Making Tacit Knowledge Explicit: Designing An Export Trading Knowledge Portal

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Abstract.

This paper investigates how tacit knowledge is made explicit in a predefined export trading knowledge domain. It also considers important aspects of portal design that support knowledge use, creation and renewal. This research looks at how a portal is designed to allow specified users to effectively use knowledge. A case study was conducted to examine the useful types of export trading knowledge involved in user interactions and portals features that support knowledge use. It was discovered that while a portal serves as a single-window entry-point to information resources, the use of communication tools to enable knowledge exchange amongst intended users and locating knowledge later is essential. Incorporating knowledge management practices is effective in a knowledge portal design as it can more effectively facilitate knowledge use, creation and renewal.

INTRODUCTION

This paper reports a case study research regarding human interactions and communications for knowledge exchange amongst export trading community members in a portal. Portals are a form of web technology (Scharl, 2001a, 2001b; Atluri and Gal, 2002), they are also known as portal technology. In this paper, a portal is defined as a single-stop window webpage providing an entry point to a collection of information resources and communication services relevant to knowledge use for a specific audience in export trading. By the same token, the intended portal users are export trading community users as follows: government departments regulating and involved in export, the exporting firms, the export service providers and any parties that contribute and enable the export operations. These users are closely related in export, carry out major functions in export and have to interact with one another in real-life trading scenarios. In the portal design, they are users who are involved in activities through portal communications. The export trading community forms a virtual community and this research is beneficial to two groups of targeted audience. The first group includes the export trading community users. The second group includes web portal designers, website developers, portal providers and management that endorse the use of portal technology. The research focuses on user needs that enable an effective portal design. However, it does not aim to address in-depth technical design layouts and details.

In the increasingly interconnected world there is a great deal of uncertainty in competitive trading and export decisions are more dynamic, demanding fast organizational responses (Merali & Davies, 2001). In export trading, the dynamic changes in global trading environment require the export trading community members to react with prompt actions based on their constantly renewed knowledge. This new or renewed knowledge is a result of constant seeking and updating their existing knowledge. In export trading, there are numerous co-related users from various types of organizations. The forms of distributed organizations and the prevalence of inter-organizational relationships have presented new challenges to knowledge transfer (Lin, Geng & Whinston, 2005). This research examines the real-life knowledge exchange in the export trading community and the important aspects of portal design needed to support knowledge use, creation and renewal within the community.

This paper adopts the following structure. In section 2, the related work of knowledge, knowledge management and portals is investigated. Section 3 presents the research method. Section 4 describes the embedded case study that explores the use of information and knowledge contents in portals. Discussions and research findings are explicated in section 5. In conclusion, section 6 reports on the strategic values of using communication tools in portals for knowledge exchange in the world of global business competition. Section 6 also indicates the future research directions.

RELATED WORK

In this section, two types of literature are examined. The first type is literature on knowledge and knowledge management. The second type is literature about general technology or portal technology supporting knowledge use.

Knowledge and Knowledge Management

Knowledge is power (Polanyi, 1962, 1983; Davenport, 2000). Knowledge is an internalized know-how and an ability to tacitly know what to do and how to do in any particular context (May and Taylor, 2003). Knowledge is a precious global resource and also a critical factor for an organization's survival (Clarke & Rollo, 2001; Haldin-Herrgard, 2000; Merchant, 2000; Nonaka & Takeuchi, 1995, Nonaka, Takeuchi, & Umemoto 1996). The importance of possessing the appropriate knowledge and using it effectively also sees knowledge as a fundamental factor behind an enterprise's success. Knowledge is seen as churning corporate competitive advantage when utilized through all its activities (Stenmark, 2002; Wiig, 1997).

It is due to the usefulness and power of knowledge in the current knowledge economy that there is a great need to manage knowledge. In this paper, knowledge management is defined as the systemic processes for acquiring and communicating both tacit and explicit knowledge of export trading community portal users.

Polanyi (1962) discusses knowledge of two types: tacit and explicit. On the one hand, Polanyi (1983, p.4) states that tacit knowledge is hard to articulate by saying "we can know more than we can tell". On the other hand, he (1983, p.5) explains in a physiognomy example that the "very act of communication displays a knowledge that we cannot tell". Whilst he points out the two types of knowledge, he highlighted the importance of an appropriate method by which tacit knowledge can be communicated into explicit knowledge. In the same line of reasoning, we see that knowledge in the mind is tacit and expressed knowledge leaving the mind is explicit. Although Polanyi (1962) claims that tacit knowledge is personal and hard to articulate, he highlighted the crucial provisions of adequate means to express ourselves in communication. We posit that the methods of communication are essential in the interplay between these two types of knowledge.

In order to manage knowledge in a dynamic export trading environment, the following points have to be considered. First, explicit knowledge is generated and shared in social interactions through the constant conversations and practices. It is through the interactions that stories, experiences and knowledge are developed, maintained, interrupted and transformed (Garcia-Lorenzo, Mitleton-Kelly & Galliers, 2003). Second, the ability to see explicit knowledge as useful, and actively make communication messages sensible is an indispensable tacit power of all knowing (Polanyi, 1966, p.137). Third, technology has to adapt to organizational and social requirements (Hoffmann, Loser, Walter and Herrmann, 1999). Forth, Internet-based knowledge support environments are to be used as a way to establish a virtual community of practice. In essence, a portal supporting the knowledge exchange environment for these human communication has to be considered and selected.

Technology, Portals, and Knowledge on the Web

Through the statements below, several researchers have agreed that technologies (either quoted as IT [information technology] or ICT [information and communication technology], web or technology) serve as a knowledge management enabler.

> The literature on knowledge management highlight issues of fit between IT-based systems for knowledge management and the socially situated leveraging of knowledge assets by organizations (Merali & Davies, 2001, p.92).

> Advanced technology for knowledge management offers prospects for knowledge sharing in communities of practice or interests in general, and in workgroups in organizations in particular. (Hoffmann, Loser, Walter and Herrmann, 1999, p.296).

> For the current interest in knowledge management, instead of identifying, capturing, and making tacit knowledge explicit, we should design IT solutions that will help us locate and communicate with knowledgeable people (Stenmark, 2000-2001).

> ICT instruments (mails, video-conferences, other web-based technologies) have been widely used because of the distances among the agents. These organizational, contractual and technological tools have adequately supported the organizational relations, improving coordination, communication and knowledge sharing (Migliarese & Verteramo, 2005, p.103).

> One approach to facilitating tacit knowledge exchange among knowledge workers is through use of IT such as electronic networks and group support systems. In these settings, individuals exchange knowledge via email, online discussions, chats and listservs (Desouza, 2003).

Web primarily represents a large body of explicit human knowledge whilst newsgroups primarily represent a large body of implicit knowledge (Green, 2000).

Seeing from the same standpoint, knowledge can be shared and can be transferred in portals as a form of technology. If we cannot reify knowledge objectively in databases or build tools that handle knowledge directly, an alternative is to capture and manage information in a way that it supports externalization and transfer of knowledge (May & Taylor, 2003). While data from database captured may turn obsolete and has to be constantly updated, portal communication tools always allow most current information to be captured. Hence, our investigation effort was concentrated on how portals support knowledge externalization before it can be captured and managed. Nonaka et al. (1996) explain that externalization happens in human dialogs. However, any dialog involves human interactions amongst two or more people. Tools in portal technology supporting human interactions are useful and are to be considered in our export trading portal design.

After the window entry point on the main web page, a portal links all information contents, people and their work processes through different web pages. Web is the primary repository of human knowledge on the Internet (Green, 2000, p.130). The web is a rich knowledge source with an enormous volume of information store for web users (Hargittal, 2000). Information is regarded as expressed knowledge. In other words, knowledge on portals is transmitted as expressed information or explicit knowledge. In addition, knowledge expressed through web communications is in an information context related to specific topics and purposes.

The export trading portal design must take into account various human communication aspects in its design. As Garcia-Lorenzo, Mitleton-Kelly & Galliers (2003) point out, traditional face-to-face networking only allows us to keep relatively small functional networks, but the new information communication technologies allow us to expand on processes and shape them differently. We therefore focus more specifically on how web communication tools are deployed and how the tools shape knowledge exchange in a virtual community of export trading members.

RESEARCH METHODS

Our research question is:

How can we turn tacit knowledge into explicit in a portal within an export trading knowledge context?

Knowledge cannot be measured. The investigation of how tacit knowledge turns explicit requires an interpretation of the related human activities in the social context of export trading. Qualitative research places an emphasis on the value-laden nature of inquiry and also seeks answers to questions that stress how social experience is created and given meaning (Guba & Lincoln, 1989). Hence, the qualitative approach is deemed most appropriate based on the nature of this research.

Nevertheless, making tacit knowledge explicit for knowledge use in a real-life export trading situation is a complex procedure. This research makes an inquiry into the complex real-life phenomenon. For this reason, the method of case study (Bill, 2000; Gillham, 2000; Yin, 1984, 1989, 1993, 1994, 2003) was seen appropriate. In addition, this research requires multiple data collection techniques for better data validation purposes. Useful data collection techniques for empirical investigation are, surveys, documentations, interview and observatory interview. Observatory interviews refer to the work or portal software demonstrations made when the respondents were interviewed. Documentations include the brochures, in-house bulletins, organizational publications given to us for more information at the interview. Survey questionnaires consist of open questions taking a structured format. All interviewees were asked the same types of questions and field notes were prepared after the interviews. For ethical reasons, the interviewee identities and ownership of their portals are anonymous. The case study took the form of two embedded case studies with various units of analysis as in Figure 1. For simplicity reasons, we use the term first phase to refer to the embedded unit of analysis I in Figure 1, and second phase for the embedded unit of analysis II in Figure 1.
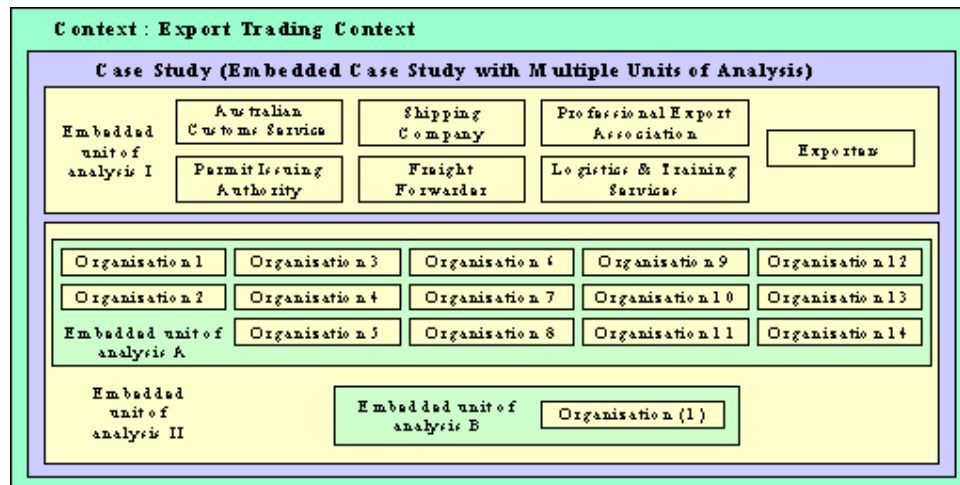
Figure 1: An Embedded Case Study

In the first phase of study, the objective was to investigate the human interactions and useful knowledge used in the export trading context. As export trading is a complex field involving multiple key players, we carefully identified and selected the major types of stakeholders after our initial contacts with ACS. It was also based on the main author's experience in export trading. As a result, only the following most critical stakeholders who took part in the key export activities and were regarded as shaping the knowledge within the context were selected for interviews. The critical stakeholders are Australian Customs Service, the Department of Primary Industries Fisheries (a Permit Issuing Authority), a shipping company, a freight forwarder, an export professional association, an export logistics and training services, and a few exporters. These interview respondents were all located in Brisbane, Queensland, Australia. The respondents selected for interviews were senior officers in the government departments and the senior management representatives in the private sectors. All respondents were asked basically the same types of structured questions in the interview. They discussed their business activities and their business operations. They told us what they saw as useful types of knowledge to them. They explained where they and their staff sourced externally useful knowledge and information through people, documents or technology. They also explained why they needed to interact with people for knowledge, the methods they used to seek information or knowledge, what they did about new knowledge, how they later used the knowledge, and their experience in obtaining new information and knowledge. As the structured questions were open-ended, the respondents were able to tell as much as they felt appropriate and explained their thoughts using printouts of office documents, software tools with databases or even free-hand drawings.

In the second phase of the study, the purpose was to investigate the useful aspects of portal design considered by various portal experts who saw these aspects supportive to knowledge use and knowledge exchange. The experts in our empirical investigation included portal designers, portal developers, managers overseeing a portal project, web architects, etc. The respondents were all experienced in their field with several years of industrial experience working with website or portal projects. The selected interviewees were from various states of Australia although the majority was located in Brisbane, Queensland. There were fourteen respondents involved in semi-structured interviews and all of them answered twenty-five pre-designed survey questions. Respondents were also encouraged to explain further in relation to each question.

CASE STUDY

The purpose of this exploration is twofold. In the first phase of our investigation, the objective was to find out knowledge used in various stakeholder organizations, how staff members obtained their knowledge and how the new knowledge was sourced. The two phases were planned to investigate how the portal experts saw knowledge could be captured in portals and particularly tools that enable humans to explicate their views and exchange knowledge. The central aim was to discover how the human tacit knowledge in the export trading context could be made explicit in web-based human interactions through communication tools and captured in an export trading portal.

Needs for Interactions to Exchange Export Trading Knowledge

The first phase aimed at discovering the types of knowledge used, other information or knowledge sought and existing methods used to obtain knowledge by these stakeholders. The outcomes of this phase were very important before moving on to consider the next phase of the study, the portal design.

From the interview responses, it was discovered that knowledge in their human resources was important to their business operations. The respondents discussed their knowledgeable and experienced staff. A respondent from the professional export association commented on the importance of having latest export knowledge in manpower in the following way; "Exporters accumulated their knowledge over time through work experience. They learnt from their experienced export ventures. They monitored factors influencing success of each export events, obtained more useful knowledge through human contacts and in many export related activities. The accumulated knowledge is wisdom. This wisdom advised export decisions and turned into important actions in exporting firms in order to achieve export success". By and large, they stressed the importance of the staff member's acquisition of the latest information from anywhere and how this affected his/her work and the business as a very crucial activity. In further explanations, the senior management particularly sees the latest and current information affecting the business as the most important new knowledge to be sought. To use the new knowledge in combination with existing knowledge gives the management ideas of how to react in the actual business environment. A senior management member in logistics and training services highlighted that new knowledge updated the existing knowledge. He commented that the renewed knowledge based on the combination of new updating information and existing knowledge also resulted in better decision making. He gave an example on the use of mobile phone and mobile computer technology for an export declaration for a shipment. With these technologies, an exporter could check the export declaration result and the related shipment at the most critical point of time. He could then contact the relevant party or authority for help and action if needed. He mentions that anyone in exporting simply has to keep pace with the changes in business operations. His opinion was if technology changed, one updated his/her technology knowledge, and if government rulings changed, one abided by the new rulings to avoid penalties and adverse business outcomes.

Several respondents pointed out that export businesses were constantly subject to dynamic changes in export trading environment. In their way, their new knowledge came from obtaining new information in their interactions with business associates like freight forwarders, shipping organizations, government officers, etc. Some new information was also found in their interactions with professional export associations or other export related parties. For example, a respondent from a logistics and training organisation stated, "Exporters have to constantly gather many relevant types of export related information for the advantages of their own business operations and to operate successfully… The more one is engaged in on-going human interactions in the export activities, the more quickly he updates his exporting knowledge." According to various interviewees, interactions enabled them to share perspectives of other management in their interactions. They were able to obtain ideas of new products, new market demands, new design techniques, other effective manufacturing methods, new management approaches and the needs of employee capabilities in any project. Frequently, the responses prompted the need to interact with people in government or private organizations in export-related seminars, information events, trade shows, etc. They stated the need for these interactions to obtain new useful information to help update their ways of business operation. In addition, various responses also prompted their need for knowledge of how their business partners or business associates solve business problems. When interpreting the information they obtained through human interactions, we regarded information they obtained in interactions as previously tacit knowledge however made explicit. In other words, the originally tacit knowledge was made explicit in their communication and interactions.

In the interviews, the senior management representatives discussed the types of knowledge they used at work and their use of Internet websites to find information. Table 1 shows the types of knowledge utilized by the seven stakeholder groups, and the type of web information that sought at work. Although Australian Customs Service dealt with import and export, the dealings with export is the central part of the empirical investigations. Table 1 reflects the knowledge used in their dealings in export only. As government officers deal with some strict and confidential government information, how both Australian Customs Service and Department of Primary Industry - Fisheries obtained information were not discussed. Hence we intentionally did not indicate the web information sought by them in Table 1.

Stakeholder Type	Category of Knowledge	Web Information Sought
Australian Customs Services	Government rulings and control over export products Quality control of export products Cargo support to exporters General export control at sea or air ports and country boundaries Knowledge of and interactions with other government departments and international agencies related to export	Not discussed
Department of Primary Industry - Fisheries (Permit Issuing Authorities)	Regulations of seafood export Quality control on seafood for export Monitoring marine habitat Innovative seafood products and cultivation of sea creatures for export Research on seafood	Not discussed
Freight Forwarding Organization	Banking Export insurance Transportation/ Delivery services Billing/ Payment methods Cargo packing and consolidation Government export regulations and laws Obey customs rulings, make export declaration Domestic country and overseas country rules Apply export permits for restricted goods to export	Local and overseas banks Insurance companies; authority regulating insurance services Transport companies Incoterm details (may obtained with traditional means) Packing and cargo consolidation services Relevant government authorities Customs service and procedures Government laws e.g. Attorney-General's Department Competitor websites
Shipping Company	Sea regulations Government export regulations and laws Competitors (Products, services, marketing, customer relations & etc) Shipment of cargo as a blue water service from a port to another in different countries	Relevant government authority on sea ruling All major government authorities related to export Local and overseas competitor websites Current affairs on world traffic/transportation situation
Export Logistics & Training Services	Government regulations and laws All export trading community issues Affiliations with professional bodies in export Improvement techniques, advices, research issues	All major government authorities mentioned above Export related organization websites are scanned through e.g. chamber of commerce, trading societies and professional associations.
Professional Export Association	Course accredited by government and affiliated bodies Student needs in export courses Contacts with government authorities, affiliated bodies and real-world of export trading to tailor courses	Government accreditation and professional bodies Cultural, social and living needs for overseas customers General export trading issues on the web
Exporter	Overseas business opportunities Variations in customer preference Sales and marketing Government rulings & policies Goods with permit control Export procedures Billing and payments Banking and insurance Transportation Shipments Advisory information from government offices or business associates Grants and subsidies	Government information Banking Shipping Goods transportation and distribution Websites containing useful information e.g. Austrade, chamber of commerce, trading societies and professional associations Logistics of resources Export training services Productions methods Technologies supporting their business All information from any websites containing useful information to export e.g. foreign currency exchange

Table 1: Types of Export Trading Knowledge Needed and Web Information Sought

Based on information in Table 1, we grouped the important types (or categories) of knowledge for their business operations in the basic groups of: government, export laws, political issues, business operating environment, technologies, payment/ finance, transportation, insurance, export procedure, production, economy in buyer country, social demography in buyer country, sales/ marketing, customer relations, and competitor.

The respondents also discussed the types of web information they used at work and for their decision making. Generally, they commented on the lack of organisation of web information. For example, a freight forwarder remarked, "There are simply too many types of websites and too many important URL links to remember.

Moreover, web information we can access from various websites usually involves recurring displays of massive and great amount of information presented in different formats. It's too tedious for us to read and filter out the essential information". They revealed that there were websites to direct them but not on a single website in an organised information format. For example, ACS provided a webpage with links to useful websites. An ACS officer said, "To help exporters obtain some useful information, ACS provides many other useful website addresses (or URLs – universal resource locations) on the ACS main webpage for anyone to access." Web information they accessed usually involves recurring displays of massive amounts of information presented in different formats (Soon, Chen & Underwood, 2003). They pointed out their own involvement of human information processing to sieve through and filter the information, and organize and make sense of the information in order to obtain and retain the useful knowledge required for their business interests. Further, they saw that almost all websites were generally disseminating organizational information or were used for buying and selling on the web (or e-commerce). These websites were not for interactions or discussion matters with the essential business parties. As far as the needs for human interactions were concerned, all respondents discussed their more important human physical involvements in seminars, conferences, export awards events, trade exhibitions, social export-related events, etc. They also discussed their interactions with other professional members in these export events to exchange information and learn new ways of business operations and obtain new insights into business.

The crux of the empirical exploration was to point out the lack of interactions on the web from the respondents and the crucial real-life needs for interactions for new information update, new knowledge creation and existing knowledge renewal in export trading. Next, we move to the second phase of study to explore the portal characteristics supporting human communication and interactions. The focus of the export trading portal is to be placed on human connections rather than web information disseminations or e-commerce activities.

Portal Design and Development

The investigation results from the first phase of empirical investigations signify the importance to consider various design aspects concerning human interactions and communication of stakeholders not otherwise available on general websites emphasizing e-commerce and web information publishing. Hence, a portal considering the stakeholders' knowledge use, the types of knowledge to be sought and methods of seeking knowledge were to be considered.

In the first part of the second phase of the study, we interviewed twenty subjects from fourteen organizations. The twenty subjects were technical specialists and expert portal designers with substantial work experience on major portal projects from private or governmental sectors. Before interviewing them, some work was done to identify basic portal characteristics in the portal literature. Twenty one characteristics were initially identified. The attributes were further grouped based on similar meanings that helped categorize portal features. During this process, there were considerations of how the characteristics could be utilized to enable knowledge capture, update and exchange in the export trading community. We also carefully examined the repeating meanings of characteristics and reduced the characteristics to fifteen deemed supportive of export trading portal usage. We structured a survey questionnaire with twenty-five open-ended questions. The interviews were conducted mostly face-to-face with respondents. In some cases, telephone interviews were conducted due to work commitments or geographic constraints. All interviewees were encouraged to expand upon all twenty-five survey questions. All respondents agreed that portals integrated all information and services for a targeted audience into a single website. Every user of a website had a specific relationship to it and all portals served the users based on the common purposes of the user community.

The second part of the study was designed to investigate portal implementation. For this we used what was regarded as a knowledge portal. The interviewee was a government officer and a system administrator for all the information systems and organizational portals in a permit issuing authority. The interviewee was also the chair of a knowledge management special interest group in a professional association. According to her, the portal was a designed to retain knowledge in knowledge workers. It also served as a knowledge base for long-term use. In the demonstration of the use of the portal, she showed many relevant users' knowledge work processes included in the portal were links to software applications (this function is also called portlets). The software was a legacy application and was linked to their databases. One advantage of the portal was to direct urgent news or critical information to users as its home page headlines commanded immediate attention. In the portal, there were also bulletin boards, newsgroup and web emails. The need for user interaction was addressed. She explained, "These web communication tools are means provided for the users to interact. The portal users need to interact because people require help, seek opinions, ask for advice, seek to clarify their doubts and wants to know different answers to their problems. All messages sent and reply messages received in the web tools are all permanently recorded. A knowledge repository is created in a form of central database. The information contents recorded are retrievable for future use"; this was done through discussion forums and listserves services catering for user questions. Users usually found valuable replies through these web communication services. A knowledge base

was formed so users could revisit the discussion forums or listserves to retrieve useful advisory information. Every new question and its related answer updated the knowledge base. She further clarified her points, "A portal that enables humans to exchange knowledge must provide means to interact so that their tacit knowledge can be externalised and expressed as text, tables, charts, etc. The externalised knowledge can then be shared, transferred, stored, retrieved and reused". As useful information was disseminated and advisory information obtained, she stated that was an important aspect of the portal to help users' decision making. The centralized storage and use of databases, information and document repositories also formed a central knowledge repository. In her view, the knowledge base created a form of business intelligence for the organization. She revealed the hidden logic of using knowledge in the central knowledge repository, "The recorded data, text, images, figures, diagrams, etc. in the web communication tools are true tacit knowledge of people. Knowledge means a lot to the users who need knowledge to perform work tasks. While the users interact, they learn from one another and gain a lot of knowledge. People know what and how to do things better when someone point a direction to them. People think deeper into their solutions about problems when there are useful advice and information that clarify their doubts and they are asked to consider more factors before making decisions and taking actions. With information for thinking, help and advice, people generally make better decisions. The portal users also explore new ways of problem solving and knowing things can be done using different creative methods. It is through the use of web tools for interactions that they understand different ideas, see things from different perspectives and learn how and why they should do things in certain ways for better work results. You can see that web information is in fact human knowledge in this context. A lot of web-published information in the portal is from critical sources of knowledge for use of our targeted users. The use brings in new insights, valuable knowledge not found elsewhere." When she was asked whether there are other benefits of using the portal by all users in the organisation over the long-term, she added, "The resultant use of shared knowledge and useful information from these valuable sources leads to business intelligence".

Analyzing the responses further, Table 2 was developed. This table takes into account portal characteristics supporting knowledge management and provides justifications on why the characteristics were parts of knowledge management practices and our rationale behind using these characteristics to enhance knowledge use.

#	Portal Element	Indications of knowledge management practices	knowledge portal characteristics
1	Information dissemination or communication facilitated (any channel of one-way, two-way or multiple-way, e.g. web publishing, message board, chat-room, email, etc.)	Knowledge management (KM) refers to the methods and tools for capturing, storing, organizing, and making accessible knowledge and expertise within and across communities (Mack, Ravin, & Byrd, 2001) The use of a knowledge portal is to support the work of the knowledge workers (Mack et al., 2001; Collins, 2003a & 2002b)	New information through acquisition of web information dissemination was important. However, more importantly, communication is to be established in the export trading portal. Two-way or multiple-way communication on the web allows knowledge or information to be sought, transferred, captured and reuse are important in the portal.
2	Creation of business intelligence or competitive advantage	Knowledge is a fundamental factor behind an enterprise's success, corporate competitiveness and all its activities (Stenmark, 2002; Wiig, 1997; Civi, 2000) Competing successfully requires either aligning strategy to what the organization knows, or developing the knowledge and capabilities needed to support a desired strategy. (Zack, 1999).	As a result of managing knowledge transferred, shared, used and reused, renewed and new created knowledge forms a ground of business intelligence and competitive advantage.
3	Focus on central knowledge repository	A knowledge repository is formed when knowledge management directs acquiring, storing, adding value to and deploying the intellectual capital of the firm's professionals (Ezingeard, 2000). The knowledge repository is used to capture the critical knowledge imminent and use it for other phases in the lifecycle, such as reusing the knowledge or creating new knowledge without reinventing the wheel (Rosemann and Chan, 2001, p.626). Additional knowledge about related business processes could be used to broaden the knowledge base (O'Leary & Selfridge, 1999)	As knowledge in web-based attached document or communication messages are compiled and organized for a centrally controlled reuse, it forms a central knowledge repository.
4	Support decision making	Managers are constrained in the amount of knowledge and information they process before decisions are made (Kreiner, 1999). The importance of knowledge management is to transfer knowledge to business decision before it is needed, to enable the information access and to generate or test new knowledge about the firm's changing risk management requirements (Marshall, Prusak & Shpilberg, 1996).	Knowledge and business intelligence can inform one on decision making
5	Business legacy applications & database (e.g. a portal function or portlet, a web form)	The world wide web offers information, advice and remote access to software with decision variables for solving problem (Fourer and Goux, 2001).	Some relevant application software can be included on the knowledge portal for the use of the wider community. For example, the web software allowing export trading declaration transaction on the web can be regarded a portal function on the export trading knowledge portal.
6	Emphasis on business operations	To remain aligned with the dynamically changing needs of the business environment, organizations need to continuously assess and organize their business for ongoing effectiveness (Civi, 2000).	Major business activities and the improvement of business operations is the interests and taken care of in the portal.
7	Facilitate user's business work processes	A knowledge management system that facilitates frequent reuse will likely integrate tightly with business processes and generate information from work processes (O'Leary, 2001; O'Leary & Selfridge, 1999). The success of businesses depends critically on the quality of knowledge which organizations apply to their key business processes (Civi, 2000).	If any work applications can be integrated on the web, the business database and information is useful to perform business work process. For example, restricted good permit application or export declaration.

Table 2: Essential Portal Characteristics in the Export Trading Knowledge Portal

After careful consideration, the fifteen characteristics were able to be reduced to seven. The export trading portal is to be exclusively used by users in the export community. Hence, advertisements, security issues, payment and subscription to use the portal are subject to the control of the export trading portal project management team. Further, search and user-designed contents are common but are two optional portal characteristics that may or may not be adopted in export trading portal. The research focuses on an export portal for the targeted audience in the Australian context and local information is used. Since it is the local information use as in the local/exotic information in contents, we eliminate this point. One of the most appropriate characteristics but irrelevant to support knowledge management is the internal/ external types of information access. Although they are useful links to external websites (e.g. chambers of commerce, international export trading agencies), these are questions of what the portal management team wanted as hyperlinks added into the export trading knowledge portal later. It is regarded as premature to consider them in this paper. However, the links to useful sources of information contents will be used in our proposed portal design in the next section. As such, the major characteristics to focus on and for our discussion are the seven portal characteristics shown in table 2. These characteristics are related to important knowledge aspects in the export trading portal design.

DISCUSSIONS AND FINDINGS

In the following subsections, the observations are discussed first and the discoveries next. In the first subsection, three key points were addressed. Using them, we develop our proposed portal design framework for the export trading portal in the next subsection.

Observation and Discoveries

A common point brought up by the respondents was that their information needs were not satisfied with information and knowledge available internally within the organization. They had to explore information and knowledge affecting their business performance from other related parties beyond their organizational scope. As in the real-life scenario, all portal users in each of the stakeholder groups by nature have a chance to interact with users in all other stakeholder groups. In the interactions, tacit knowledge is made explicit. Accordingly, the user groups and their interactions are depicted in Figure 1. The relations and formation of interactions in Figure 1 are to be considered a way of tacit-explicit knowledge conversion. As such, the portal design should allow their relations and interactions (in communication tools and possibly the linkage of their websites with their permissions within a portal) as in the real-life situation. This design aspect enables them to find help information and knowledge-updating information in the portal interactions with any parties.
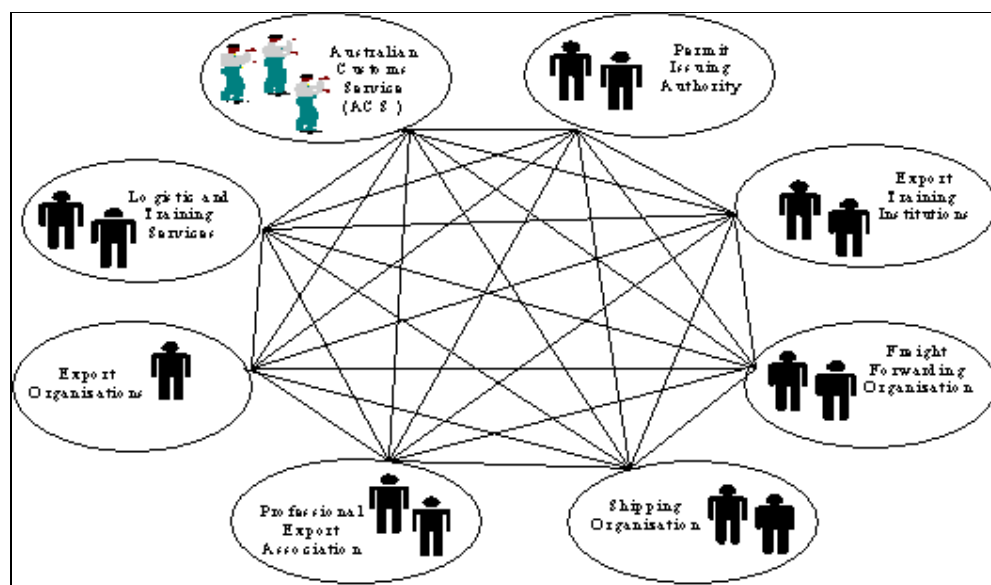

Figure 2: Export Trading User Community in Real-life and for Portal Design

Second, we discover from the respondents' feedback that individuals within a stakeholder group share to a rather high extent the same knowledge, and individuals amongst different stakeholder groups share very similar knowledge in the export trading context. Thus, the portal users are considered to be able to understand their unique and context-specific vocabularies within the community. This common ground knowledge facilitates knowledge exchange. The overlapping of understanding provided by the boundary spans multiple communities, and provides a basis for communication, sharing, resolving and combining disparate perspectives (Hahn &

Subramani, 2000). Our portal design considers the common language and the context-specific vocabularies within the export trading portal community.

Third, the real-life information delivery in government or private organizational seminars, conferences, talks and export award presentations are forms of information dissemination. The purposes of these occasions are one-way information deliveries. At the speaker end, tacit knowledge is made explicit. At the information receiver end, this explicit knowledge needs appropriate attention and understanding. We call it "consumption" here to establish a point that disseminated explicit knowledge needs to be understood, make sense to one and assimilated into one's existing knowledge in the mind. In other words, it is only after the information or explicit knowledge is properly processed in the mind of the receiver, that the previously explicit knowledge is internalized into tacit knowledge for the individual. In the same line of reasoning, information as explicit knowledge displayed on the web is for information dissemination. This explicit knowledge is meant for consumption but may not be consumed until the knowledge is properly used. One-way information delivery occurs when information travels directly from the sender to the receiver. As one-way information delivery systems, newsgroups, list-serves, bulletin boards and message boards are most appropriate for this kind of web information dissemination. Conversely, interactions and discussions are not regarded as one-way information delivery. In this situation, there are two (two-way) or more parties (multiple-way) involved in human interactions and communication. Two-way or multiple-way communication invites more than one party in interactions and encourages broader information transfer in the discussion topic. Examples of two or multiple-way human communication can be seen in trade shows, social events for professional export members, and export trading interactive sessions inviting questioning and answers. In these interaction sessions, there are discussions of ideas, products and services, and brainstorming for solutions to problems. The two-way or multiple-way human communication in these interaction sessions are regarded as methods for knowledge exchange of export trading skills, experience and knowledge. These interaction sessions allow the tacit knowledge in humans to be made explicit (externalized). To enable tacit knowledge to turn explicit, web communication tools such as discussion forums, discussion boards, discussion groups, chat-rooms and possibly even the more costly web video-conferencing are suitable.

The Export Trading Knowledge Portal Design Framework

The information not existing through the current use of websites or business portals in interviewees' organizations but retrievable from their real-life contacts is the motivation behind the need and creation of an export trading portal. Using the fact-finding results, Figure 3 is built to show the two main purposes of addressing portal user needs for the non-existing (at least in terms of externalised information) but valuable export trading portal information.
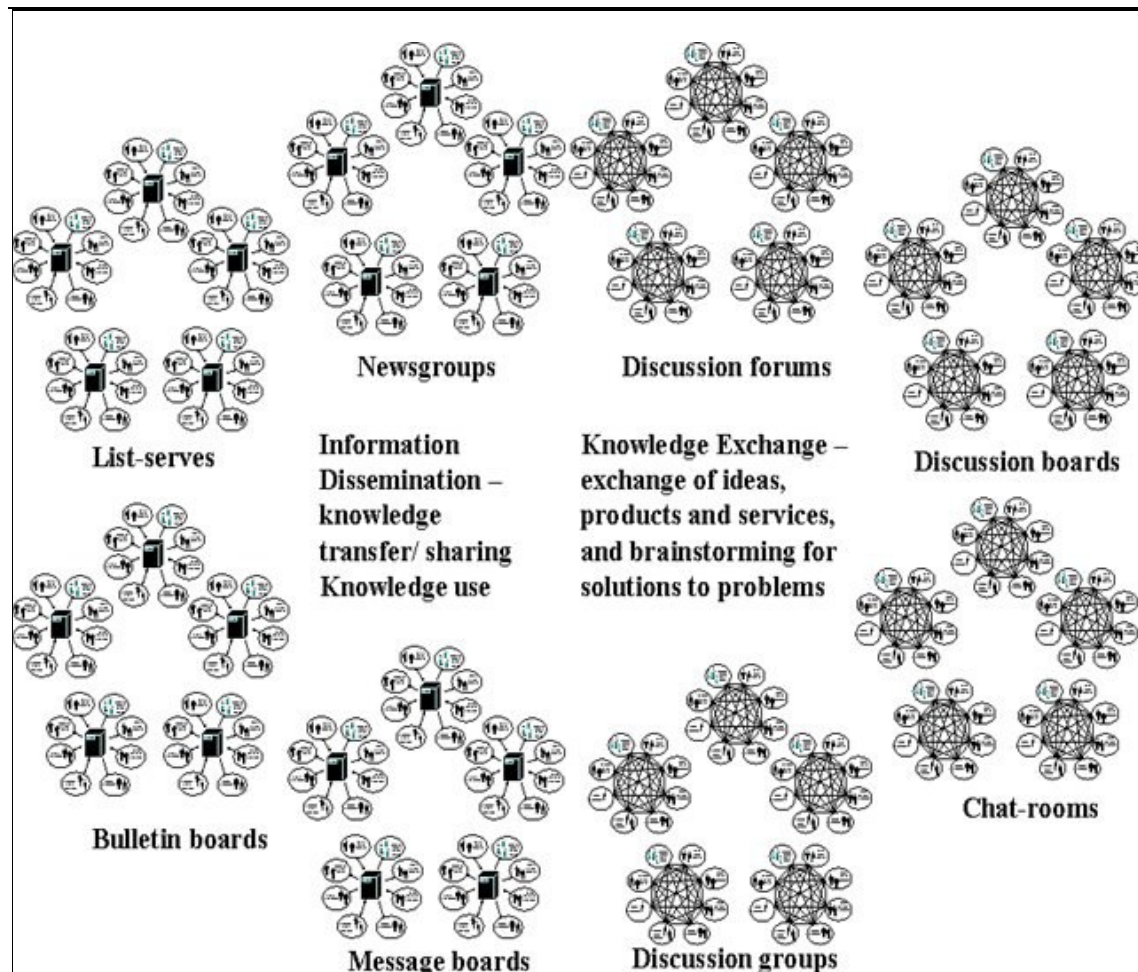
Figure 3: Inclusion of the Non-Existing but Valuable Export Trading Information in a Portal

In addition, we add that the intent of the export trading portal is two fold. First, other than the web information delivery and communication tools, the usual web pages shown after the portal home page are to be used to accommodate existing information by linking to websites with information and knowledge in various relevant areas. Second, there should be inclusions of non-existing but valuable export trading information. Figure 4 is produced to show the two intentions. Through the contents of the export trading portal shown in the first left-hand-side box, it reflects the needs to incorporate some tailored made information content and links to external information resources to serve the export portal community users. The middle box is used to reflect the importance of considering the inclusion of non-existing but valuable export trading information in communication tools. The right-hand-side box shows the need for including useful context-specific export trading stakeholder group information through the use of various information delivery means. In the contents of the export trading portal, some contents are included for the following reasons. All users may belong to a certain organization with an existing website. This web page should offer the user a chance to state whether his/her organization wish to have their organizational website included. The inclusion will allow export trading portal users (or members) to access organization specific information.
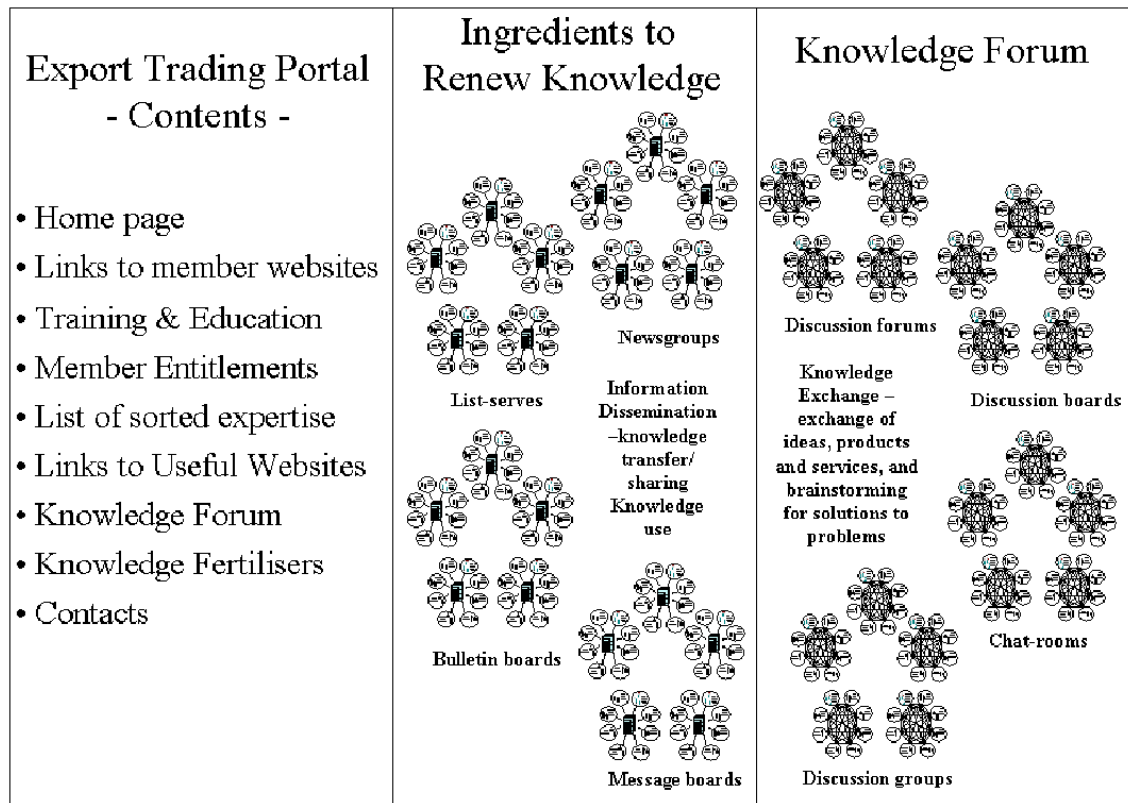
Figure 4: Contents, Information and Knowledge Tied Together Inside the Export Trading Portal

As learning, training and education were frequently stressed as important by interviewees, the portal design considers links to training centres or education institutions for useful course opportunities. Community members need both initiatives and incentives in order to adopt the portal. Portal use must be rewarded with tangible user benefits and entitlements. These rewards may take the form of shopping discounts, waivers of housing loan establishment fees, travel information and benefits, use of discounted resort facilities, user point reward systems, etc. As users are of diversified backgrounds and each one is regarded an expert in his/her own field, upon being accepted as an export trading portal user, he/she is to reveal his/her expertise. This expertise has to be based on knowledge categories discussed directly after Table 1. The useful knowledge categories enabling the sorting of expertise are government, export laws, political issues, business operating environment, technologies, payment/ finance, transportation, insurance, export procedure, production, economy in buyer country, social demography in buyer country, sales/ marketing, customer relations, competitor. Links to external websites with useful export trading activity information should be incorporated. Various interviewees discussed the currently disorganized and messy way of finding information over numerous websites. The most useful links to all permit issuing authorities, chambers of commerce based in Australia, export-related professional societies and international export trading authorities are to be used selectively.

The points made here are content page with links to information are simply serving as web pages of more explicit knowledge (already formalized and articulated; whether in text, tables, graphics, images; with or without metaphors, mental models, analogies) for further information dissemination. This information dissemination shares the common purpose to deliver explicit knowledge. The communication tools are the ones inviting more new information, and enabling the conversion of expert (or user) tacit knowledge to explicit knowledge.

CONCLUSION AND FUTURE DIRECTION

This paper explored the real-life export trading situations with the objective of examining knowledge use, existing knowledge renewal and new knowledge creation. The major findings were: (1) Explanation of how previously tacit but currently explicit knowledge are to be delivered to knowledge users using information delivery means such as newsgroups, listserves, bulletin boards in export trading portal; (2) Tacit knowledge is to be made explicit through web communication tools like discussion board, online chat, discussion forum etc.; and (3) Web communications enable human interactions to obtain the advisory information, solutions to problems in brainstorming, shared management perspectives, and more as in real-life situation.

Whilst websites abound, the empirical findings indicated a lack of a context-specific website for the intended community users. The research also highlights the need to include information delivery means to stream the important news to users for knowledge consumption. Information delivery is seen to be useful for users' knowledge renewal purposes. Direct interactions amongst users enable both knowledge exchange and new knowledge creation. The useful knowledge obtained through these interactions facilitates business activity. Web tools must be used to facilitate human interactions amongst users. The research also reflects various important considerations such as links to more knowledge sources, identifying an expert based on expertise using knowledge categories, etc. These contents are to be considered in the export trading portal design and should be carefully based on the salient information needs of the export trading community users.

There are however some limitations to this research. Although seven stakeholders were included in the empirical investigation in this study, there are more stakeholders involved in the complex export trading context. The seven stakeholders were selected for this research as they were identified as the major stakeholders useful for current purposes of this research. The portal project is currently not related to any organisation or authority so there is no ownership with respect to implementation. In future, when there is an organisation able to implement the portal project, the management team may consider more stakeholders and more users in the actual usage of this portal.

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