

CHALLENGES AND DIRECTIONS IN KNOWLEDGE ASSET TRADING

DIMITRIS APOSTOLOU,^{1*} GREGORY MENTZAS,² ANDREAS ABECKER,³
WOLFGANG MAAS,⁴ PANOS GEORGOLIOS² AND KOSTAS KAFENTZIS²

¹ Planet SA, Athens, Greece

² Department of Electrical and Computer Engineering, National Technical University of Athens, Greece

³ FZI, Karlsruhe, Germany

⁴ Institute for Media and Communications Management, University of St. Gallen, Switzerland

SUMMARY

This paper addresses the area that is at the intersection of knowledge management and electronic commerce. This area refers to the exchange and trade of explicit and implicit knowledge at an inter-organizational level. Electronic knowledge marketplaces are currently emerging to address the opportunities and risks found in the purchase and selling of knowledge in the business-to-business (B2B) environment, the need for supporting long-lasting relationships of knowledge exchange and the requirement for facilitating virtual community contexts where knowledge seekers can find suitable knowledge providers and knowledge providers can advertise and sell their available knowledge. The paper describes the business challenges associated with the design of an Internet-based knowledge marketplace. INKASS, a European IST project, has stimulated this work and has provided real-life verification on the arguments raised and on the positions adopted herein. Copyright © 2005 John Wiley & Sons, Ltd.

1. INTRODUCTION

Organizations are in the midst of two significant transformations (Skyrme, 2001). The first is the positioning of knowledge centre stage as a valuable resource and a driver of wealth creation. The second is the impact of the Internet, leading to the evolution of business into e-business. Until recently these developments were considered in isolation (Gartner Group, 2000), but there are connections, and these are becoming increasingly apparent. Knowledge is an asset that can be re-packaged into knowledge-based products and services. The Internet provides an effective vehicle for marketing and delivering knowledge. The new term ‘knowledge trading’ captures the convergence of these two strands.

Already, the idea of knowledge trading is an exciting topic with manifold implications in both technological areas and business engineering. Early adopters of the knowledge trading idea are already working towards this goal; some of them are dealing with some facets of the overall scenario and maybe unaware of the bigger picture behind, like researchers building Expert Finder Systems, who are mainly thinking about significant technical solutions for the matchmaking between information needs and expert competency profiles, but paying less attention to other business-related topics

* Correspondence to: D. Apostolou, Planet SA, Apollon Tower, 64 Louise Riencourt Str., 11523 Athens, Greece. E-mail: dapost@planetey.com

around, like market mechanisms, revenue models, etc., which are required to run a business. Existing approaches:

- neither take into account the fact that knowledge is not just a book that can be described and retrieved with a simple keyword retrieval, but has manifold complex context and content features that determine its applicability and usefulness in a given situation;
- nor take into account that the real power of electronic marketplaces lies not in copying ways of working known from traditional business (like book selling with a catalogue and a simple, sequential seller–intermediary–buyer relationship), but in exploiting the strength of manifold synchronous and asynchronous communication and community-building means, which is of utmost importance when dealing with such a sensible good as knowledge;
- nor take into account that setting up a Web-portal is far from designing a sustainable business, which means thinking about customer relationships, advanced revenue models, appropriate pricing mechanisms for different kinds of knowledge, etc.

This paper aims to identify the core elements associated with knowledge trading. The paper is largely based on the research and early findings which have taken place at the framework of the European Community IST project [Intelligent Knowledge Asset Sharing and Trading (INKASS, 2000)] that is going to design and implement knowledge trading tools, and develop and validate business models for the electronic knowledge marketplace. In the following sections we introduce the concept of a knowledge marketplace and we discuss its economics based on the economic characteristics of electronic marketplaces and the special characteristics that knowledge assets possess when considered as tradable products. We present how these ideas apply in the design of a knowledge marketplace for a consultancy and we conclude by discussing key challenges and issues that need to be considered in similar initiatives.

2. THE EMERGENCE OF KNOWLEDGE MARKETPLACES

Our economy is knowledge-based. The quest for maintaining, leveraging and exploiting knowledge inside an organisations led to the development of various knowledge initiatives. Davenport and Prusak (1998) suggest that knowledge movement within the organisations is powered by market forces similar to those that animate markets for other, more tangible goods. Like markets for good and services, the knowledge market has buyers and sellers and brokers and market pricing and exchange mechanisms, even though money is rarely the form of payment. They suggest three main factors at work, the most significant being reciprocity followed by reputation and altruism. Market mechanisms for knowledge have much appeal, because the incentives of contributors are based on the pricing system of the market. However, only few organisations made experience with knowledge trading among employees (Siemens ICN is one such example), notwithstanding that the trading of know-how to external customers is the very business of a lot of organisations like professional services firms. The existence of electronic marketplaces where a wide range of knowledge-intensive goods and services are traded give rise to electronic knowledge marketplaces. Examples of electronic knowledge marketplaces include (Skyrme, 2001).

- *Intellectual property trading.* Copyright material, patents and designs are increasingly traded online, widening creator access to a broader market base. Trading sites can also serve as rights clearing houses.

- *Recruitment agencies.* Many types of recruitment, such as computer contracting, are fast shifting into online mode. The pool of job seekers and recruiters is larger. Computerized testing and profile-to-job matching helps both parties more quickly find mutually beneficial matches. Portal sites, such as Carrermosaic.com, give hints on writing CVs, links to recruitment fairs, etc.
- *Management consultancies.* Their business is knowledge, but they are increasingly packaging it, both for internal use (on their intranets and knowledge bases) and externally, such as Arthur Andersen's Global Best Practices and Ernst & Young's Ernie.
- *Research companies.* Market and industry researchers, such as Nielsen and The Welding Institute, now deliver much of their material over the Web or transfer it to clients' intranets.

Various developments are also influencing the creation of online knowledge markets. One is the growth of the Internet as a vehicle for e-commerce and knowledge exchange. The shift towards dynamic commerce actually favours k-marketplaces because unlike most markets, the product of exchange—knowledge—has some unique characteristics that do not allow static pricing. It is mostly intangible, making it difficult for the buyer to assess and value beforehand and its value is context-dependent, making it difficult for the supplier to price it in a transparent marketplace of multiple buyers with varied applications. Moreover the on-going development and extension of mechanisms and tools that efficiently support collaboration and knowledge sharing and also seamlessly integrate these functionalities with corporate knowledge management systems facilitates the formation of dynamic value webs and in general the ad hoc on-line collaboration for the creation or transaction of a knowledge asset. Another important fact is that content is becoming even more critical for k-marketplaces. Buyers need good content description, namely content about the content, to make informed purchases and valid and appropriate knowledge assets that will satisfy their needs, while sellers need content about transactions and customer feedback as to properly market and differentiate themselves from the competition and address efficiently existing and emerging customer needs. As a result, the accessibility, usability, accuracy, and richness of content directly impacts the value that a marketplace adds on its customers. Additionally intelligent match-making capabilities, an area that research has focused for years, arise as a catalytic factor for the success of k-marketplaces.

3. THE ECONOMICS OF E-KNOWLEDGE MARKETPLACES

The Economics of e-marketplaces

Electronic marketplaces can be said to represent a new wave in the e-commerce propagation and extending the Business and Consumer combinations (B2C, C2B and C2C) aiming primarily at the Business-to-Business (B2B) area. E-marketplaces can be defined as interactive business communities providing a central market space where multiple buyers and suppliers can engage in e-commerce and/or other e-business activities (Bruun *et al.*, 2002). They present structures for commercial exchange, consolidating supply bases and creating sales channels. Their primary aim is to increase market efficiency by tightening and automating the relationship between supplier and buyer. Existing e-marketplaces allow participants to access various mechanisms to buy and sell almost anything, from services to direct materials.

The products and services offered on e-marketplaces may either be industry-specific or horizontal across many applications. A number of classification schemata exist in the literature for

Table 1. Characteristics of e-marketplaces (adopted from BuyIT, 2002)

	Independent	Coalitions/consortium	Direct
Member structure	Many-to-many Open membership	Few-to-many Anchored by a number of companies Open membership on the 'many' side	One-to-few/many Anchored by sponsoring company
Value	Market efficiency Liquidity Transparency Shared benefits	Market efficiency Liquidity Transparency Shared benefits	Deep collaboration Value chain optimization Speed and flexibility Privacy and control Retention of all benefits Customer satisfaction Service/process excellence
Business model	Revenue based on transaction percentage, services, membership, advertising, etc.	Revenue based on transaction percentage, services, membership, advertising, etc.	Revenue based on benefit sharing, margin sharing, speed of innovation, service fees
Financing	Net Market Maker	Core members	Anchor members
Business impact	Dis-intermediation, re-intermediation	Dis-intermediation, re-intermediation	Expand competitive advantage Control value chain

e-marketplaces (Kaplan and Sawhney, 2000; Dou and Chou, 2002; BuyIT, 2002). Overall, we may distinguish between three primary e-marketplace models:

- *Direct or private B2B e-marketplaces.* These are one-to-many models that reflect a company developing their own e-marketplace to support their own customers and suppliers.
- *Coalitions or consortium e-marketplaces.* These models reflect a many-to-many model in which major industry players come together to aggregate their buy-side and supplier-side leverage to increase operational efficiencies and leverage buying power around an industry supply chain.
- *Independent e-marketplaces.* This is a many-to-many model, typically hosted by a neutral intermediary providing Net Market Maker services, such as aggregation, transaction services to participants.

These three types of e-marketplace vary in different characteristics, such as member structure, value, business model, or financing and business impact (Table 1).

3.1. The Economics of Knowledge

The positioning of knowledge assets centre stage in B2B exchanges is in line with the recent trend in the strategic management that positions knowledge as the primary resource (Drucker, 1994), i.e. the primary assumption in the Knowledge-Based-View of the firm (Eisenhardt and Santos, 2001). The specific knowledge base, the ability to make use of the available knowledge, determines the competitiveness of organizations in the emerging knowledge society (Franke, 2000).

Knowledge assets are different from other firm resources; e.g. see Glazer (1991) and Day and Wendler (1998). They are not easily divisible or appropriable. This means that the same information and knowledge can be used by different economic entities at the same time. Moreover, knowledge assets are not inherently scarce (although they are often time-sensitive). This implies that they are not depletable.

Knowledge assets are essentially regenerative. This means that new relevant knowledge may emerge from a knowledge-intensive business process as additional output besides products and services. They may not exhibit decreasing returns to use, but they will often increase in value the more they are used. This characteristic is of crucial importance for senior management; e.g. see den Hartigh and Langerak (2001). Most assets are subject to diminishing returns, but not knowledge. The bulk of the fixed cost in knowledge products usually lies in creation rather than in manufacturing or distribution. Once knowledge has been created, the initial development cost can be spread across rising volumes.

Network effects can emerge as knowledge assets are used by more and more people. These knowledge-users can simultaneously benefit from knowledge and increase its value as they add to, adapt, and enrich the knowledge base. In traditional industrial economics, assets decline in value as more people use them. By contrast, knowledge assets can grow in value, as they become a standard on which others can build.

Finding appropriate prices for knowledge assets is a challenging task (O'Hara and Shadbolt, 2001). As knowledge assets have an intangible character, there are certain specialities for the price-finding which are derived from its general characteristics:

- Because of the lack of visible capability characteristics, the price can be viewed as an indirect criterion for rating the quality of the knowledge asset.
- A direct comparison of prices is usually difficult without actual utilization of the knowledge asset.
- Owing to the intangible character of the knowledge asset it is difficult to find out in advance about the customers' willingness to pay a certain price for an asset.

In the following we provide an overview of the factors that set value on knowledge, when considering knowledge assets as tradable goods.

Context of Knowledge

One central problem lies in the fact that knowledge is, by definition, highly context-dependent, whereas all explicit representations (at the seller side) will necessarily de-contextualize it to some extent. Furthermore, in an electronic marketplace, such representations should also express aspects like knowledge quality and knowledge actuality, which can hardly be dealt with in a generally applicable manner, but must be considered separately for different types of knowledge product and knowledge request. Knowledge has manifold complex context and content features that determine its applicability and usefulness in a given situation.

Affiliation and Branding

Affiliation is also a significant factor to be considered when setting a price on knowledge. Knowledge purchases are immensely affected by the degree of affiliation between the buyer and the seller. Because of the criticality, sensitivity and high customization of knowledge products and services, the need for trust and established relationships increases proportionally. Branding also plays a significant role, because it associates a purchase with a certain level of quality of service, guarantee and after-sales support.

Refined and Customized Knowledge

The value of knowledge increases as it is refined, improved and formatted ready to be used. Users will value most knowledge that is relevant to them and provided ready to be used by them.

Generalized knowledge will be priced toward the lower end of the scale, while customized knowledge on a critical purchasing decision, for example, that combines the latest data with analysis from experts will command a higher value.

Timing of Knowledge

Timing is also an important ingredient of the value of a knowledge offering: knowledge is most valuable at the exact moment that it is needed for critical business requirements. Knowledge is also valued by the timing that it is received in advance of the competition. As knowledge products and services are offered on the marketplace, the value of these services will be determined by the timeliness and impact of this knowledge on the person purchasing it.

Tacit Knowledge

A powerful combination is that of tacit and explicit knowledge. Although codified generic knowledge may have relatively low value, the addition of human judgment and experience can considerably enhance value. Capturing the information is the first step, followed by rationalizing the data so that it can be shared by appropriate people. It is the expert, nevertheless, that can add his/her experience and can assist in putting knowledge in context or solving a particular problem.

Aggregated Knowledge

Aggregated knowledge is often worth more than the sum of the parts (Skyrme, 2001). The buyer will benefit from a one-stop-shop, because it reduces the time and effort needed to collect information from multiple sources. Expertly collated and edited information can eliminate overlaps while highlighting contrasts. The richness and depth in one place aids understanding and offers new insights.

Quality of Knowledge

The quality of knowledge products can be related to different criteria, like accuracy, reliability, presentation, timeliness, completeness, highlighting of main issues, relevancy and usable format (Rolph and Bartram, 1994). In general, there are two different perspectives to consider when talking about quality of information: on the one hand, an individual or a company creates knowledge-based products and, on the other hand, they are distributed in a marketplace to other individuals or organizations. This leads to a constructivist and a receptive view on the quality of the product. For both views it is necessary to develop methods that ensure that only high-quality products are used in problem-solving processes (Nohr and Roos, 2001).

Constructivist quality	The constructivist quality includes all measures that are taken to ensure quality assurance during the production and distribution processes of knowledge products. Thereby, attention is paid to the quality of the process, besides the quality of the result.
Receptive quality	The receptive quality refers to measures concerning the evaluation and rating of external products. It is most commonly related to the sources of information or the creator, because the knowledge asset itself is not available for direct evaluation.

Compared with other products, knowledge products have the special characteristic that they cannot be previewed and tested before the purchase. Similarly to services, the quality of traded knowledge can not be experienced beforehand. Nevertheless, there exists a need for some indicators to assess it in advance. Concerning the receptive quality, there are five general possibilities to improve a customer's trust for the product: (1) trust in the source of knowledge because of earlier experiences; (2) quality assessment by trusted third-parties; (3) quality assessment by the users or customers; (4) trial versions; (5) description by meta-information.

3.2. The Right Model for Knowledge Marketplaces

Evans and Wurster (2000) group potential benefits of e-marketplaces in three 'dimensions of advantage': (i) reach, which means how many customers a business can connect with and how many products it can offer to those customers; (ii) richness, which is the depth and detail of information that the business can give the customer, as well as the depth and detail of information; and (iii) affiliation with participants, especially buyers. By affiliating with customers, a net market maker can make money by providing value-added services such as advice.

The traditional economics of information suggest that rich information requires proximity and dedicated channels, thereby imposing limits on the reach potential of the same information. Evans and Wurster (2000) suggest that our economy is on the verge of a new era characterized by the gradual removal of the trade-off between the *richness* and the *reach* of information. The emergence of independent e-marketplaces in various industry sectors is a proof of the aforementioned analysis. Independent marketplaces have emerged with the objective to capitalize on the increased reach capability of the Internet, coupled with sophisticated information technology applications able to manage and process rich information.

Nevertheless, many analysts (Davenport *et al.*, 2001; Gartner Group, 2001; Bruun *et al.*, 2002) believe that independent e-marketplaces have had difficulty achieving both high levels of reach and richness, even in non-knowledge-intensive sectors. This market reality, combined with the special characteristics of knowledge assets as tradable products, renders the direct or private marketplace type as the prominent one, because it offers the: (a) required deep collaboration between buyer and seller; (b) speed and flexibility required for timely provision of critical, sensitive knowledge products; (c) privacy and control needed to create trusted relationships; and (d) quality of service that is a prerequisite for customer satisfaction.

4. THE INKASS PROJECT APPROACH

The INKASS project tries to overcome some of these challenges by spending due diligence on both technological and methodological developments, investigating issues like creation of trust and customer satisfaction.

Figure 1 gives an overview of the functional architecture to be developed. For building such a platform and validating it in realistic case studies, the INKASS approach is guided by the following principles:

- *Integrate e-commerce with knowledge management software technology.* INKASS builds upon Empolis' *Orange*, which is an e-commerce middleware solution for intelligent retrieval and assistance, and extends it with e-commerce functionalities.

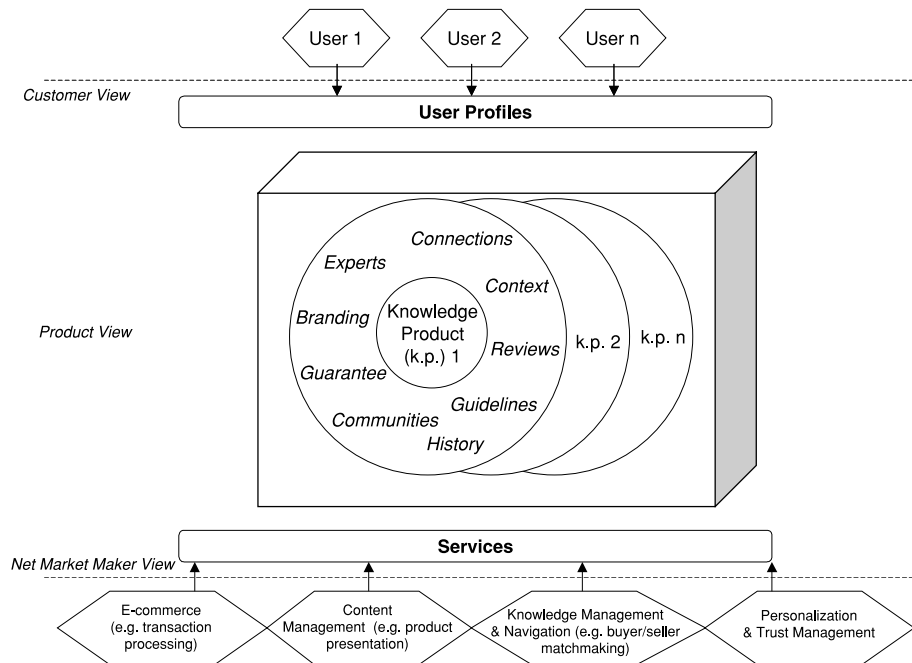


Figure 1. The INKASS functional architecture for knowledge trading

- At the technological side, *focus on the critical questions which distinguish knowledge trading from other e-commerce areas*; we see crucial points (i) in a powerful, knowledge-based matchmaking mechanism comparing offers and demand; (ii) in flexible, intuitive interfaces and intelligent assistance helping users to express their demands and interactively search for appropriate offers; and (iii) in elaborated networking and community-building facilities to exploit the power of customer groups exchanging and further developing knowledge in direct communications, assessing the value of products, etc.
- At the operational side, *focus on how to use the platform cost effectively for the novel problem of trading knowledge*. In order to do this, at least the following elements must be worked out:
 - the very *basic ontological foundations* for the utilization of e-commerce systems for knowledge trading, plus *cost-effective methods for up-front knowledge engineering*;
 - an overall system design (e.g. *business engineering*) and configuration of existing mechanisms (e.g. different pricing mechanisms) which take into account the particularities of knowledge trading;
 - appropriate *business models, roles, processes, and revenue models* for installing and running knowledge trading platforms.

INKASS will pilot knowledge trading in the *business management and engineering areas*, with the participation of three knowledge-intensive organizations: The Welding Institute (a research and technology organization), Planet Ernst & Young (PLEY; a consultancy), and the Athens Chamber of Commerce and Industry.

5. DESIGNING A KNOWLEDGE MARKETPLACE FOR A CONSULTANCY

PLEY is a multinational consulting firm providing management and engineering consulting services in southeast Europe.¹ PLEY provides a wide spectrum of consulting services mainly to sizable private and public-sector organizations. PLEY's consulting practice has focused on developing and expanding their relationship with key large organizations in the region. There is plenty of opportunity within this customer-base and PLEY's full-service capabilities to enable them to meet the needs of this type of client continually. Despite the recent slow down in the management consulting services at the global level, PLEY has seen a growth of 20% per year over the past 5 years.

5.1. Strategic Orientation

When PLEY started thinking of commercially exploiting knowledge products and services over the Internet, it was faced with two broad choices:

- Utilize online knowledge trading to expand to new market segments, both in geographic and in company size terms, similar to the original thinking behind Ernie, the online consultant launched in 1997 by Ernst & Young International (Whittle, 1997).
- Utilize the knowledge marketplace as a private exchange to offer to its major clients a knowledge resource, and a secure channel for working online and using dedicated business tools.

The latter choice of a private knowledge marketplace was deemed more appropriate because it was considered more *feasible* from a technical perspective (because integration issues with existing processes and roles are easier to solve), and more *meaningful* from a business perspective because: (a) it allows for better client relationship management; (b) it can lead to supply chain efficiency by allowing clients, partners, subcontractors and PLEY to share and develop knowledge (primarily on a project basis); and (c) it can lead to new knowledge creation because of the focused and close interaction between PLEY and its clients. PLEY recognizes that some types of knowledge can be delivered efficiently online, whereas others require person-to-person contact. The private exchange model allows for offering a broader array of service delivery.

5.2. The Knowledge Offerings

The knowledge offerings that PLEY is putting online cover the core services (Strategy and Policy Development, Programme and Change Management, Process Improvement, Knowledge Management, Financial Management, Human Resources Management, Supply Chain Management, Marketing & Communications, Technology and IT Consulting) as these are provided to the major industries (financial institutions, communications media & entertainment, commerce and tourism, transport, energy and utilities, government and health care).

Each service is represented by a collection of information that includes: methodologies, assessment or analysis tools, expert profiles, links to related documents and sources (internal/external),

¹ The company was formed following the merger of PLANET S. A. and the Southeast Europe Management Consulting network of Ernst & Young.

case studies and related training material. This core package is accompanied by metadata that aim to assist the user in finding and customizing content. These include: meta-information (taxonomical data, summaries, abstracts), historical data (identity, modification history), validation data (performed by internal experts), as well as marketing and pricing data.

Contextualisation of knowledge is accomplished by two mechanisms. *First*, content is filtered according to the user profile (e.g. if the user is working for a specific industry, then only relevant segments that have been classified accordingly are represented). *Second*, by offering a range of 'self-service' tools (such as methodological components) that can help the user put prior knowledge in context. Nevertheless, irreplaceable human intelligence is accounted for by providing the option of providing expert advice, as part of the service offering.

5.3. The Trading Mechanisms

The traditional subscription scheme is retained mainly to serve the firm's major clients, but additional pricing mechanisms, appropriate for the one-to-many trading model, are considered. These include:

- Pay-per-document, to allow *ad hoc* users to buy just the items they need. The document-based knowledge product may be sold (a) at a fixed price or/and (b) by bidding that includes the setting up of an initial asking price, and controlling the price fluctuation based on the number of sales and the inactive time intervals.
- Negotiation subsystem, to allow users to develop a request for the purchase of more complex products and to reach an agreement for provision of a knowledge product (that perhaps involves buying expert consulting time). If a buyer cannot find the exact items or items at the price they wish to pay, they may initiate a Request for Quote (RFQ). In composing the details of the RFQ, the buyer can elect to allow certain fields within the description of the product to be able to be modified by the seller. The RFQ can be used to negotiate a long-term contract, in which the prices, qualities and dates are to be agreed between the two parties.

5.4. Operational Considerations

In addition to the external market challenges facing PLEY there are significant internal issues that need to be addressed. There is a need to determine how to make the connection from the user to the expert. To this end, the existing internal knowledge management infrastructure is exploited: Internal Knowledge Managers, who are already responsible for managing and updating knowledge at the service level, are also assigned the additional responsibility to manage the content that is available externally and to make sure that the user of the system succeeds in contacting the appropriate expert.

The quality of the knowledge offerings in the marketplace is of critical importance. The ways these offerings are used by the firm's clients can have a significant impact on the business, and care must be taken to ensure knowledge is not being misused. Quality is ensured by the experience and expertise of the consultants, as well as by the already established review process performed by the Knowledge Office (also responsible for quality assurance of internal KM infrastructure). Additionally, there are plans for receiving direct feedback from customers to monitor client satisfaction. The 'closed group' nature of the marketplace allows for consultants to have a close relationship with the clients and to trigger feedback. Furthermore, it allows for ensuring that clients are using the system properly and understand how to take advantage of its features and content.

6. DIRECTIONS FOR DESIGNING KNOWLEDGE MARKETPLACES

The personal nature of much knowledge means that human and social factors loom large in many areas of trading and exchanging knowledge. When professionals and managers seek advice, their first port of call is usually someone in their knowledge network, for example a work colleague or a peer in another organization. If their knowledge needs are greater or not easily obtained through their network, then they tend to go first to people and suppliers they already know and trust. Established relationships count for a lot. Much existing buying of knowledge, especially that which is more people-based, takes place through established supply chains.

Traditional marketplaces, on the contrary, are more dynamic (Skyrme, 2001). They bring together buyers and sellers who do not necessarily know of each other. They allow participants to compare what is on offer and learn more about what products and services are available. They engender competition and innovation. They also foster cooperation, in that suppliers get together to address common concerns. In the real world, trade exhibitions and competitive tendering for services are situations that show some of these characteristics. Conferences are other occasions where professionals can top up their knowledge for a fee. Between such events, professional workers seeking knowledge have to rely on their network or other means, which do not necessarily get them the best knowledge at the keenest price.

The concept of interoperable knowledge networks evolved as a trade-off between the prominent traditional model of conducting knowledge business in closed, private networks, such as the PLEY case, and the market efficiency, liquidity and transparency of broad, open, public networks. During analysis of the knowledge requirements of the INKASS pilot users and their business partners, an environment that would enable their business partners to have easy and real-time access to up-to-date information and custom-made solutions to their inquiries was acknowledged as a significant advantage. Business partners could be kept aware of the latest knowledge in their domain, gain a rich representation and good understanding of knowledge products on offer, query about costs and even decide to consult an expert online. Furthermore, the possibility to reconstruct and contextualise the knowledge offering, taking into account the specific needs of the client, was deemed essential.

However, most business partners confessed that, in the usual case, a certain knowledge provider, which they mainly cooperate with, does not have all the expertise required to address their needs. These needs may go beyond the specialist capabilities of any single business partner or, in fact, any private knowledge marketplace. To cater to broader knowledge requirements, marketplaces may link to each other, creating networks based on the exchange and trading of knowledge (Figure 2). Knowledge networks can be formed in two general ways:

- through an infomediary business body that will manage the information flow across the marketplaces (resembling the centralized or star network model), or
- through a 'knowledge hub', which connects one marketplace with one or more other marketplaces (resembling the distributed, peer-to-peer or hub network model).

Either model results in linking effectively and extending the knowledge offerings without giving up 'control' of the buyer. The ability of marketplaces to interoperate extends the idea of liquidity and network effect by joining more buyers with more suppliers, but it does not sacrifice the ability of each knowledge marketplace to be highly specific to the supply-chain node or target buyer group it serves.

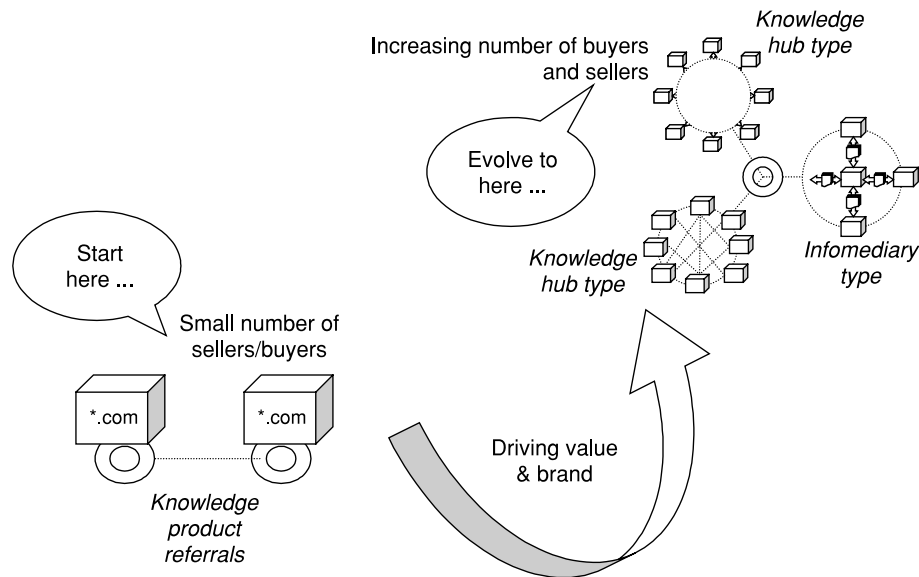


Figure 2. Connected knowledge marketplaces

Independently of which model is followed, for effectively exploiting the network effect for conducting knowledge exchanges our analysis shows that interaction must be based on value-added service, relationships must be increasingly based on trust, negotiation skills will become paramount, and there must be ample security, standards and community cohesiveness.

Value-based Services

The acceptance and success of knowledge marketplaces is dependent on the development and delivery of true value-added services that are offered in both digital and physical delivery systems through the evolution of trusted trading communities. The value offered by the knowledge marketplace should be greater than the traditional means of conducting the business process. We should not expect that selling knowledge assets can only be done in the digital domain, by offering only explicit knowledge. The knowledge offering should only have a tacit dimension; careful planning is needed to accommodate the selling of tacit knowledge, in terms of offering expert advice through physical (e.g. selling consulting time) or virtual (e.g. through online collaboration) channels.

Trusted Relationships

As the critical dependency of highly customer-specific knowledge product and services increases, the need for trust and established relationships increases proportionally. For example, if a company is planning to purchase some standard maintenance products, then it may be willing to try some suppliers that it has never used before. However, if a company needs expert advice on a safety-critical metal joining application that feeds the production of an aviation component, then it would be most likely to rely more on trusted relationships with established knowledge providers.

Trust is a critical component to true partnering in creating long-term, knowledge-intensive solutions to industry pain points and to create new forms of value. It is imperative that a trust relationship be forged either through the knowledge marketplace or that established trust relationships be given

a safe pathway to expand through 'knowledge networks'. The trend seems (Raish, 2001) to be that independently owned and operated exchanges and e-marketplaces are the venue for transacting commodity trades that require less trust and established relationships. Industry-backed private marketplaces, on the other hand, can build on the well-established trusted relationships that exist within the existing business partnerships.

We should keep in mind that price is not the only driving factor in knowledge transactions. Factors such as quality, expertise proven in previous cases, consistency or timely delivery weigh heavily in the decision for a knowledge purchase.

Negotiation and Dynamic Pricing

Another key factor to consider when developing a knowledge marketplace or participating in one is the ability to buy and sell products where price and quality change with supply and demand. Negotiated pricing models include auctions, requests for quotation and exchange/matching. Negotiated commerce with multi-parameter bidding allows purchases where the price is not the only driving factor, as usually is the case in knowledge transactions. Furthermore, a direct benefit of negotiated commerce is the simplification of the process to screen and select buyers. For example, a company needs a feasibility study for opening a new branch within 2 days. Since the company does not have the time to call each of the potential organizations that can provide this service, and does not want to award the contract to the lowest bidder automatically, a multi-stage, multi-parameter negotiation format may be used for the selection process. At any point, the purchaser or seller can accept, reject, or counter an offer. In the end, the negotiation process allows companies to transfer sophisticated, knowledge-intensive business transactions to the Internet.

Community Cohesiveness

For knowledge marketplaces to foster a greater level of buyer loyalty and community cohesiveness they should combine the reach of the Internet with the flexibility to adapt to the changing nature of specific market needs. The real power of electronic marketplaces lies not in copying ways of working known from traditional business, but in exploiting the strength of manifold synchronous and asynchronous communication and community-building means, which is of utmost importance when dealing with such a sensible good as knowledge.

Standards

HTTP servers and XML-enhanced Web content are proving effective (Ontology.org, 2002) as the foundation for small groups of cooperating commerce agents operating over the Internet. However, doubts remain whether these representations will scale to support interoperability between large, loosely coupled trading groups of buyers, sellers, brokers, aggregators and integrators, in scenarios where the full potential of the global reach of the Internet can be realized. Initiatives are already under way to agree standard XML modelling within vertical industries or markets in initiatives such as RosettaNet, CommerceNet's eCo and OASIS's ebXML.org.

7. CONCLUSIONS

Within organizations, the need for continuous access to knowledge has spurred the development of various knowledge initiatives. The pervasiveness of the Internet has already started to shift existing knowledge markets into cyberspace, with examples including intellectual property trading, copyright

material, patents and designs traded online, management consultancies packaging knowledge both for internal and external use, and research companies deliver much of their material over the Web. Knowledge trading refers to the trade of explicit and implicit knowledge for specific needs at an inter-organizational level. It addresses the opportunities and risks found in the purchase and selling of knowledge at the B2B environment, the need for supporting long-lasting relationships of knowledge exchange and the requirement for facilitating digital community contexts where knowledge seekers can find suitable knowledge providers and knowledge providers can advertise and sell their available knowledge.

The real challenges of knowledge marketplaces lie in best exploiting the economics of knowledge. Knowledge exchanges require timeliness, trusted relationships, ability to adopt to the customer needs, to name a few. Our findings provide evidence that the most prominent model for knowledge marketplace appears to be the private one, in which organizations exploit their business partners and clients to offer highly targeted knowledge through established relations. This would potentially form a polarization between the private marketplace 'clubs' and the neutral, independent knowledge marketplaces, which would be left to serve the more fragmented industry players. However, even companies that choose to build their own private knowledge marketplace will want to be connected to other knowledge networks in order to gain access to others' pools of knowledge as well as their own. Regardless of which marketplace model will prevail, knowledge marketplaces offer new means for knowledge access, delivery and application.

REFERENCES

- Aberdeen Group. 2000. White paper—the e-business marketplace: the future of competition. April 2000.
- Bruun P, Jensen M, Skovgaard J. 2002. e-Marketplaces: crafting a winning strategy. *European Management Journal* **20**(3): 286–298.
- Burke R. 1999. Integrating knowledge-based and collaborative-filtering recommender systems. In *AAAI-99 Workshop on Artificial Intelligence for Electronic Commerce*, Orlando, FL.
- BuyIT. 2002. e-Business models and how they apply to you, a BuyIT best practice guideline. Issued by the BuyIT Best Practice Network, January.
- Davenport T, Prusak L. 1998. *Working Knowledge: How Organisations Manage What They Know*. Harvard Business School Press.
- Davenport T, Brooks J, Cantrell S. 2001. Do independent e-markets have a future? Accenture Institute for Strategic Change.
- Day J, Wender J. 1998. The new economics of organisation. *The McKinsey Quarterly* (1): 19.
- Den Hartigh E, Langerak F. 2001. Managing increasing returns. *European Management Journal* **19**(4): 370–378.
- Dou W, Chou D. 2002. A structural analysis of business-to-business digital markets. *Industrial Marketing Management* **31**: 165–176.
- Drucker P. 1994. Knowledge work and knowledge society: the social transformations of this century. Transcript of the Edw in L. Godkin Lecture delivered at Harvard University's John F. Kennedy School of Government.
- Drucker P. 1997. The Future that has already happened. *Harvard Business Review*, September–October.
- Eisenhardt, KM, Santos FM. 2001. Knowledge-based view: a new theory of strategy? In *Handbook of Strategy and Management*, Pettigrew A, Thomas H, Whittington R (eds). Sage Publications.
- Evans P, Wurster TS. 2000. Getting real about virtual commerce. *Harvard Business Review*, Aug 1.
- Franke U. 2000. The knowledge-based view (KBV) of the virtual Web, the virtual corporation, and the net broker. In *Knowledge Management and Virtual Organisations*, Malhotra Y (ed.). Idea Group Publishing.
- Gartner Group. 2000. Strategic planning, SPA-09-4188, Research Note, 8 October.
- Glazer R. 1991. Marketing in an information-intensive environment: strategic implications of knowledge as an asset. *Journal of Marketing* **55**: 1–19.

- INKASS. 2000. *The INKASS Project Web Site*. Available at www.incass.com [1 August 2002].
- Kaplan S, Sawhney M. 2000. E-hubs: the new B2B marketplaces. *Harvard Business Review*, May–June.
- McGuinness DL. 1999. Ontologies for electronic commerce. In *AAAI-99 Workshop on Artificial Intelligence for Electronic Commerce*, Orlando, FL.
- Nohr H, Roos AW. 2001. Informationsqualität als Instrument des Wissensmanagements. *Wissensmanagement* 3(2): 24–27.
- Ontology.org. 2002. The need for shared ontology, white paper. Available at www.ontology.org [1 August 2002].
- O'Hara K, Shadbolt NR. 2001. Issues for an ontology for knowledge valuation. In *Proceedings of the IJCAI'01 Workshop on E-Business and the Intelligent Web*, Seattle, WA, USA, August.
- Raisch WD. 2001. *The E-Marketplace Strategies for Success in B2B eCommerce*. McGraw-Hill.
- Rolph P, Bartram P. 1994. *The Information Agenda: Harnessing Relevant Information in a Changing Business Environment*. Management Books 2000: London.
- Skyrme DJ. 2001. *Capitalizing on Knowledge: From e-Business to k-Business*. Butterworth-Heinemann: London.
- Whittle R. 1997. The evolution of Ernie—the online business consultant. Marshall School of Business, University of Southern California.

Reproduced with permission of the copyright owner. Further reproduction prohibited without permission.