

RESEARCH ARTICLE

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Intelligent-Agent Systems
Approach**

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Customer Value Creation and Delivery in B2B Context: An Intelligent-Agent Systems Approach

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Abstract

Global competition and rapid changes in industry structure are encouraging organizations to address needs for flexibility and real-time value creation and delivery. However, there is no standard means of identifying which strategy best meets the goals for an organization to create and deliver superior value in real-time. The purpose of this research is to investigate the generation of superior customer value within a business-to-business (B2B) virtual network organization (VNO) of Land and Property Information (LPI) division in the state of New South Wales (NSW) through the application of an Intelligent-Agent System (IAS) representing customer focus, customer orientation and market orientation. Implementation of intelligent-agents can facilitate workflows within the virtual network organization while consuming minimal resources. This conceptual model seeks to establish a superior customer-oriented network organization with the capability of designing and delivering superior customer value.

Keywords: B2B relationship; virtual network organization; customer value creation; orientation of organization.

1. Introduction

Most successful organizations understand that the purpose of any business is to create value for their customers [1]. Marketers in today's global economy recognise customers are an important element in the value creating process. Marketers also know that value is relative to competition. Offering better value than competitors helps a company create a sustainable competitive advantage. However, as Ulaga [2] stated, "Research on customer value is of increasing importance in the marketing discipline. Yet, few researchers have investigated the construct and its operationalization in the business-to-business setting" (page 319).

This research investigates the generation of superior customer value within a business-to-business (B2B) relationship between a virtual network organization (VNO) of the New South Wales (NSW) Department of Lands: Land and Property Information (LPI) division and a local government agency client organization through the application of a multi agent system.

In brief, LPI is one of the subdivisions of Land and Property Management (formerly known as Department of Lands of New South Wales). LPI has an integrated framework that connects the people of New South Wales (NSW) to a comprehensive package of land and property services. These services include land title registration, property information, valuation, surveying and mapping. LPI is the largest mapping organization in the southern hemisphere, embracing satellite, aerial and survey data [3]. Over the last decade an integrated property warehouse (IPW) has been under construction and population, generating comprehensive problems of awareness of what is there and how it might be used.

This paper describes an overarching framework for the marketing opportunities of the LPI's data resources. The agent system is integrated within a virtual network model to create customer value through the integration of agents representing customer focus, market orientation and customer orientation. Once a number of these virtual customer value design and delivery systems are in place, it will be possible to introduce a customer orientation or customer best practice agents into the system.

The research advances the methodology of creation and delivery of customer value to a client organization via LPI's VNO within a B2B context (as in Figure 1). The research will focus on leveraging relationship intellectual capital within and across network partners and the client organization, with the objective of creating benefit to the client organizations through the potential of the client organization to meet the solution requirements of its customers.

The LPI has permitted one of its important clients, the Bathurst Regional Council (BRC), to be used. As a local government agency, the BRC requests resources from the LPI to fulfil clients' solution requirements. However, where that data is insufficiently accurate for the required purpose or data is absent, BRC will create additional data (in addition to resources retrieved from the LPI) to fulfil their clients' requests.

Figure 1: Delivery of superior customer value within a B2B context.

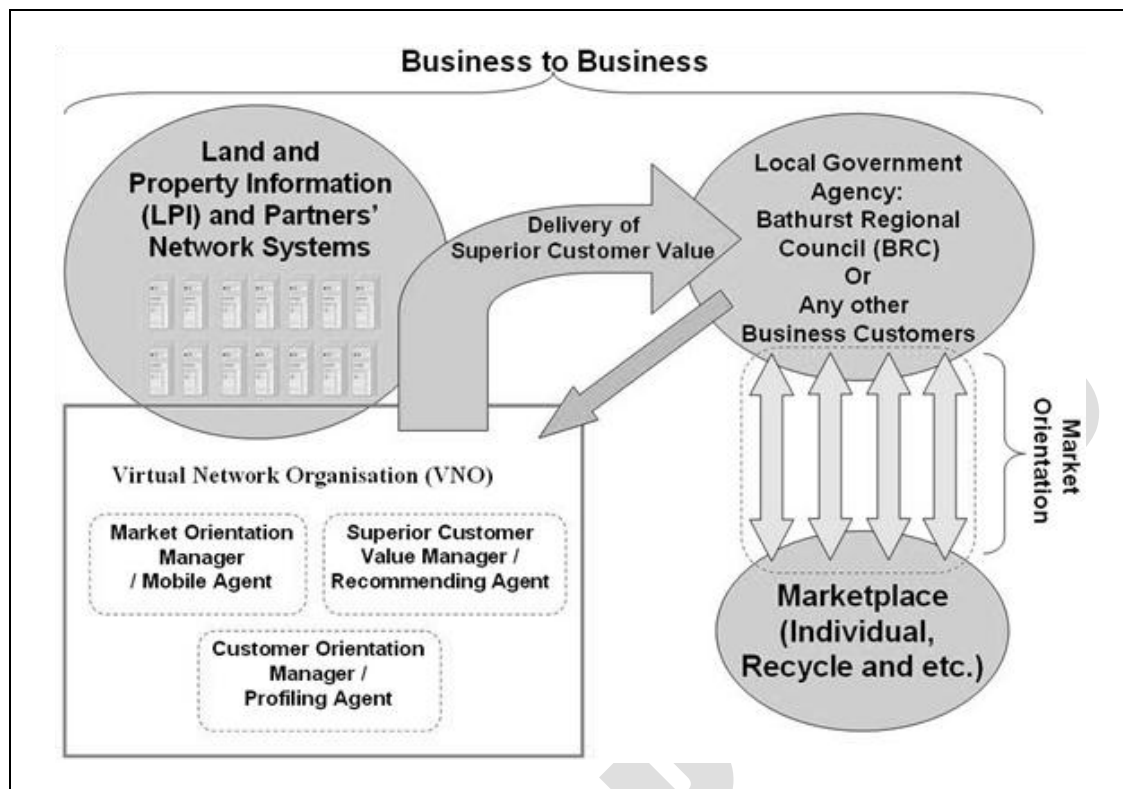


Figure 1 illustrates a conceptual framework of the LPI with the implementation of VNO. This conceptual framework is ideally suited to an organization like the LPI where it has a diversified range of raw data which can be generated and configured to meet solution requirements of the BRC's internal and external customers. This will lead to a further decrease of production costs and shortening of the value creation life-cycle to deliver data in a form and accuracy that meets the changing demands of BRC and its customers. Intelligent-agents are adopted to monitor the processes, execute specific tasks and ensure that the data are of a quality that meets client expectations. Further explanation of how the VNO functions and the job responsibilities of each intelligent-agent will be explored in the later sections of this paper.

2. The Orientation of Organizations

The orientation of an organization towards its customers, market and broader stakeholders has been one of the major research streams within the marketing discipline since the early 1990s. Market orientation, customer focus and customer orientation refers to a specific organizational behavioural pattern that can facilitate the implementation of the marketing concept. These features can also be treated as marketing strategies and, therefore, address a set of measurable activities that can collectively create an organizational capability in understanding and reacting to the dynamic market environment [4, 5].

Market orientation is a culture-focused on the continuous creation of customer value [6] through market information capture, synthesis and action. It is an intangible that is posited to be a source of competitive advantage that positively influences business performance [7-10]. Traditionally, a market-oriented organization focuses on understanding the expressed needs of customers in their served markets and on developing products and services that satisfy those needs [11-13]. However, new generation market-oriented businesses are committed to understanding both the expressed and unexpressed needs of their customers, and the capabilities and plans of their competitors, through the processes of acquiring and evaluating market information in a systematic and anticipatory manner [14-16].

Researchers often describe customer-focus as part of a market-oriented strategy in terms of building a close relationship with customers which allows them to have better understanding of their customers' needs [9, 10]. One viewpoint that is widely accepted by most of the researchers is that a customer-focused organization emphasises adopting organizational structures to facilitate increased responsiveness to

customers' needs. In fact, customer focus is about an attitude of gaining deep insight into a client's organization: understanding what it is, what it does and what it prides itself on [9, 10, 14, 15, 17-19].

As compared with a customer-focused organization, a firm implementing a customer-oriented approach concentrates effort in customer problem solving, identifying generic customer needs and coming up with efficient and effective solutions [17]. Customer orientation is basically putting the customer at the centre of the strategic focus of the organization [20]. Customer orientation involves understanding the customers' needs and using this knowledge to make all functions of the organization work towards fulfilling the needs [21]. The aim of a customer-oriented strategy is that the organization should be able to view the customers' needs as its own goals [22].

Orientation of an organization towards its customers market and broader stakeholders leads to improved business performance. In a long run, a market-oriented, customer-oriented and customer-focus organization will provide superior customer value for client organization's clients, who in turn, will lead to increase in market share and stronger customer loyalty. Thus, clearly, a network organization with the capability to provide superior customer value is the intermediate construct that connects market orientation, customer focus and customer orientation with performance.

3. Creation of Customer Value in the Virtual Network Organization

For the past decades, authors have proposed various explanations about what customer value actually means. Most researchers judge customer value as the results or benefits (of goods or services) customers receive in relation to total costs (such as price paid plus other costs related to the benefits) [4, 5, 19, 23-26]. In simple terms, customer value is value assessment associated with the customer evaluation of the benefits derived from owning the goods or services and compared to the amount of money paid.

According to Pihkala *et al.* [27], a network consists of three basic factors that are interrelated: actors, resources and activities. Actors can be individuals, groups of individuals or companies. Actors will run the activities and control the resources. These three mentioned variables form structures that can be described as networks.

An alternative explanation of a network is offered by Arias [28] who argued that the term "network", by itself, is an abstract notion referring to a set of nodes and relationships which connect to each other. A network is a powerful tool to foster innovation in companies and industry-wide. A network organization can also be treated as a linkage between the environment and the company. In other words, when individual companies come together with the objective of acting as a single firm with vast capabilities to achieve a specific goal [29, 30], a network organization has been formed.

Both approaches conceptualise, and provide important insights for understanding, networks. They also emphasise resources residing at nodes and as actors, and collectively emphasise the activities stimulated through linkages across nodes and the market. These linkages expand the innovative potential of organizational actors, with value creation – delivery options expanded through access to new capabilities, knowledge and other resources, and the potential of real-time delivery.

One of the major tasks of a VNO is to shorten the life-cycle of business process with the objective of generating and delivering better value to business client and their customers in real time. Suggested by Zeng *et al.* [31], the highest level of customer satisfaction can be reached within the business market, where both the customer contact and the customer focus are high. To achieve value creation within VNO, intelligent-agents can participate and play an important role in identifying components and forms of value appropriate to achieve customer satisfaction (client organizations and their customers).

4. Introduction of Intelligent-agent

Research on intelligent-agent or agent-based systems started in the late 1980s [32]. Following this period, in the early 1990s the focus shifted to the learning capability of agents [33, 34] while later research explored the intelligence capability of such agents with a view to their mimicking human actions [35]. Throughout these two decades, researchers have generated alternative definitions of an intelligent-agent, but most of them agree that an intelligent-agent is a software entity that carries out some set of operations on behalf of a user or another program, with some degree of independence or autonomy, and in so doing, employs some knowledge or representation of the user's goal or desires [33].

In brief, an agent is a program that performs a specific task with a minimum or even without direct human supervision. Intelligent-agents systems can combine both computers and humans, working cooperatively over space and time to solve a variety of complex problems.

Within a multi-agent system environment, intelligent-agents must communicate with other agents to perform or complete assigned task. Some agents learn or change their behaviour based on their previous experience. Some intelligent-agents are mobile, moving from one system to another to be closer to information or resources they may need to process, and do so without network delays.

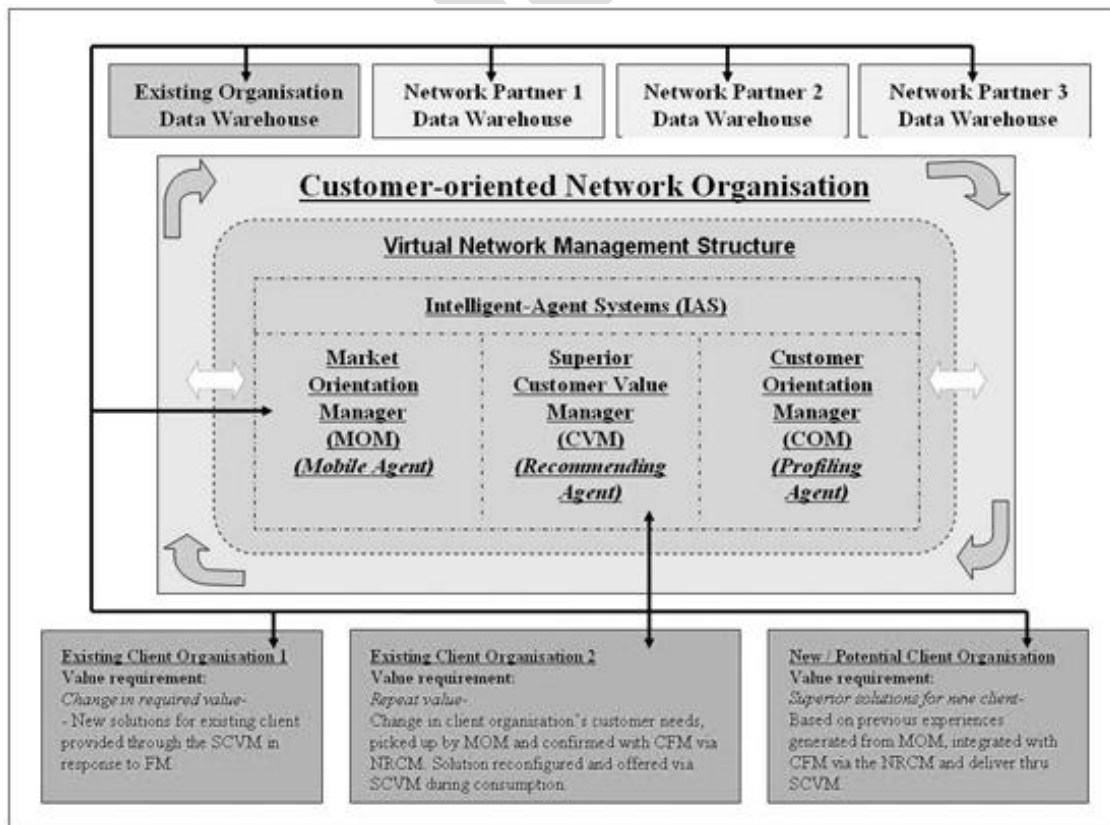
5. Proposed Model of a Value Creation’s VNO of LPI

Intelligent-agents, due to their suitability for open environments, have recently become popular with distributed, large scale, and of a dynamic agent application such as e-commerce and virtual organizations [36, 37]. The key aspects of agents are their autonomy, their abilities to perceive, reason, and act in their surrounding environment, as well as the capability to cooperate with other agents to solve complex problems. Facilitating the adoption of a virtual value creation strategy in a network organization would significantly enhance the ability of the network to satisfy customer needs without consuming a large proportion of the resources of the network.

Our framework adopts Intelligent-Agent Systems (IAS), which perform in a similar fashion to human. However, the IAS does not require complicated organizational structures to facilitate multiple simultaneous organizational orientations; a physical organization would struggle to achieve the simultaneous adoption of customer focus, a customer orientation and market orientation [38]. Further the proposed IAS provides a unique opportunity to deliver superior customer value in real time.

Figure 2 illustrates the LPI’s VNO containing three network partners and three different business customers. This customer-oriented network organization is designed to fit into today’s global market. It is ideally suited to an organization that relies on its internal or external network partners’ resources to produce quality products or services for their client organization customers. Its additional benefits are a further decrease in production costs and shortening the value creation life-cycle to deliver total customer satisfaction. Multi-agents are adopted to monitor the processes, execute any specific tasks given and thus ensure that the services and products are of a quality that meets customer expectation.

Figure 2: Intelligent-agent in a virtual network organization.



It is assumed that existing client organization 2 (as in Figure 2) represents the BRC, where it regularly request resources from the LPI based on its own and its customers' needs. To successfully deliver superior customer value to the BRC and its clients, solutions given by LPI must be accurate and relevant. With the deployment of intelligent-agents within the VNO and between the VNO and its client organization, the IAS will provide the semantic support infrastructure for high-level elements.

Based on the request received from the client organizations, the Market Orientation Manager (Mobile agent) will first locate any suitable data within its home server to fulfil the client's requirements. If solutions cannot be found, this Market Orientation Manager will then move from its home server to network partner servers to retrieve reliable data and transfer that valuable data back to the home server to integrate with the Customer Orientation Manager (Profiling agent).

The Customer Orientation Manager will be capable of analysis, suggesting solutions and solution changes from data retrieved from the network partners and the Customer Focus Manager. Those solutions will then pass over to the Superior Customer Value Manager (Recommending agent). The Superior Customer Value Manager will then have all the necessary knowledge and real-time information to provide a quality solution to resolve any ad hoc requirements specified by the client organizations or any potential client organization.

Each agent is thus responsible for performing duties that are assigned depending on that agent's characteristics. A virtual network value solution system including the integration of multiple-agents will have a common infrastructure and agent architecture to support system functioning, specifically sharing of data, processing resources across networks, exchanging information and collaborating on tasks and goals with the agent representing network orientations and client organizations.

A superior quality management system within a network organization will enhance the efficiency of the network by improving the quality of products and services to meet customer requirements [39]. Intelligent-agents are able to handle the administration of the network as a whole. Implementation of intelligent-agents can facilitate workflows within the virtual network organization while consuming minimal resources.

6. The Architecture of the LPI Network System and Virtual Network Organization

The overall system architecture of the LPI VNO is shown in Figure 3. This LPI VNO is a simple and powerful system which aims to show how superior customer value can be captured and delivered within the business-to-business customer-oriented virtual network organization of the LPI. The LPI VNO can be separated into two layers – 'LPI IAS (Intelligent-Agents Systems)' and 'LPI and Partners' Network Systems'. Within the IAS, each agent is responsible for performing assigned duties, depending on the agent's characteristics. In brief, these agents are capable of resolving any task as provided by the LPI's customers without human agent supervision. They perform their tasks quickly including retrieving relevant resources from data warehouses (via LPI and Partners' Network Systems) and reformat to meet LPI's customer requests.

In simple words, the LPI VNO by integrating multiple-agents will develop a common infrastructure, agent architecture and communication protocols to support system functioning, specifically, sharing of data, processing resources across networks, exchanging information and collaborating on tasks and goals with the agents representing network orientations and client organizations. How these agents work within the IAS and the explanation of LPI network systems will be explained in the following section.

7. How These Intelligent-agents Work

To better understand how intelligent-agents perform their task, the taxonomy of intelligent-agents with specific behaviours is shown in Figure 4. In a multi-agent system, it is essential to design a set of autonomous types of behaviour, including reactive, proactive, and cooperative behaviour, for the agent class to take action based on own goals and other agents' requests. The reactive behaviour of an agent allows actions based on other agents' requests; the proactive behaviour enables an agent to act based on its goal; the cooperative behaviour enables an agent to cooperate with other agents. The IAS within the LPI VNO is composed of three agents: Recommending Agent (RA), Profiling Agent (PA) and Mobile Agent (MA). The details of each agent are illustrated in the following sections.

A *Recommending Agent (RA)* which serves as a Customer Value Manager improves productivity of marketing activity and profitability of an organization by identifying the value of different customer segments and aligning marketing strategies, plans and resourcing accordingly. RA serves as a first contact point within the LPI VNO that allows the LPI customers to carry out business transactions with LPI via Internet.

Figure 3: Overall system architecture of LPI’s VNO.

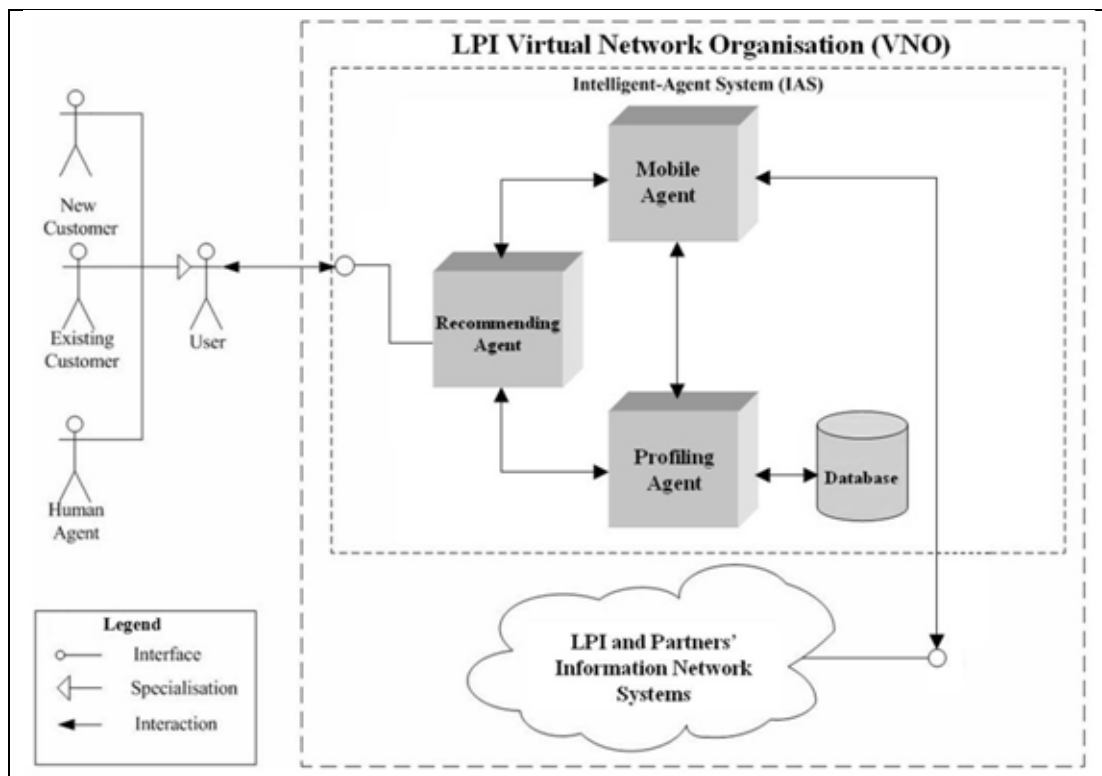
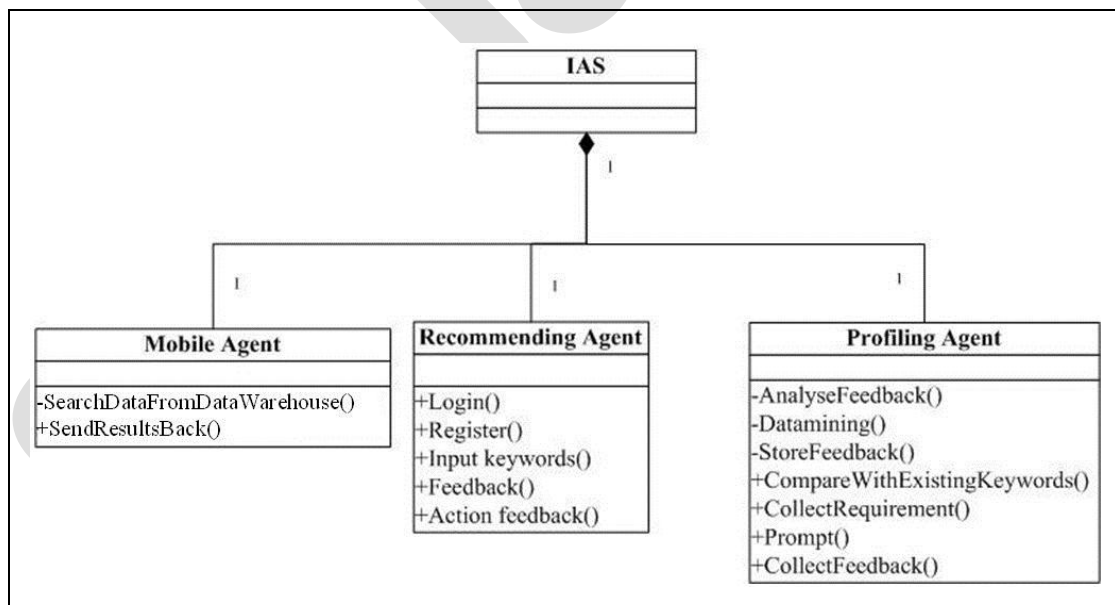


Figure 4: Class diagram of intelligent-agents in the LPI’s VNO.



At first, the RA provides a user interface (UI) by allowing new customers to change their role through registration “Register ()” and access core functions after “Login ()” to the system. Once the user ID is identified, existing customers will then enter their product request by using the “InputKeywords ()” function to describe any product they are searching. Information of the requested product will then be transferred to the PA for further processing.

With the close working relationship of all the intelligent-agents within the VNO, the RA will then have access to the necessary knowledge and real-time information (provided by the PA) to deliver a quality product

to resolve any ad hoc requirements specified by the customers. At the same time, the RA could provide the relevant results to customers using the “Feedback ()” function (results attached and sent by email).

A human agent (LPI staff) can always monitor and follow up feedback provided by the RA with the use of the “Actionfeedback” function anytime they wish to make sure that customers are satisfied with the products and services provided within LPI’s VNO.

A major task for the *Profiling Agent (PA)* is to datamine any information received from its colleagues (RA and MA) and interpret it as useful data to be deployed by the RA at a later stage. In this case, a PA within the LPI VNO must be capable of analysing and suggesting data requirements to meet solutions needs and requirements of customers. This is explained in the following paragraphs.

Firstly, the PA collects customers’ requirements via the RA using the “CollectRequirement ()” function. The PA will then search for any solution that can meet the customer’s request within its own database using “CompareWithExistingKeywords ()” function. If no solution can be made internally, PA will then need to search for solutions externally (looking at network partners’ data warehouses) via the MA.

Moreover, this PA must also be capable of suggesting solution changes based on data retrieved from the MA. The data will then be reconfigured using the “AnalyseFeedback ()” function to suit the customers’ interest, and released to the customer via the RA using the “Prompt ()” function. All products and services released to customers will be stored as a backup within the VNO’s database using the “StoreFeedback ()” function.

At all times, a human agent can analyse customers’ preferences using the “AnalyseFeedback ()” function or perform any data mining manually by using the “Datamining ()” function.

The main task of the *Mobile Agent (MA)* is to travel from its home server to network partner servers to search for any reliable data and transfer that value relevant data back to the home server for integration with the PA. To search non-local information (from network partners’ data warehouses), the MA should have the mobile capability to search related information through networks. The MA can access multiple, heterogeneous and geographically distributed information resources in partners’ Intranets or Internet.

In simple words, the responsibility of the MA is to search for information from data warehouses based on the customers’ request (input of accurate keywords) by using the “SearchDataFromWarehouse ()” function. Once the relevant data has been located, it will then be transferred back to the PA for further integration using the “SentResultsBack ()” function.

8. Conclusion and Future Research

A superior quality management system within a network organization will enhance the efficiency of the network by improving the quality of products and services to meet customer requirements [39]. Implementation of IAS within the VNO as shown in Figure 2 identifies components and forms of value appropriate to achieve superior value design and delivery for both client organizations and their customers.

This study explains how a VNO (with the incorporation of intelligent-agents) as an organizational system and phenomenon exhibits potential to open up further areas of marketing and management research. This study provides interested researchers with an opportunity to apply and modify this newly created VNO model designed to create superior customer value and delivery in other contexts. It would be useful for future studies to discover whether this new customer value creation and delivery VNO can be applied across all regions of B2B including other industry sectors, and in the private sector. The increase in customer expectations requires more sophisticated analytical systems such as the Web-based VNO as implemented in this study. The way in which marketers address the ever increasing and competitive nature of demand will determine the effectiveness of their service delivery and client satisfaction. Furthermore, feedback system efficiencies will in turn deliver more sustained profitability through enhanced customer-care, client retention and customer relationship management.

Competing Interests

None declared.

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