The Creation of a Ubiquitous Business Community for an Agribusiness Cluster

Research-in-Progress

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ABSTRACT

Ubiquitous Business Communities (UBC) are information processing systems that offer people the possibility to connect to networks, any time independently from location and computing platforms, which are sensitive to the users´ contexts. UBC allow participants to exchange information and enhance business transactions. These systems may act as market organizers and may affect millions of producers and clients in developing countries. Our research-in-progress paper presents the creation of a UBC to enhance business transactions in an agribusiness cluster. We highlight some characteristics of the UBC under development, considering the main factors that influence the competitiveness of the cluster. We also describe aspects of the development process of the UBC and of the structuration process of the community (organization of a member and product catalog and of product quality standards). Finally we present expectations to be verified in the implementation process of the UBC.

Keywords

Ubiquitous, community, computing platform, development, agribusiness, cluster

INTRODUCTION

The need to perform empirical research on the impacts of Information and Communication Technology (ICT) on agricultural supply chains in developing countries was highlighted by Banker, Mitra and Sambamurthy (2011). They state that ICT has the potential to affect the lives of millions of people around the world and its influences have been inadequately examined in the Information Systems literature.

Previous studies involving market organizations (especially commodity trade platforms) focused on the impacts of such online environments, including lower transaction costs for buyers and sellers, 7 days-a-week operations, better price and product information, better visibility of the price formation process, less collusion among buyers, less exploitation by intermediaries, and a more streamlined agricultural supply chain. The studies also explored the main trade exchange processes involved with the support of ICT platforms (Banker et al., 2011; Kambil and Van Heck, 1998).

With the growth of mobile telephony, broadband, wireless networks and multiple computing platforms and devices, computing is no longer centered on the personal computer. This evolution brought reality closer to the vision of Weiser (1991) of ubiquitous computing: computing becomes ubiquitous, embedded in various objects of everyday life, and increasingly sensitive to users´ context. The applications of ubiquitous technologies vary from industry to industry. Through the availability of resources (for example, automatic location identification) they make the delivery of information and services tailored to specific needs in innovative ways possible, enabling new forms of market organizations, especially those that require intense communication (Costa, Yamin and Geyer, 2008; Franco, Rosa, Barbosa, Costa and Yamin , 2011; Begole, 2011; Dourish and Bell, 2011).

A Ubiquitous Business Community (UBC) is defined as an online business community supported by a computer application designed to promote business transactions and interaction between economic agents in a ubiquitous manner. UBC concerns

information services, communication and business transactions available anywhere (across different computing platforms) at any time (allowing synchronous or asynchronous interactions), and it is sensitive to the context (location, information needs, time demands, user profiles) (Banker et al., 2011; Costa et al., 2008; Kambil et al., 1998; Rigoni, Saccol, Barbosa and Costa, 2012). Based on the exchange trade platforms literature and aware about the potential to develop information services supported by ubiquitous technologies, we present preliminary results of a research that intends to create and test a UBC with the purpose of developing business in an agribusiness cluster in order to create value to its agents. Fostering inter-organizational relationships in a cluster can be a way to promote the development of regions and sectors (Morosini, 2004) and the adoption of a UBC can promote such relationships. In this context, this research and development project aims to study practical and theoretical aspects of the creation and implementation of a UBC in a not well structured inter-organizational environment.

This paper presents some elements of our research-in-progress: the main factors that influence the competitiveness of the cluster and the resulting characteristics of the UBC. These concepts are important since the assessment of the level of competitive cluster factors can be used to guide the adaptation of ubiquitous services in order to create a well suited business community. Since one important factor in the flower sector is the perishability of products, UBC services empowers sellers to seek more effectively for selling opportunities while buyers are empowered to get tailored information about members and their products. We also describe aspects of the development process of the UBC and of the structuration process of the cluster, like the organization of a product catalog and of product quality standards.

In the remainder of this paper we first present the theoretical background concerning ubiquitous computing and market organizations, as well as the cluster competitiveness factors. Then we describe some aspects of our research project and about the design research method adopted. As preliminary results we describe the competitive factors of the agribusiness cluster that influenced the features of the UBC, the ubiquitous computer support under development, and elements of the development process and user concerns. We also present expectations to be studied during the implementation of the UBC.

BACKGROUND

UBC and Market Organizations

Banker et al. (2011) compared transactions on a recently commissioned digital coffee-trading platform in India with those in the corresponding weekly physical auctions run by the Indian Coffee Traders Association, and with farm gate prices in the coffee producing regions. They concluded that the digital platform is suitable for numerous commodities for which precise grading standards already exist, such as wheat, soybean, and corn. This platform supports a market organization. Market organizations are information processing systems that perform the role of governance systems since they represent a consensus among different competing stakeholders on organizing the interdependent processes (Kambil et al., 1998). One big difference between these digital platforms and a UBC is that the first offer information about the price of the tradable products and this situation concerns whether the benefits of the online platform actually translate to higher commodity prices for the producers (Banker et al., 2011).

In an article about reengineering the Dutch Flower Auctions, Kambil et al. (1998) presented a framework to analyze the main trade exchange processes that influence the adherence to market organizations and the main trade context processes. The most important elements of the trade context processes are product representation, legitimation, influenced structures and processes, and dispute resolution. The main elements of the trade exchange process are search, valuation, logistics, payment and settlements, authentication, and communication.

The studies of Banker et al. (2011) and Kambil et al. (1998) revealed that the use of digital platforms has the power to increase the amount of combinations of business processes (information search, valuation, logistics, etc.), creating business opportunities that were previously unfeasible and thus increasing the likelihood of matching of interests from different business partners. In general, commodity markets have grading standards of the commercialized products. This facilitates the use of digital platforms. Since most of developing countries' economies are characterized by the commodities they produce, it can be expected that the use of digital platforms could eventually foster the development of these economies.

Ubiquitous Computing Applied To Business

Ubiquitous computing environments refer to applications of technology that enable people to obtain information and connect them to networks anywhere and anytime (Weiser, 1991; Kim, Oh, Shin and Shae, 2009, Franco et al., 2011). Such applications involve the use of multiple computing devices (fixed or mobile) interconnected by different types of networks (global, local, wireless), as well as sensors that make these devices "aware" of each user in any environment (Yuan and Zhang, 2002).

Anckar and D'Incau (2002) proposed a framework that identifies different scenarios (needs) where the mobile and wireless technologies can help to deliver business value. They mentioned a time urgency scenario – where mobile technologies can open up new opportunities in situations where there is urgency for an interaction and where time-sensitive information must be delivered -, a spontaneous decision scenario – where users can adopt mobile and wireless technologies to help them to seek for information or support to find efficient ways to accomplish daily activities and save time, and a mobility scenario – which allows users to work anywhere and always staying connected. The latter is particularly important for organizations that are geographically dispersed.

The adoption of mobile and pervasive technologies by business has an important social dimension, since these technologies enable communication and coordination within and outside the organization (Davis, 2002; Sorensen, 2011). Therefore, they can be powerful tools to support social networks and business communities. The use of mobile technology also enables UBC members, even those who are travelling around, to be in touch with other potential members, including and teaching them how to be part of the community. This capacity may enlarge the market potential of the community at low costs.

Cluster Competitiveness Factors

Cluster is a social community distinguished by a delimited knowledge base related to a common “sphere of business” and supported by a labor pooling of skilled manpower in one or several specific geographical regions (Morosini, 2004). Within the cluster there is also an economic role played by local associations of entrepreneurs and/or local government, who create specialized service centers, strengthen infrastructure, and launch initiatives to support the cluster.

Firms located in specific geographic areas are more capable of having intensive face-to-face contacts, share values, behaviors, codes and languages which in turn enhance knowledge sharing with previous existing or spin-off firms. This strategy is an alternative to substitute vertical integration of activities that do not constitute a firm´s core business (Morosini, 2004).

Rigoni and Saccol (2012) realized an extensive literature review to structure a framework which consists of three main blocks. Their purpose was to assess different points that have the potential to contribute to the competitiveness of the cluster. The constructs are the cluster features (social community, economic agent cohesion and cluster governance); competitiveness factors (external factors, internal factors - resources and processes -, and knowledge interaction); and performance (of the cluster and of the firms).

Within a cluster, firms can establish ties, interact and participate in joint activities, including the exchange of information. They also can perform a joint monitoring of the external market, resource sharing and a joint search for innovations to achieve a good performance. In this scenario of ties and interactions, the establishment of a code of behavior may facilitate the increase of trust among cluster members, and can avoid opportunistic behaviors.

Two characteristics that are emphasized in the cluster literature are the existence of a code of behavior and a sense of belonging. Considering these aspects, it makes sense to assess the level of the competitiveness factors of a cluster in order to identify which UBC services are more fitted to a selected cluster.

Considering the possibilities of ubiquitous computing and the features of clusters, in the next section we present the research method to create a UBC in order to enhance business transactions inside a cluster.

THE RESEARCH METHOD

The cluster selected for the creation and testing of a UBC was an agribusiness cluster of flower growers, in which firms plan to obtain increasing competitive gains. This cluster is located in the South of Brazil and is not well structured. The different

members of the cluster are flower growers, suppliers, wholesalers and retailers, and representatives of governmental agencies and associations, representing more than 200 organizations.

We adopted the design research method (Vaishnavi and Kuechler, 2004) in our research. This research method allows a systematic knowledge building through the construction of an artifact. The design research paradigm, according to Hevner, March, Park, and Ram (2004, p.75), "seeks to extend the boundaries of human and organizational capabilities by creating new and innovative artifacts". The artifact designed and implemented is a prototype of a computer application to support the UBC.

According to Vaishnavi et al. (2004) the design research method comprises:

(1) **Problem awareness** – it involves the understanding of how the cluster works and what the cluster competitiveness factors which can be improved with the use of a UBC are. Our context, the flower cluster, was studied and the first ideas to the UBC design were collected.
(2) **Suggestions** – consists of a first tentative of designing the artifact (UBC). The main features the artifact is supposed to have were studied in this phase.
(3) **Development** – this phase comprises the introduction of the artifact (UBC) in the cluster, in order to evaluate the effects of its use.
(4) **Evaluation and conclusion** – this will constitute the last step of our research when all the lessons learned and the knowledge generated by the development and use of the UBC in the cluster (our field) will be evaluated.

Our research and development project initially involves five researchers and about 23 members of the flower cluster. This number of agents is not large enough to test the UBC in a real business setting, with the diversity of the flower grower's business scenario. As stated by Anckar et al. (2002), some characteristics of this setting are the urgency of making an offer, the efficiency of delivering the demanded products to customers, and the need to do business even of out of office. Consequently, one of our recurrent actions was to motivate and recruit new cluster agents to take part of the project and increase the number of participants.

For our research purposes we need different types of secondary and primary data. So, we organized a detailed research protocol, data collection procedures, and data storage procedures. We are taking systematic notes about participant's needs and the actions we performed. The analysis of this data is mainly content analysis.

In the sequence we describe the stages of the research that we have performed so far: (1) Problem awareness, (2) Suggestions, and some aspects of stage (3) Development.

PRELIMINARY RESULTS

Problem Awareness

The project started with some preliminary contacts with flower growers in March 2011. Secondary data consisted basically on the study of two academic studies about the economic demography of the sector and the website of the main cluster association, AFLORI. A partnership was also started with AFLORI. This partnership and the participation of an undergraduate management student of our research group, familiar with cluster participants, allowed the researchers to obtain valuable contacts for data collection and to gather important information concerning the cluster, such as cluster firms' locations, number of employee, involvement of firms in associations, and technology used.

The first step to develop the UBC consisted in identifying the main factors that affect business competitiveness in clusters, in order to develop services that enhance such factors. Drawing on the cluster literature a first questionnaire to assess cluster competitive factors was proposed in (Rigoni and Saccol, 2012). A qualitative semi-structured questionnaire with a total of 46 open questions (divided in 6 constructs) was validated and used (Hoppen et al., 2013), resulting in seven constructs named *Institutional fabric* (social community, economic agent cohesion), *Cluster governance* (leadership, leader roles, structure of cluster representative institutions, institutional roles), *External factors*, *Internal factors* (resources, processes), *Knowledge sharing., Human development and Cluster competitive potential*. Twenty three interviews with different members of the cluster – flower growers, suppliers, wholesalers and retailers, and representatives of governmental agencies and associations were performed to develop this instrument (Table 1).

Interviewees	Number of interviews	Duration (in hours)
Flower growers	9	16:29
Input suppliers (seeds, breeders, fertilizers, materials to hothouses, supplements, etc.)	6	05:45
Flower wholesalers	3	02:15
Flower retailers	3	04:56
Representatives of governmental agencies and associations related to the flower cluster	2	06:52
Total	23	36:17

Table 1. Characteristics of the interviews performed

Source: Hoppen et al. (2013)

The data gathering process took approximately seven months. During this period, the researchers participated in meetings organized by the local clusters' associations, Brazilian Flowers Institute (IBRAFLOR) and in informal meetings with local clusters' representatives. Eleven additional observations and informal conversations, totalizing 43 hours, were performed. Also 74 emails were exchanged with different members of the cluster during the research process.

The collected data was analyzed adopting content analysis procedures with the support of the software NVivo9®. All information gathered – transcribed interviews, coded observations and field notes, emails, sector reports, input suppliers catalogues - were analyzed together in order to perform triangulation. This procedure resulted in a better comprehension of the field and the competitiveness factors of the flower cluster. The main competitiveness factors of the cluster generated the first suggestions for designing the UBC.

Suggestions

To start the specification of the artifact, we first defined its information services of the UBC. These services were based on the cluster competitiveness assessment and were specified following the needs expressed by cluster agents. They were grouped in four distinct categories: pushed information about external entities that affect the local community (consumer markets, supplier markets, external substitute products, events, and regulatory and legal information); information referring to supplies (human, production, transportation and specialized resources); information referring to competitive capacitation (ideas forum, capacitation in new technologies, financial, predictive, qualitative and market analysis and research and product development) and business information services (offerings, demands, marketing and sell out). The main objective of these information services is to enable collaborative capacities and enable new forms of business combinations. The study of Rigoni et al. (2012) presents the details of the UBC information services specified.

Implementing these 21 services would result in a highly complex platform and would demand a considerable amount of resources and time. To reduce such complexity and to improve the chances for implementation success, we followed an incremental development approach. This approach is supported by design research as it concerns systematic knowledge building.

We realized two meetings with eight potential UBC members to decide which services should be implemented first and what kind of information the members would like to have access first. On the first meeting, one by one of the 21 possible services were presented to the eight members, followed by a detailed explanation regarding the benefits acquired from the implementation. This process was leaded by two researchers. The most important UBC services chosen were communicating demands and offering of products and some related information. When the members were inquired about the importance of those services, all of them stated that getting information about product demands is crucial to add value to the system. One producer stated: *"if I become aware of where the demands are, I have the opportunity to attend them even if I have to buy products from my competitors to supply urgent demands."* The offer of products was ranked as the second most important service. When members have to sell their products, they spend too much time (some spend almost two weeks) sending e-mails or calling potential buyers. This is critical due to the perishable nature of the products produced in the cluster.

The UBC services that the members considered most important to know where (1) the products and quantities demanded and its location and (2) the possibility of making their offer aware to all members. So, the selected UBC services consist basically

in collecting, consolidating and redistributing information about product demands and offerings according to members' preferences through an algorithm of matching. Since the flower growers' cluster is not yet well structured (there is a lack of consolidated institutions and associations to apply any kind of ethical rules), its members decided that information about products' prices should not be included yet, in order to avoid auctions disputes among cluster members. This showed to be a very important decision because in this kind of market such information will favor the bigger agents considering they have power to shrink prices in order to eliminate competitors.

At this stage, if a member of the community wants one or more products, the process of buying and selling needs to be confirmed by phone or e-mail. This procedure remains the same as the business procedure currently practiced, the seller or buyer needs to contact to the potential supplier to acquire information about his offer. This action forces interaction between cluster members. One unpredicted behavior is when one member searches in the opportunities catalog (demands and offers) and he decide by himself to make the match between the offer and the demand making a profit acting as a broker.

Figure 1 presents a schema to explain how the UBC interrelate different kinds of economic agents in the cluster studied.

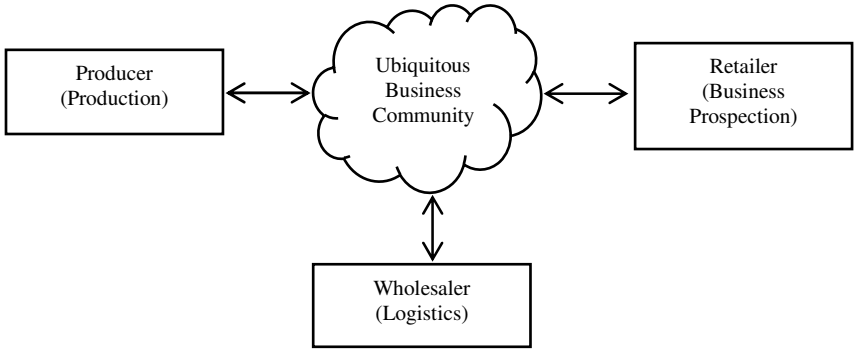


Figure 1. Information interactions making use of a UBC

The second meeting consisted in determining which category of products (e.g. flower, ornamental plants, and landscape gardening) should be prioritized in the first phase of the project in order to obtain a maximum benefit/expenses ratio. Participants decided that the project should start with cut flowers because their higher aggregate value.

Development

The development of the UBC and its assessment process occurred in parallel. In order to guide us in this process, the framework proposed by Borenstein (1998) was used. This framework concerns the development of prototypes of IS and its test following field test validation.

The creation of a research artifact such as a UBC, typically involve three parties: the cluster community, researchers, and the technical support team. The commitment of the cluster community to the UBC development of services and processes is a determinant factor. Researchers must identify the problems of the cluster and, based on them, start new studies to generate theoretical and practical knowledge. The technical support team is responsible for the ITC and its operation. It is important to state that in a UBC project, besides knowledge generation, the self-sustainability of the whole experience is another issue to be taken into account.

Members of the cluster also defined the products (flowers and ornamental plants) to be included into the platform. They also defined which members of the group would be responsible to manage the inclusion or the removal of these products. In the future this group may assume a governance role in the UBC. They also decided to use a forum to exchange ideas among the cluster members and settled an agenda to organize the adoption of the UBC platform.

Three meetings occurred to present, correct and validate the developed prototype. In the first meeting, which occurred in the AFLORI site, a preliminary prototype, including only cut flowers, was shown to eleven members. Some errors that occurred while showing the prototype were correct on the fly. In this first meeting the cluster members decided to include ornamental plants. A second meeting occurred in a computer laboratory of UNISINOS. The agenda was very similar to the first meeting,

and it involved five members that were already introduced to the UBC and ten new members. In this meeting it was decided to include another class of plants (landscape gardening) into the prototype. A third meeting was organize to correct some bugs and to define the features of the version 1 of the UBC and to train new potential members. It involved five members with some experience on the UBC and ten new members. After this meeting the research group considered that a first prototype version was able to be implemented in the cluster.

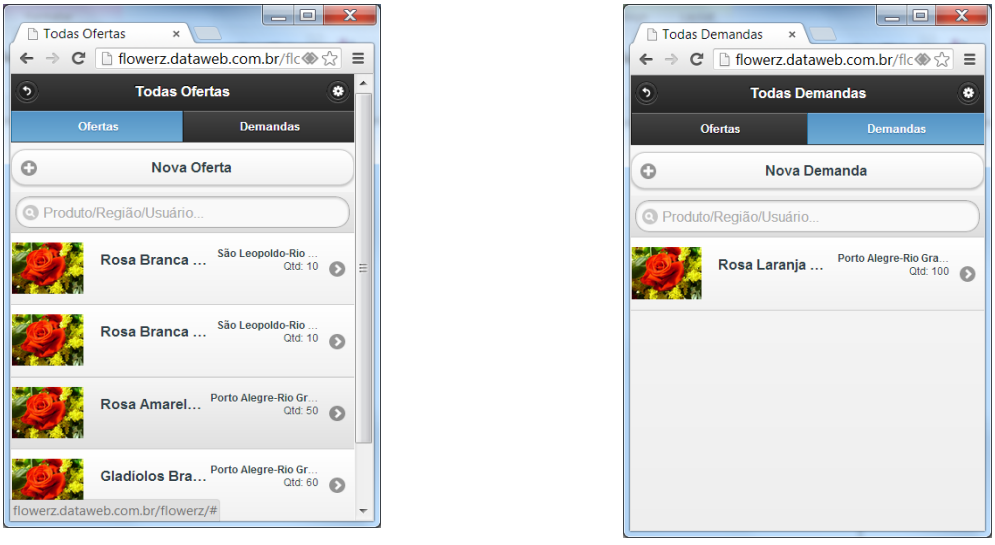
At Table 2 we present the actions performed by researchers and cluster members to obtain an initial organization of the community and to define initial features of the UBC. Actions like the development of a catalogue and the diffusion of quality standards contribute to the consolidation of a community which can evolve to a market organization. These actions preceded the implementation of the artifact in this community.

Actions performed to develop the consolidation/ organization of the community, preliminary to the introduction of the artifact	Hours spent	Number of agents	Number of Researchers
Development of a catalogue of the agents of the sector	15*	1	1
Development of a catalogue of common products of the region	15	7	2
Diffusion of quality standards according to local singularities	15	11	4
Development of the artifact based on two platforms: web, android	220	2**	3
Training of UBC potential users (UNISINOS computing laboratory)	12	15***	4
Testing of the UBC platform in a controlled environment (UNISINOS computing laboratory)	12	15	4

* The lack of a database regarding the contacts of cluster members makes necessary create one. This process still continues.
** These two agents were elected by the participants to represent them in how the selected UBC information services should be implemented.
*** The group was composed with ten new participants that were not familiar with the prototype and its features.

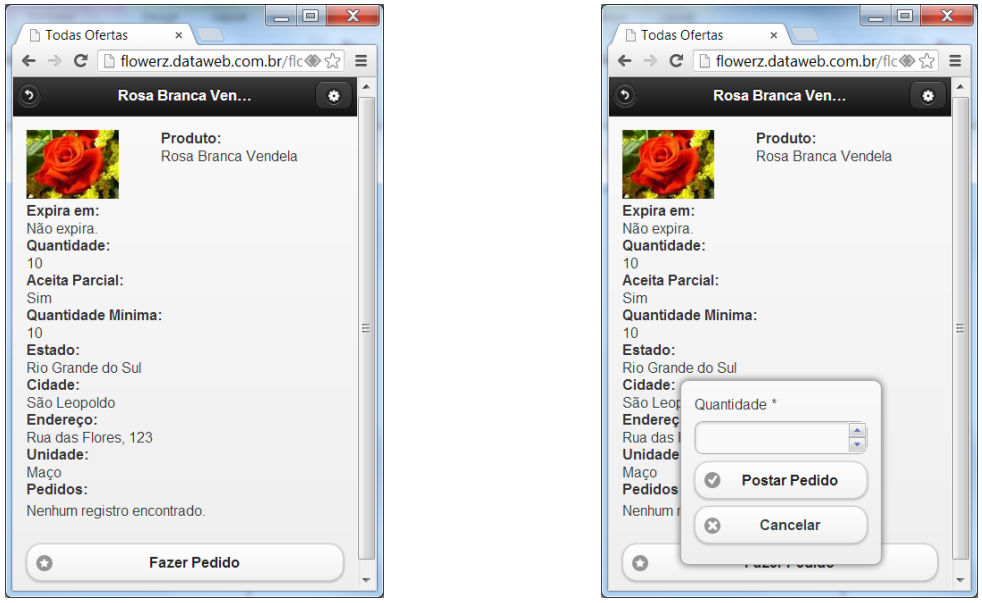
Table 2. Actions performed to organize the community, preliminary to the introduction of the artifact

The UBC prototype was developed using the languages C# and JavaScript. Figures 2 and 3 present snapshots from the implemented UBC prototype functionalities: offer and demand of products by the UBC members (Figure 2 a and b), and a specific offer of a seller and the correspondent demand of a potential buyer (Figure 3 a and b).



(a) (b)

Figure 2. Screen snapshots of the flowers offered (a) and demanded (b) by all UBC members



(a) (b)

Figure 3. Screen snapshot of a specific offer (a) and the corresponding demand of the offered product (b)

DISCUSSION AND NEXT STEPS

In this paper we presented the theoretical basis, the methodological foundations and the preliminary actions taken in a research-in progress in order to design and test a UBC. Since this UBC is an artifact to organize a cluster based community, its different stakeholders (flower growers, wholesalers, retailers) can obtain benefits using the services.

Some benefits derive from the use of this UBC, which are: reduction of the information asymmetry; diffusion of information to subside logistic decisions; and individual and aggregate information and knowledge to guide public investments. It is expected that this may provide the basis to develop circles of partnerships. In such circles it is also expected that trust will increase among its members and that transaction costs will decrease if an opportunistic behavior tend to be avoided, transforming the cluster in a more competitive community. It is also expected a logistics analysis that will benefit logistics firms. In turn they will be able to specialize according to products and routes minimizing costs (e.g. optimization of existing fleet of trucks) and maximizing benefits (e.g. adapting transportation to specific flower needs).

Another benefit derived is real time information on how the community behaves. This resource enables collective and collaborative actions. A by-product of such information is the orientation of public investments to improve infrastructure (e.g. communications, transportations) of the cluster.

Other benefits result from the organization process of the cluster, preliminary or parallel to the adoption of the artifact. The structuration of a member catalogue, of a product catalogue adapted to the specific needs of the agents and the definition of quality standards for these products are some of these benefits. These elements are not frequently reported in the UBC literature.

All these expectations need to be verified in future steps of our research.

We detected that the most successful players in this market are not willing to adopt new ways of doing business (we feel that this can threaten their market share), and that players in a more precarious situation are willing to adopt this artifact. However they do not have enough power to promote innovative changes in the market.

The next steps of this research-in-progress will show if this type of rationale effectively applies to practice.

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