also have to understand and improve their effectiveness and need to know what happens after all knowledge transfer in relation to the final decision in what they have decided for the new product development in the Winery's study.

Decision makers also have access to the last three stages of activities in the modified KVC model. In other words, the decision makers are not enlighten to the knowledge transfer process in the final stage of knowledge action factitively so they have to go back to the first stage of activity to gather other information and knowledge to be reused and redo the entire activity's loop again or called corrective loop (see Figure 2) until the knowledge are qualified by decision makers.

4.2.3 Knowledge acquisition

In this first stage of the modified KVC's activity, knowledge workers who have been recruited will start searching for and gathering the data related to the given study. For purposes of environmental management, data could be collected through interviewing key internal staff within the organisation and external suppliers who supplies raw materials and components (Yin 2003). Successful knowledge transfer processes from one organisation to others have been identified as a main vehicle to the organisational performance in many studies (Soley and

Pandya 2003, Bircham 2003, and Roy, Parent and Desmarais 2003).

As discussed above, this study is to illustrate the company, a large wine-maker, must take on Product Stewardship Obligations under the Australian NPC. These obligations impose a requirement for transformation of the company's existing New Product Development System. Initially, letters and e-mails were sent out to suppliers, explaining the aims and objectives of the NPC and new product development study. Here, the objectives were to invite participation and to indicate the overall every of support for the study emanating from the company's senior management. Indeed, the letters and e-mails also made it clear that any responses would be treated in the strictest confidence (read Section 4.2.5 to have more detail) such that no single interviewee could be identified on the basis of their transcribed responses. In addition, the letter of consent forms to be signed by the participants would accompany this handout, as the interview was about to proceed. Letters of consent were to reflect the variety of modes of engagement for each of the participants—for both communication and interviews.

> *"Having a good beginning, having a half way of a success process"*

The interview questions (Yin 2003 and Bircham 2003) elicited information about the knowledge interviewees possessed about new product development, environmental management systems, and product stewardship. Follow up information was requested about detailed breakdowns on environmental impacts and costs.

As mentioned earlier, knowledge can be classified into two different modes: tacit and explicit. After data collection has been completed, the transcripts and additional information must be analysed so that it can be converted into valuable and meaningful knowledge for the company. Furthermore, a useful framework for analysis is provided by the Action Research (AR) tool, which can be deployed in two ways. First, it can underpin our research methodology as a metaphor for social inquiry, problem-solving and interactive transformation of the company. Second, it can be used as a vehicle for the analysis of existing practices around product design and development. AR is informed by the well-known Kölb cycle that has four iterative stages: observation, reflection, planning and action (see Figure 3):

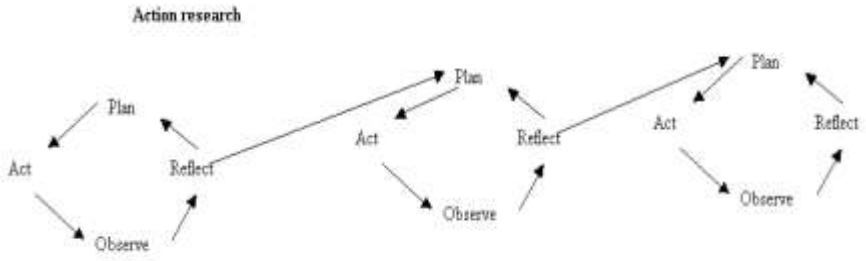


Figure 3: The action research component of soft systems methodology

The AR process is underpinned by a belief in individual potential (Weinstein 1999), as reflected in self-guided learning through practice, application and inquiry (into what is happening to us and around us). In addition, I have to allow for sufficient time to identify the question, understand what it entails, and then to reflect, gain insight and then consider how I should act in future, albeit in a thorough and structured way.

4.2.4 The role of Soft Systems Methodology (SSM) in AR

Checkland (2000) states that soft systems methodologies (SSM) are more appropriate when dealing with fuzzy, ill-defined (soft) problem-oriented situations (for example, those involving cultural considerations and qualitative aspects of stakeholder value). Nevertheless, SSM is also seen to encompass well-defined (hard) systems. In certain circumstances SSM applications can be broken down into

both hard and soft system components, with each supported by a different combination of qualitative and quantitative metrics. From an environmental management perspective, the hard system component would include technical aspect of green engineering concept in this study. The concept of green engineering (GE) can be defined as a framework that applies environmentally conscious attitudes, values and principles, in association with relevant science, technology and engineering practices, to the objective of improving local and global environmental quality. GE thus encompasses all of the engineering disciplines and is consistent and compatible with sound engineering design principles. Additionally, the Winery has accreditation from the ISO 14001 environmental management system (ISO 14001 EMS). Under ISO 14001, all environmental risk factors must be assessed, priorities for action must be determined, and risk management strategies must be developed and documented. Hence, they all were gathered for using in this stage of the modified KVC model in this study. This ISO standards-based approach to environmental management is primarily concerned with documenting actions and monitoring strategies. Existing systems that support new product development (NPD) and process improvement must still be reviewed and upgraded later.

On the other hand, the soft system component would include broader knowledge management (i.e. social aspects of collaborative learning). In Checkland's model the AR cycle is combined with an interpretative framework, which acknowledges that participants interpret the problem situation through the lens of different worldviews. Thus, the individual learning cycle based on observation, reflection, planning and action is re-conceptualised as a social process (taking a global view), which is now directed at finding an accommodation across various groups drawn from different functional areas within the organisation. The Winery has significantly reduced some energy consumptions in packaging department by using an effective AR and SSM approach (Wong 2003a).

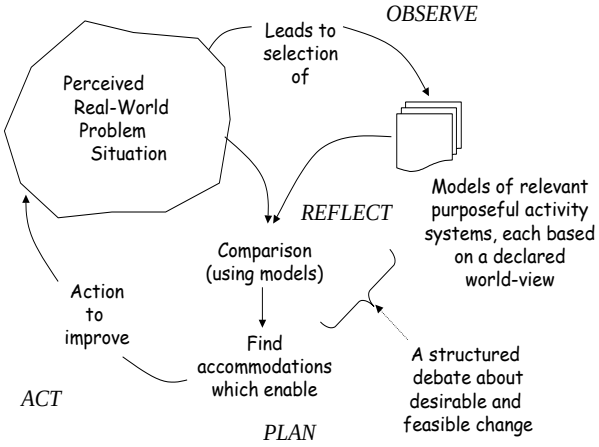


Figure 4: The Kölb Action Research cycle modified to incorporate SSM

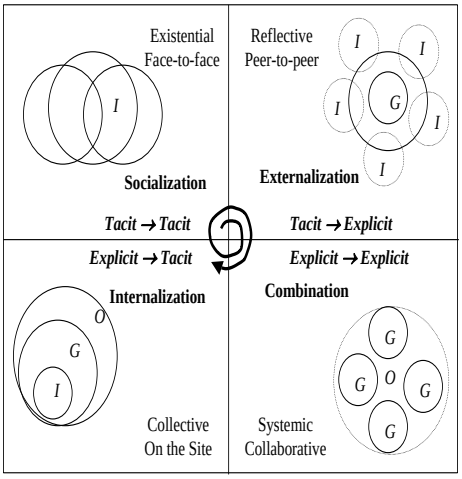
In the case study, the action research cycle as modified by SSM provides a schematic picture of how the researcher intends to deal with the Winery. Information that is gathered will provide the material for on-going reflection and collaborative evaluation. In some respects, Checkland's methodology can be used as an ideal benchmark for the assessment of actual procedures and deliberations. At a later stage, the researcher may be able to conduct further interviews with representatives from the company and its supply chain to evaluate how successful the project has been in their eyes.

Within the action research cycle used in this study, it is essential to recognize the question, observe and understand the situation, so that we can plan, then act, and finally reflect on what has occurred with a view to gaining additional insights into how best to act in the future. When applied in a soft systems context each group within the Winery will first observe the situation in relation to their own worldviews. The stage of reflection then

entails a comparison of these different interpretations to achieve an accommodation realized through a structured process of debate This planning stage then leads on to a set of actions focusing on how best to improve the situation. After having done action loop by loop again, the quality and useful of knowledge will come out to be ready for the next stage of activity. As a consequence, knowledge must be learnt both from this direct experience and through trial and error and concurrently through both mental and bodily modes of experience.

4.2.5 Knowledge innovation

Nonaka (2000) construct a four-way taxonomy of knowledge transfer and conversion based on socialisation (from tacit-to-tacit), externalisation (from tacit-to-explicit), internalisation (from explicit-to-tacit), and combination (from explicit-to-explicit) as shown in Figure 5. This process of knowledge creation, in turn, depends on four different kinds of learning relationship that are set up between the individual (I), group (G) and organisation (O) (as depicted in the following diagram). Under this study, as the knowledge innovation process is well managed the knowledge created by individuals, it can amplify both within the organisation and across inter-organisational networks or clusters. Organisational overlap and redundancy can also be deployed to improve cross-functional collaboration and experimentation within the organisation. The knowledge innovation spiral emerges when the various learning interactions are elevated dynamically from the lower level of knowledge to higher levels, as depicted in the following diagram (Nonaka 2000, as modified by Juniper 2003):



Source: Nonaka, Reinmoeller, and Senoo, 2001

Figure 5: A four-way taxonomy of knowledge transfer (Nonaka 2000).

The Nonaka's structure of four-way taxonomy of knowledge creation is adapted for this new product development of the Winery's study. The "socialisation" knowledge creation mode requires "face-to-face" interaction for the tacit to tacit knowledge that focuses on collecting the annual reports, environmental reports, details of company mission and vision and NPC action plan from each participant due to the difficulties to communicate and formalise in some situations in this study (Nonaka 1995 and Donnellan 2003). The "externalisation" knowledge creation mode requires "peer to peer" interaction for the tacit to explicit knowledge that focuses on the semi-structured interviews with relevant participants from both internal and external in relation to the study's knowledge for this study. The "combination" knowledge creation mode requires "systematic collaborative" interaction for the explicit to explicit knowledge that focuses on the interviews and meeting with the environmental group members within the Winery in relation to the environmental knowledge such as the EMS, policy and reports to be used for the study. The reason is this study has to use the parameters gathered and test for transferring to the new knowledge that must be alignment with the Winery's environment management system. At the last stage, the "internalisation" knowledge creation mode requires "collective on the site" interaction for the explicit to tacit knowledge that focuses on coding the knowledge and information gathered from all participants, and enables them to be transformed to further explicit knowledge

or data can be re-used for the EMS system or other systems within the Winery.

4.2.6 Knowledge protection and knowledge confidentiality

Knowledge, especially of a tacit kind, is difficult to evaluate or measure. However, tacit knowledge is much easier to protect. Through this right of legal action against infringers, intellectual property rights (IPR) no doubt afford the best form of protection against actual and potential theft of explicit knowledge. However, certain forms of IPR may promote collaborative learning because they support the development of knowledge-based assets. These IPR can also be supplemented by other protocols and policy guidelines, which recognise investment of resources in collective forms of learning. For instance, once a proposal has been discussed in a group collaborative environment, it should then be protected immediately by IPR.

Recent studies were conducted by Twigg (1998), Trueman (1998), Muffatto (2000), Rahim (2003) and Yin (2003) who adopted the case study approach successfully to collect the data in their studies. Indeed, all authors used the same method before commencing their project or writing up their findings for their study and all were progressed through the ethical stages to write up the formal consent form that involved a brief explanation of the study.

After obtaining approval from the ethics committee, the research study design was appropriately covered by the University's insurance policy to cover the study of the Winery, participant's interviews and the Australian ethical standard conditions. Furthermore, the right to privacy of the individual participants and the Winery were protected.

4.2.7 Knowledge integration

Knowledge Integration is the first stage of activity appearing in the "decision makers" section of the KVC model. In this crucial stage, knowledge that has been developed in the mind of the knowledge worker is transmitted to a decision-maker. To successfully communicate and link the two principal sectors of KVC, for instance, the "knowledge workers recruitment" and "decision makers" core components, there needs to be adequate organisation and summarisation of the materials. Information, data and knowledge must be accurately sourced with thorough analysis, conclusions and recommendations. There then must be successful communication and interaction between both to ensure that the knowledge is integrated and actuated effectively.

Furthermore, the Winery receives the knowledge from these participants of years of their experience in such things as manufacturing, packaging and service (Selen 2001 and Claycomb 2001). And this knowledge gathered from the environmental meeting of the Winery. Integrating the knowledge gathered from internal and external that all just passed by the previous stage of the modified KVC model, they must compile with the current ISO 14001 EMS and environmental standard and the requirements of the Winery. Otherwise, the knowledge must be useless for the any purpose.

This cumulative experience from various resources is used together with information gathered from outside sources such as open-ended interview questions, and the environmental report from each participant that can be suitably integrated into the modified KVC of the Winery. Finally, it also depends upon how people make the decisions on how to translate this raw knowledge from the information obtained from the previous stage, and then convert it into actionable knowledge that is in regard to accurate understanding of their environmental business context. This is then used to project into possible foreseeable scenarios. The next step is to disseminate the knowledge to the personnel concerned.

4.2.8 Knowledge dissemination

"Decision makers" firstly disseminate the knowledge and analysts use it to make decisions for the Winery. These decisions may involve resource allocation such as where to increase or reduce investment. This stage before the final action is to further develop the knowledge base by creating an environment of shared input before the action stage. As such, this stage is finding better ways to have the quality of knowledge for the Winery to bring the useful idea and particular to the complication of environmental issues for the organisation and the customer perspectives to the markets, especially,

the European market. Indeed, the knowledge dissemination illustrates that the people and stakeholder realise that the Winery has highly qualified and professional in environmental areas of people to access the usage of knowledge based model. This is fully supported by the Winery's NPC action plan, environmental mission and vision, and the Winery is looking forward to the future investment and innovation for extending their business.

This stage is very close to the end of results. However, the system may need to plan and execute some actions for the final stage of the modified KVC model to take the action that embodies the decision. This establishes the formula for further action and policy development within the Winery.

4.2.9 Knowledge action

This is the final stage of the modified KVC model. The knowledge action stage is the sophisticated integration and collation of all knowledge and information for the study requirements, that all have been organised and analysed through these previous stages and seven processes of KVC. This stage therefore represents the synthesis of all previous steps.

As a result of that, this stage is taking the action to implement the valuable knowledge into three different group members namely, environmental group, marketing group and packaging group, then later summing up and monitoring their significant comments to make the final decision and to help them to overcome their previous knowledge deficiencies and continuously develop a fuller understanding to address problems and find solutions. The Winery, in its minds, has found a great deal of ability and responsibility to reduce the environmental impacts of their new product development. After implemented the knowledge fertilisation in six different stages of activities, it is time to illustrate the final stage of the process and implicate it to the Winery's NPD process.

5. Discussions with the modified KVC model

This Winery is located in South Australia. The Winery is voluntary signatory to NPC and encourages their employees to contribute to the achievement of the principle of NPC for its shared product responsibility and product stewardship by throughout the conscious relationship of the entire supply chain in order to minimise the packaging waste.

In addition, the Winery has made up the action plan in recent years that show people and shareholders how they gradually achieve to the objectives of Australian NPC. The Winery will not only satisfy the state policies that is under the NPC requirements, and the Winery is also acted as a vehicle to put more focuses on addressing the environmental concerns associated with packaging cost compared with other wineries in the year.

Figure 6 shows the relationship between the modified KVC model and packaging group, environmental group and marketing group and the final stage of new product development for the Winery product. It also illustrates the stages of how they are working together to make contributions to the development and the promotion of a reliable profit margin in their new product development. By working through Figure 6, it shows how these stages have an effect on the normal information or data format to become the valuable knowledge used for the Winery after implementing the modified KVC model. During the processes of transferring the knowledge, it flows through the action research and SSM loop from the first stages of activity "knowledge acquisition" of the modified KVC model to reach the final stages of activity "knowledge action". The detailed of this process can be found from previous section 4.2.3 to 4.2.8.

Moreover, the core components of "knowledge worker recruitments" and "decision makers" need to be effectively incorporated into the company policy, environmental issues and mission, all of value-added processes into knowledge of acquisition, innovation, protection, integration, dissemination and action in order to incorporate with new product development to formulate the final outcome and improve the overall value of the business in particular to the packaging section of the Winery.

It is important to implement the modified KVC model into the company's decision-making processes to effectively reduce the

cost for the Winery. As shown in Figure 6, groups' namely environmental group, packaging group, and marketing group are interrelated. The three expert groups will monitor the knowledge carefully from the "decision makers". If they all are passed through the internal policy and in compliance with the 14001 EMS requirements (that is current management system using in internal environmental group within the Winery), the knowledge and comments of the environmental group members regarding the products that will then share with marketing group and packaging group for further discussion and make adjustments. Importantly, these groups have to add the "knowledge" in parallels with the Winery's action plan, mission and vision in relation to the "green and clean" image for their new product development. Finally, all three groups are to satisfy the results with the knowledge that is provided by this modified KVC model. Now, the packaging department will sum up all relevant knowledge and results from the other two groups, then the final products will be packed by packaging department and passed on to the NPD of the final stage of this paper to be ready for the market.

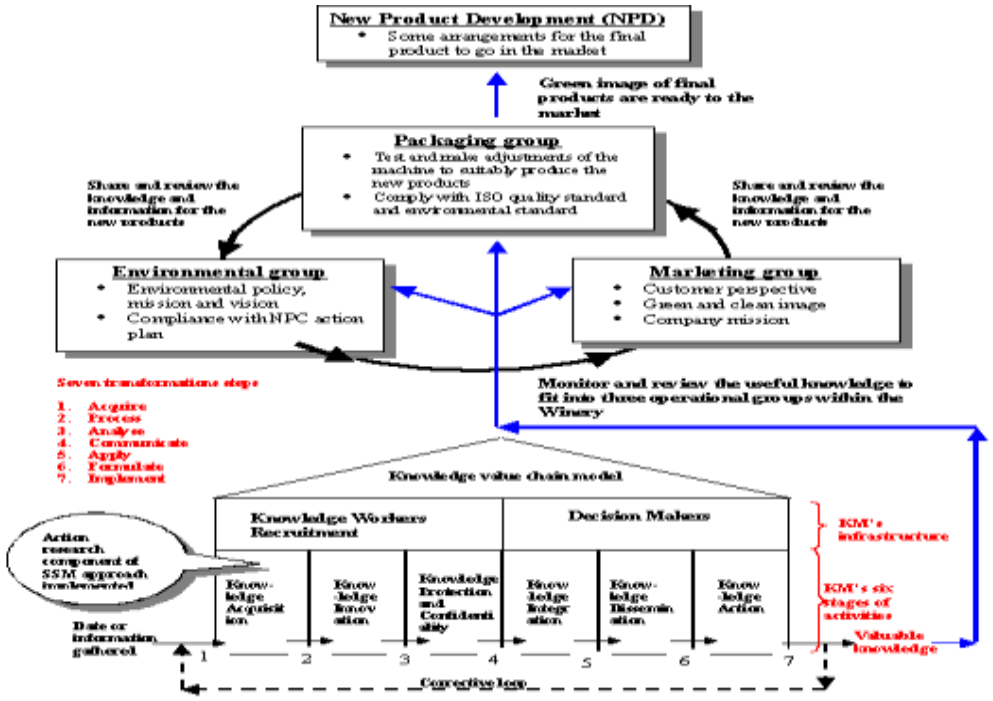


Figure 6: The modified KVC model implemented for the Winery's new product development

Of all processes, the researcher finds the added value generated from the specialisation of each component activity from the modified KVC itself. So KVC's activity enables business to develop the components of the Winery such as packaging competence with the added value. In particular, this modified KVC model is involved with relevant environmental issues to fulfil the ISO quality and environmental standard to satisfy for the customer requirement and the new product development (NPD).

In this paper, the case study can lead the acquisition of data related to energy consumption expanded on the packaging of wine bottles and the various related greenhouse effects. To process the gathering of information and data involves trend indicators, diagrams and graphs for helping to build up the structure of information and data. The knowledge development process requires correlation between the volume of production, profits and energy intensity. All of this data needs to be synthesised to bring to the attention of the decision-makers.

Importantly, the last 2 stages of the modified KVC model involve the final formulation and implementation of the knowledge gained through the entire process after constant reviewing and feedback of each stage. At this stage a proposal for an action plan can be put to

the target company. This would involve calculating the impact of environmental considerations acquired from the data. This would also have effects on the market shares of the company.

As mentioned earlier, in the whole process of this modified KVC model, the knowledge innovation can act properly to the activities that can fit the product differentiation strategy, which can enable corporate gains, the competitive advantage, and sustainable competitive growth as well.

In addition, the researcher found that the data, information and knowledge are re-useable assets. It is certain that it is useable in unlimited situations anytime and anywhere. For instance, the researcher performed several interviews to look for how to reduce the cost of the environmental impact of the wine industry in South Australia. The researcher gathered considerable amount of information and data to support the environmental issue process and stored this information in the computer for later analysis. Particularly, the data, information and knowledge gathered herein can be used for the energy consumption so as to how to reduce the greenhouse effect and energy consumption's areas alternatively. In the end of last year, the energy consumptions have significantly reduced approximate 3% compared to the previous year results after using the action research loop at the first stage of activity of the modified KVC model. It is clear that the same data can be transformed for the use of other fields. In fact, it will improve the co-operation between different sections of the Winery and overcome any apparent divisions. For the corporation with the closer relationship with each level, the achievement will be higher because more efficient and effective work.

6. Conclusion

The application of knowledge to tangible assets drives the creation of value, so that knowledge becomes a source of competitive success. Firms develop capabilities that embed this knowledge in the production of goods and services. Sustaining competitive success requires that organisation to capture the knowledge that resides in individuals and leverage it across the whole plant. This modified KVC model is a valuable and useful tool incorporated with green engineering issues and competitive advantage section to solve the environmental problems such as the greenhouse effect and knowledge management for the Winery. Transforming the information into knowledge and capabilities, and then into competitive advantage is a process necessary rooted in the intangible assets of the plant, in particular its environmental management and intellectual's capital. Finally, this modified KVC model as discussed can clearly show how to understand the ways in which getting better at finding, and creating and using creates real added business value for the Winery. Knowledge management is therefore one of the most powerful organizational tools. Hence, the information gathered for the study is then transformed into knowledge after the researcher reads, understands, interprets and applies to a specific work function in the Winery. Once developed, this modified KVC model is in the hopes to spur enhancements in the productivity of knowledge process used in the packaging, marketing and environmental section of the Winery. Importantly, it can provide fully understanding on the working of the knowledge added into the value chain in order to identify the Winery's strengths and weakness in some particular activities. The robust based KVC model can be considered as part of a larger effort focused on adding new product development in environmental issues, green and clean image, an organisational performance time, an effective for managing knowledge and time to market. Finally, this exploratory research study does reveal the way of systematic processes using the modified KVC model for transferring the information to knowledge via the semi-structured interviews as well as archival documents all the way to the NPD system.

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