Collaborative networks as incubators of dynamic virtual organisations: a case study of the emerging MAP sector

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Abstract: This research explores development requirements and policy arguments in the emerging medicinal and aromatic plants (MAP) sector. Supported by a reference model adapted from the European Collaborative networked Organisations LEADership (ECOLEAD) project, the creation of a virtual organisation (VO) breeding environment (VBE) is also assessed using a qualitative exploratory case study involving an EPAM (Entrepreneurship-in-MAP project) IT-platform, where data was collected from the EPAM website and from multiple secondary sources. Contributions to practice include the setting of critical success factors, the assessment of management roles and the discussion of the MAP-VBE positioned within the scope of EPAM. While the introduction of a ‘neutral mediator’ role constitutes a contribution to theory, innovative insights into MAP structuring promotes operations management research on VO incubation/formation in nascent and emerging industry contexts.

Keywords: collaborative networks; virtual organisation; VO; VO source network; VO breeding environments; medicinal and aromatic plants; MAP.

Collaborative networks as incubators of dynamic virtual organisations

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1 Introduction

The definition, characteristics and business interest of medicinal and aromatic plants (MAP) are addressed in this section. Then, the empirical gap concerning the definition of a collaborative network (CN) to support virtual operations in MAP is identified from previous research and two research questions are formulated.

1.1 MAP and virtual organisations

1.1.1 Definition and characteristics of MAP and importance of organic farming

MAP are botanical raw materials, also known as herbal drugs, primarily used for therapeutic, aromatic and culinary purposes. They are considered healthy foods and a source for other natural health products; a source of chemical components for cosmetics, perfumes and medicinal products (Verpoorte et al., 1999; Gómez-Galera et al., 2007); and are raw materials for essential oils, dry/liquid extracts and oleoresins.

Farmers, in Portugal, are now increasingly looking into the sustainable production of MAPs, especially with a view to developing an export trade, in response to growing consumer preferences for natural health products (ECPGR, 2010). The demand for MAP has grown rapidly due to this accelerated local, national and international interest, the
latter coming from the pharmaceutical and cosmetic industries. Organic MAP are plants that are grown without added chemicals and are quality certified, which ensures consistently meeting (inter/)national standards. Organic farming is also a way to improve productivity whilst caring for the quality of the soil, environmental welfare and human health (Stockdale et al., 2001). For this reason MAP are increasingly recognised as very important resources for sustainable development, specifically as a source of safe, effective, and accessible products. Moreover, their production integrates traditional and community knowledge, with innovation and practices from modern scientific approaches to health research.

1.1.2 The potential business interest of MAP

The MAP business has been an important income source for rural populations worldwide. Developing the sector, providing modern tools and new business arrangements may help increase revenues, promote exports and create additional local jobs. Moreover, land assigned for organic farming, the number of organic farmers, and the organic market are constantly growing. In 2012, 11.2 million hectares, (2.3% of the overall agricultural area), was under ‘organic management’ in Europe, (representing an increase of 6%, compared to 2011), with more than 320,000 producers (FiBL-AMI-IFOAM, 2013).

The size of the European organic market was 22.8 billion € (2012) and its growth rate was ≈ 6% (FiBL-AMI-IFOAM, 2013). The European Council of Agriculture estimated the MAP retail sales produced in organic farming, in 2013, to be approximately €6 billion (GPP, 2013). Moreover, the number of organic farmers in the EU has been increasing by approximately 12% per year (Carrera and González, 2011), with most of them being small-scale producers.

1.1.3 The MAP sector in Portugal

The exceptional edaphoclimatic conditions of Portugal are an important driver of MAP production. Recent studies have shown that the MAP sector has risen significantly:

1. farming explorations increased fourfold in the period 2009-2013 (GPP, 2013) with significant growth expected to continue
2. cultivated areas soared from 230 to 1324 ha, in seven years.

Moreover, the international market has exhibited higher growth rates, which favour exportation.

Currently, MAP are produced by small-scale farmers. There is a growing trend in entrepreneurs, after completing their studies in urban centres, returning to the rural areas because they are fascinated by the opportunities supported by attractive government grants made available to help them establish themselves (Almeida et al., 2014; Almeida and Vilas-Boas, 2014). This has also been seen as an opportunity to create more dynamic and innovative projects, despite the fact that the following aspects might require attention:

1. commercial – difficulty reaching the international market
2. operations – no ICT platform to support the social one; the need to adapt plants and production to natural regional conditions through specialised studies
3 research – the need to bring together the countless specialists in the several knowledge areas by focusing on MAP; the need for a clear research initiative in MAP, to focus research agents.

1.2 Purpose, empirical background, research questions and expected contributions

This paper reports research on an innovative topic, and is based on a previous exploratory theoretical validation of collaborative networks that support virtual operations in MAP (Almeida and Vilas-Boas, 2014). Here, there is an argument to be made for both the opportunity and suitability of commercial virtual organisations (VOs) to address the scenario of small-scale, independent, autonomous, geographically distributed, and heterogeneous MAP producers. In fact, producers would have great difficulty cooperating and reaching the marketplace without proper organisation and adequate technological support. This is another argument in favour of this organisational solution as a way to produce types of VOs other than the commercial ones, which might leverage and drive the national scientific potential towards the interest of the MAP sector, and farming in general. Usually, these technological and scientific abilities have been spread over several independent institutions distributed geographically.

In fact, Almeida et al. (2014) have recently identified a few critical ‘missing links’ for the MAP sector, in Portugal, based on data collected from panels comprising of 12 participants from government, rural development associations and producers. One of the gaps identified concerned the misunderstanding of the concept of ‘fileira’, which was being formally classified and characterised as a value-added chain dedicated to routine operations. From this perspective, the ‘fileira’ was expected to materialise in a stable relationship, capable of resolving most of the misunderstandings of the MAP business and appearing to target administrative regulation by the State ‘nomenclature’. In addition, a need to establish a social platform for all the stakeholders involved in the MAP business was acknowledged, based on civil society and built on the already established associations for rural development. However, this social network was considered as a time consuming and risky entrepreneurial initiative that required the support of a technological platform. Therefore, the web-based platform developed by the EPAM (entrepreneurship in MAP) project, in Portugal, deserves special attention because it represents the state-of-the-art of the technological support afforded across this social network. Thus, a first research question was formulated, as follows:

• “Is the current ‘state-of-the-art’ technological support of the social network adequate?”

Secondly, Almeida et al. (2014) also proposed addressing the MAP ‘fileira’ as a loose network of MAP stakeholders, glued together by non-mandatory interest and, also, by understanding the need and the value of trust and collaboration, in building voluntary partnerships. Almeida and Vilas-Boas (2014) also cross-examined and confirmed the interest of these ideas.

1 by revisiting the supply chain (SC) fundamentals

2 by reviewing the competitive environment of MAP to evaluate the adequacy of the proposed business policy
by preliminarily addressing the configuration of a collaborative network
by discussing the technical challenges of a collaborative network
by recognising the role of enterprise knowledge in collaborative ventures.

Thus, a recommendation for further work suggested expanding the previously formulated principles into an inquiry tool to run a field test of the proposed solution concerning a virtual organisation model. Therefore, this empirical gap requires a framework to develop and operationalise virtual organisations. Thus, a second research question arises, as follows:
• “How to best characterise and model a collaborative network as a potential generator of virtual organizations?”

In summary, the overall aim of this research was to discover a sustainable operations management (OM) policy that fits the needs of the MAP sector in Portugal. Here, we identified an organisational structure framework with the ability to address critical requirements in the MAP sector that are expressed within a competitive environment for sustainable rural development. In addition, a qualitative exploratory case study focused on the evaluation of an existing IT platform to support entrepreneurs in the MAP sector in Portugal. Data was collected by observation from the EPAM website and from multiple secondary sources.

The reminder of the paper is structured as follows: Section 2 presents a literature review aimed at identifying and briefly characterising a reference model for a virtual breeding environment. Section 3 introduces the case study, where the framework that emerged in Section 2 provides the terms of reference for both the existing ICT infrastructure and the required VBE roles within the scope of the EPAM project (http://epam.pt/about-the-project/). Classifications for the MAP VBE are also proposed. Finally, an overall discussion and the conclusions are presented in Section 4.

2 Literature review

In this section, a relevant set of observations was captured, by examining the significant works of Bernhard Katzy and Luis Camarinha-Matos. Moreover, the review is organised in terms of several sub-themes that have emerged from the literature on VOs and, also, on CNs as incubators of dynamic VOs. Then, the first sub-sections set the semantics by defining the VO concept and they introduce the earlier frameworks to address the VO design in a systematic way – i.e., the value system lifecycle (VSL) – and they develop the conceptual approach by considering the breeding environment, i.e., the source network. In addition, the roles in a VBE that contribute to the strategic positioning of the VO partners are described, and a few benefits and disadvantages of affiliation to a VBE are enumerated. Finally, an innovative holistic framework is identified and adopted as a reference. This model was developed within the scope of the ECOLEAD1 Project. It puts together VOs and VBEs and, it may accommodate an instantiation methodology aimed at implementing the VBE in the MAP domain, in the near future.
2.1 Understanding the concept of VO

The motivation for forming a VO is the expectation of achieving results that could not be obtained by parties working alone (Camarinha-Matos and Afsarmanesh, 2008). Many organisations are starting to join efforts and are working together under a large number of collaborative models to deal with market dynamism and hypercompetitive global environments (Todeva and Knoke, 2005). Moreover, collaboration is widely recognised as a mechanism for leveraging competitiveness and, thus, increasing survivability in turbulent market conditions (Romero et al., 2009).

The VO goal is to address mostly short-term business opportunities, in fast changing markets, in order to spot challenges and realise value, by achieving more together, by focusing on distribution, on knowledge development and, on innovation explosion. A working definition of a VO is presented here. This is based on a conceptual theory introduced by Katzy (1998) that was further fine-tuned by Almeida and Vilas-Boas (2014). Thus, a VO is a distributed, geographically dispersed, ongoing, dynamic, temporary and self-restructured network of independent win-win partners that extends the internal organisation by cooperative processes. These processes are facilitated by market coordination mechanisms. They are driven

1. by market and demand
2. by trust that should be coordinated and aligned with the internal systems
3. by sharing opportunities, information, cost and risk.

They are supported by a common IT infrastructure.

A VO might be led, designed and cared for by a so-called ‘broker’, ‘entrepreneur’ or ‘promoter’, who is legitimised by his/her focal position within the network, his/her social competence and also by the customer to be served. Sometimes, it might involve co-opetition among the partners. These customer-centric networks intelligently combine complementary competences, professional services, experienced routines and resources for the period needed to realise and capture the value. In this way, the limits to a firm’s internal growth that are generated by regulations and hierarchies are overcome.

Furthermore, by definition, a VO is a virtual community and as such requires computer mediation to enable the socialisation of the human community, i.e., the social group (e.g., Sudweeks and Rafaeli, 1996 in Katzy and Ma, 2002). On the one hand, Qureshi (1997) considered it necessary to address social structures, their development and the influence they have on actors’ behaviour, when investigating electronic meetings. In order to design an effective enterprise collaboration, well-defined decision-making processes and coordination are required. These processes might be based on peer-to-peer multi-agent systems, which may eventually participate in other virtual enterprises. On the other hand, business processes are enabled by IT, ICT software, internet, open architectures and mobile technologies, common communication protocols, object technology, application inter-operability, specification and exchange of standard information models. With the help of ICT, one might expect that each organisation would be able to magnify its core competencies, resources and skills with complementary ones from the virtual community.
2.2 Value system designer as a life-cycle-based framework for designing a VE

The introduction of the VOs has given rise to a few questions, as follows:

1. Who designs them?
2. Where does the designer get his/her authority from?
3. How can partners be motivated to combine their efforts?
4. How is the design being done?

Thus, the design and implementation of VOs requires additional developments (Katzy, 1998). Katzy (1999) adds the following issues:

1. Why is the value system (VS) created?
2. How can the value be created?
3. Who are the potential partners?

The VSL model is a framework for designing a VE. It was introduced as an infrastructure for building VOs in an attempt to address previous needs/questions (Figure 1). The VSL model comprises a set of methods and tools for selecting partners, reengineering business- and logistic processes and for setting up an information and communication platform for operationalising the VE (Katzy, 1999). It is a way to provide a source network of competences aimed at breeding VOs (Heines, 1997).

**Figure 1** VSL model of Fuchs (1997) and Katzy (1999) (see online version for colours)

The VS represents a network of independent partners that provide the required competences for a temporary network of processes, in order to realise and capture the value of a business opportunity (Katzy and Obozinski, 1998). This value is the main driver of the managed cooperative processes network that configures the virtual enterprise. Katzy (1999) also argues for the need to develop projects that create value for their partners by identifying market opportunities outside their core-business, and in non-related industries. This is not covered by traditional marketing analysis.
To sum up, the VS is a voluntary cooperation that creates value through the flexible reconfiguration of the resources and competences of its participants. It is a heterogeneous construct that requires a number of alignments by the partners regarding their objectives, strategies, social relations, business processes, information infrastructure, logistics, etc. In addition, the four VS-enabling views (processes, ICT, logistics, culture) have to be coordinated on all three levels of the VS-interaction level model (intra-/inter-partner and integration), in order to reduce the complexity inherent to the VS design and implementation (Figure 1) (Fuchs, 1997). According to Katzy (1999), the network cooperative culture has proved to be the most critical success factor.

In addition, the environment in which the network phenomena are investigated, the structures of power, the influences which constrain human action and the patterns of relations are all core drivers of the social structure to be taken into account. Therefore, prominence is a useful concept in assessing the extent to which certain social networks tend to adopt new ideas, knowledge or innovation. At the same time, centrality and prestige help to define the prominence of individuals, groups or organisations. While centrality is measured in terms of the number of nodes/actors linked to a particular actor, factors such as

1. the one most sought for opinion
2. the one most influential to conversation
3. leadership in discussion and decision making, enable prestige relations to be identified.

These aspects of both the positional and the relational views of networking (Qureshi, 1997) are cornerstones for the success of the focal company, which acts as a strategic centre.

Finally, the VSL model includes five stages that range from strategic definition to the dissolution or recomposition of the VS partners in cases of severe dispute. The middle stages concern the initial configuration – i.e., the suitability, resources and competences, philosophy, process management, ICT use and logistics support, the design – where implementation is pursued, and the operation – where value is generated. However, as previously defined, operation concerns the VO itself and not the VS.

2.3 Relevance of VO source networks/VO breeding environments (VSNs/VBEs)

2.3.1 From the VS to the VSN/VBE

One might argue that the models of Fuchs (1997) and Katzy (1999) address the VS as the CN environment that provides the required competences to form a VO/VE. Therefore, the VS is a concept that fits well in the definition provided by Camarinha-Matos and Afsarmanesh (e.g., 2003, 2005) for a VO breeding environment (VBE). In fact, they define VBE as an association of organisations adhering to a base long-term cooperation agreement and that adopts common operating principles and infrastructures, with the main goal of increasing their preparedness towards the rapid configuration of temporary alliances for collaboration in potential VOs.

Moreover, Afsarmanesh and Camarinha-Matos (2007) contend that VO breeding environments (VBE) are the most efficient way to dynamically create VOs, despite recognising that earlier approaches suggested the possibility of dynamic on-demand
creation of VOs built up from the open universe of organisations accessible through the web (Figure 2). These findings agree with those of Katzy and Sung (2003) that had recognised the existence of a stable source network from which short-term VO cooperation emerged, although they argued that only a few actually modelled it, at that time. Katzy et al. (2005) also confirmed a relevant explicit or implicit reference to the existence of a more stable network of companies or individuals to select partners from. These networks are called VO source network (VSN) or, VO breeding environment (VBE), after Afsarmanesh and Camarinha-Matos (2007).

Figure 2  VO creation in a VBE context (see online version for colours)

Camarinha-Matos and Afsarmanesh (2006) also consider the goal of a CN aimed at quickly forming a VO, to be: either the maximisation of a part of its VS, e.g., economic profit in a business context, or the contribution to the amount of its prestige and social recognition, e.g., in altruist networks. Thus, potential partners should be ready in advance and prepared to participate in such collaboration, as a core requirement. This includes compliance with a common interoperable infrastructure, common operating rules, and common collaboration agreements, among others. In fact, the VBE concept has emerged to provide the necessary context for the effective creation of dynamic VOs. As previously suggested this was a relevant shift in the reasoning, if contrasted with VO formation from an unorganised open universe, i.e., with no VBE.

In short, one might accept the definition of requirements for an infrastructure to build up virtual enterprises (i.e., a VSN/VBE), as being a relevant updated gap to be addressed from the emerging body of literature of VOs.
2.3.2 Roles and design tasks in a VSN/VBE

Katzy (1999) introduced six roles that contribute to the strategic positioning of the VO partners by facilitating the requirements specification, as follows:

1. **the broker** who acts as an entrepreneur is responsible for the sale of the competences of potential virtual factories and for acquiring new projects for the network; the broker must be able and willing to actively create opportunities and to stretch competences beyond their primary business through interaction with involved stakeholders, to discover value that is embodied, but not yet exploited.

2. **the competence manager** that engineers the VS, processes and selects the best partners by providing the engineering knowledge in the network and by supporting the application with the customers; experiences of VSs have revealed engineering services to be independent competences not linked to machine tools, but which were needed to back the competence to design and to engineer complete customer solutions.

3. **the project manager** who keeps time and budget restrictions and is able to re-engineer processes, e.g. to replace partners; in general, they organise the response to a customer request, but do not actively encourage or seek out new work.

4. **the in/outsourcing manager** of each network partner that provides a dedicated interface by offering technological know-how, resources and the technology for the network, representing the interest of his/her firm.

5. **the auditor** who provides the business environment with neutral financial solidity, which is crucial where there is no track record for the customised on demand engineered VS.

6. **the network-coach** who is not related to a business opportunity; governance in the network, business rules and routines for cooperation, provision of technological infrastructures, and management of the relationships illustrate their tasks.

Camarinha-Matos and Afsarmanesh (2007a) confirmed these roles by mentioning a similar set of duties.

Structuring the roles, as previously shown, is a good match for a star topology, where the network needs explicit leadership. However, a point is made about delegating too much power to one entity, or even to external entities. Thus, it is argued that there should be some concern about defining the roles performed by the partners and the role of someone purposefully employed by the VSN/VBE. Thus, within a network topology closer to peer-to-peer, roles (i) and (ii) seem more of a collegial nature, and should be implemented by the partners on a joint basis, while (iii) and (v) could be more independent from the partners and, perhaps, outsourced; role (iv) is within the private scope of each one of the partners; finally, for role (vi), either an outsourced, or a mixed solution (internal/outsource) would appear to be adequate.

2.3.3 Benefits and disadvantages of the affiliation in a VSN/VBE

In order to decide whether to join a VSN/VBE, managers should analyse whether the benefits outweigh the extra costs, despite the loss of some control, and the risks that the collaboration implies. In fact, an effective VSN/VBE should be able to provide benefits,
such as: agility for opportunity-based VO creation, apparent larger size, increased market influence and coverage, better negotiating power and access to loans, insurances and legal support, an effective common plug and play ICT infrastructure, mechanisms and guidelines to facilitate VO creation, general guidelines for collaboration (e.g., working and sharing principles), and greater chances of VO involvement (e.g., access to competencies, resources, services) (Camarinha-Matos and Afsarmanesh, 2007a).

On the other hand, the actual meaning of a benefit depends on the underlying VS that is used in each context. For instance, the values considered in a business-oriented CN are different from those in a non-profit context, e.g., disaster rescue network (Camarinha-Matos and Afsarmanesh, 2006). These authors suggest that the previously introduced advantages vary over time. Moreover, a number of other barriers might also be identified from practice. The challenge is to identify and develop remedial measures to overcome these fears.

2.4 State-of-the-art of the characterisation and modelling of VSNs/VBEs

While a VBE is a long-term association and its members are recruited from the ‘open universe’ of organisations according to the criteria defined by the VBE creators or administrators, a VO is a temporary association/consortium of (legally) independent organisations triggered by a specific business/collaboration opportunity, and its partners are primarily selected from the VBE members (Camarinha-Matos and Afsarmanesh, 2007a). This section identifies a reference model based on a proposed VBE lifecycle that characterises and models a CN as a potential generator of VOs (Camarinha-Matos et al., 2008). Thus, the ECOLEAD framework was chosen due to its completeness and consistency, despite the availability of other modelling proposals, e.g. the VOSTER project (Löh et al., 2005).

2.4.1 VBE lifecycle

Romero and Molina (2010) developed a framework within the scope of the ECOLEAD Project (Figure 3) that follows the approach of Camarinha-Matos and Afsarmanesh (2007a, 2007b). It represents all the stages of a breeding environment, from its creation stage to its potential dissolution, including the key business processes carried out by the VBE administration during these stages. This promotes an innovative holistic view that also puts together the lifecycles of VOs and VBEs. However, the testing cases of ECOLEAD have occurred in traditional and mature industrial partners (vide Camarinha-Matos et al., 2008) that exclude nascent and emergent sectors like the MAP one, which is a relevant gap to be addressed.

2.4.2 A VBE reference model

According to Romero et al. (2008) a reference model serves as a guide in the creation and maintenance process of an entity with regard to obtaining and maintaining a consistent list of requirements to define, prototype, design, implement, and execute business processes according to certain needs. Thus, a “VBE reference model focuses on providing a comprehensive overview of the key elements/components of a breeding environment and on the main requirements to create and manage one during its entire lifecycle” (Camarinha-Matos and Afsarmanesh, 2007a).
Figure 3  VBE lifecycle: key business processes overview (see online version for colours)

Figure 4 presents a VBE reference model derived from the ARCON modelling framework. ARCON is a comprehensive framework covering both the endogenous elements of a collaborative networked organisation (CNO), i.e., structural, componential, functional, and behavioural dimensions and, the exogenous interactions, i.e., market, support, societal, and constituency dimensions. This model also sets the guidelines and assisting means for supporting processes and activities belonging to the creation and operation of a breeding environment. The full process under real world constraints should be considered.

Furthermore, the functional modelling view is also a core part of the VBE reference model that includes a set of fundamental and background key business processes (management functionalities) required for ensuring the success of all VBE management activities across the VBE lifecycle. They comprise the management of

1. VBE actors
2. VO creation
3. VBE general issues.

Source: Romero and Molina (2010)
The management of VO creation is considered, despite the fact that it refers to VOs themselves (Romero et al., 2008).

Figure 4   VBE reference model (see online version for colours)

Source: Camarinha-Matos (2009)

3 Case study

3.1 Methodology

An instantiation process is proposed as a methodology that could be followed in the specific sector of MAP. Its scope goes from general business requirements (requirements definition) through the specification of partial requirements (design specification), to the particular implementation in a specific domain (implementation description) (Figure 4). Therefore, each modelling level should have been analysed from different modelling standpoints, such as function, information, resources, and organisation.

Moreover, the VBE instantiation process systematically addresses a set of steps, which are supported by mechanisms and methodologies for the specification and/or generation of a customised VBE model, describing its components to characterise a specific VBE typology (Figure 5). Together, these components represent an instance of the VBE reference model (Romero et al., 2008).

Given the existence of a credible VSN/VBE reference model (vide §2.4), a diagnostic will be run to identify and describe what has been currently implemented in the specific domain of the MAP, i.e. the functionalities of the technological platform denominated EPAM (Entrepreneurship in MAP). Therefore, this qualitative exploratory case study concerns the appreciation of an existing IT platform for supporting entrepreneurs in the
MAP sector in Portugal, which is promoted by the EPAM project (§3.2). The final goal is
to understand the development of the requirements in the MAP sector, in order to press
for a business policy that is based on a CN supported by the introduced reference model.

Figure 5  VBE instantiation process

Source: Romero and Molina (2010)

Data were collected from non-structured observation of the EPAM website and also from
observing situations primarily targeting other research purposes. These secondary sources
are, as follows:

1 contact with the several stakeholders involved in a six full-day training course
attended by members of the research team; this was a hands-on course that took
place in four different places in the countryside (‘Herdade do Gamoal’, ‘Monte do
Menir’, ‘Monte dos Abibes’ and ‘Casa da Moagem de Safara/Moura’)
2 a four-day visit to Biofach 2013, in Nürnberg (Germany)
3 conversations with stakeholders at specific events, e.g., the ‘National Forum
2013 – PAM Producers’, in Oeiras (Portugal)
4 one week at ‘Cantinho das Aromáticas’, in a learning-by-doing programme
5 governmental reports for the MAP sector (e.g., GPP, 2013)
6 MSc thesis (Rocha, 2013).

In addition, two interviews were carried out, as follows:

1 with a senior technical staff member of ‘Associação de Defesa do Património de Mértola’ (ADPM)
2 with the producers of ‘Monte do Pardieiro’, in Messejana.

Furthermore, data were analysed by interpreting contents and the subject categorisation in
tables.
3.2 Characterisation of the EPAM platform

Next two tables will describe and summarise the purpose, activity areas, stakeholders, coordination and funding and, IT platform of the EPAM project.

Table 1  Purpose and areas of activity of the EPAM project

| Purpose |  
|----------------------------------|---|
| (i) Fostering the development of a national network related to the production and sales of medicinal and aromatic plants (MAP)  
| (ii) Supporting entrepreneurship within the sector and developing the capacity of its agents  
| (iii) Increasing and disseminating knowledge within the sector  
| (iv) Building up on experience and preparing policy proposals |  

| Areas of activity |  
|-------------------|---|
| Knowledge |  
| (i) To document innovation and best practice in the MAP sector both at national and international levels  
| (ii) To create a database of producers and another one for the agents in the sector |  
| Relationship |  
| (i) To hold national and local meetings  
| (ii) To foster the development of common practices within the sector, e.g., setting up work groups and organising study visits |  
| Dissemination |  
| (i) To publish information in newspapers and other media  
| (ii) To create a Manual on MAP Good Practices for Production, Sales and Promotion  
| (iii) To train MAP rural development agents |  
| Potential |  
| (i) To cooperate with public entities on issues related to the sector development  
| (ii) To develop expertise in sales and marketing of products, i.e. cooperation, domestic and international promotion, differentiation |  

Source:  
http://epam.pt/about-the-project/

Table 2  Stakeholders, coordination and funding and, IT platform of the EPAM project

| Institutional stakeholders |  
|---------------------------|---|
| ADCMoura (http://adcmoura.pt/) |  
| • Non-governmental organisation (NGO) aiming at supporting and promoting sustainable development of the Moura Municipality, as well as in other regions of Alentejo |  
| ICAAM (http://www.icaam.uevora.pt/) |  
| • Research unit of ‘Universidade de Évora’ that is based on multidisciplinary teams of researchers, aiming at understanding the Mediterranean agro-ecosystem and at promoting technological innovation, in order to answer to the social, economic and technical needs of agriculture, by preserving the natural resources and environmental quality |  

Source:  
http://epam.pt/about-the-project/
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Table 2  Stakeholders, coordination and funding and, IT platform of the EPAM project (continued)

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<th>Institutional stakeholders</th>
<th>Description</th>
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<tr>
<td><strong>O Monte</strong> (<a href="http://www.monte-ace.pt/">http://www.monte-ace.pt/</a>)</td>
<td>NGO pursuing a development project for Central Alentejo from ALIENDE, A.D.I.M., A.D.M.C. and TRILHO. It does have more than 700 associated entities and its mission concerns rural intervention programmes to develop Central Alentejo. It argues for action based on the participation, building up and development of cooperation networks that promote social dialogue among different agents, as the path to create competencies and attract people.</td>
</tr>
<tr>
<td><strong>ANIMAR</strong> (<a href="http://www.animar-dl.pt/">http://www.animar-dl.pt/</a>)</td>
<td>Non-profit private association with more than 75 institutional and more than 100 individual associates involved in local development, social solidarity economy, among other areas. It argues for a network form of organisation that includes both rural and urban citizens, targeting the improvement of the living standard, local democracy and sustainable change of the territory. It promotes networking and local/regional inter-cooperation partnerships as main priorities.</td>
</tr>
</tbody>
</table>

**Coordination and funding**

(i) It is coordinated by a Portuguese non-governmental organisation “ADCMoura – Associação para o Desenvolvimento do Concelho de Moura”

(ii) It receives support from the European Agricultural Fund for Rural Development (FEADER)

IT Platform – website: http://epam.pt/

Source: http://epam.pt/about-the-project/

3.3 Analysis of the data

The following current functionalities of the EPAM project were found, after browsing its website and analysing the data:

- Repository of technical information/manuals, e.g., a MAP production guide, in Portugal (<http://epam.pt/apresentacao-do-guia-de-producao-de-plantas-aromaticas-e-medicinais-muito-participada/>); standardisation; links to papers and theses in MAP

- Repository of business information, e.g., producers mapping and links (<http://epam.pt/produtores/>); funding schemas and public funding; newspapers articles

- Repository of research information, e.g., projects and researchers in several topics (<http://epam.pt/investigapam/>); theses

- Repository of educational and training initiatives in MAP (<http://epam.pt/formar/>)

- Electronic forum for exchange and sharing of information and discussions (<http://epam.pt/forums/ourforum/forum-epam/>)

- Repository of news concerning MAP and of information about the EPAM activities.

One might conclude that the website of the EPAM project mainly works as a repository of information. As such, it is mainly a one-way communication, except with regard to the
electronic forum, which is a very crude first step towards enabling users to exchange information on a free peer-to-peer basis.

It is also interesting to note the explicit interest of the EPAM initiative to develop expertise in sales and marketing, if one checks the self-enumerated activity areas (Table 1). This has considerable significance, because it might be perceived as a preliminary inclination towards acting as a VSN/VBE broker (§2.3.2), although many other tasks should also be expected to be carried out under such role.

Moreover, there is an already consolidated functionality, as regards the storing of data and information in a basic database of producers. This could be oriented towards the development of a more advanced tool, closer to a knowledge base. Despite the very different functionalities required, as outlined in the previous literature review (§2.4.2), it may also be easily anticipated that this website is perceived as laying down the foundations for an ICT platform to support a VSN/VBE (§2.2). However, there is already some expertise in subcontracting resources to develop and maintain the technological infrastructure, as well as some practical awareness that there are operational costs to be supported, which means a need to raise funds among the partners.

The most important lesson to be learnt is the contribution coming from the social platform (§2.2) that has been developed for so many years. This innovation is an entrepreneur initiative that is very difficult to imitate and develop, and one that requires experimentation and persistence over time.

A VSN/VBE for MAP represents a core requirement to build up a network of competences, much broader than those enumerated above, in order to support the future formation of VOs. Thus, the requirement for a computer network should also be expected to enable the interactions among the heterogeneous organisations originated in the social structure, which are part of the VSN/VBE. We believe that the EPAM project could then assume the strategic centre (‘broker’) role, since it appears to exhibit prominence in the network, i.e., centrality and prestige (§2.2). In fact, EPAM partners – i.e., ADCMoura, ICAAM, O Monte and ANIMAR (Table 2) – are experienced, influential organisations linked to many relevant actors that contribute to prestigious relations. Therefore, as regards business relations, the EPAM project emerges as a natural leader, it being responsible for market integration, as well as for controlling activities and administration services, such as the management of the ICT infrastructure (§2.3.2).

3.4 Discussion of the results

The classification of the purpose of the MAP VBE that is going to be discussed enables the visualisation of value and shows potentially different value streams for network partners. Moreover, the discussion of the positioning of the roles required to set up the MAP VBE within the EPAM scope provides insights into the interaction between various stages of the source network. In addition, the possibility of developing peer-to-peer topologies for the MAP VBE is acknowledged as a sign of understanding the different dynamics and nature of this complex, emerging industrial networks.

3.4.1 Classification for the domain, collaboration driver and VS typologies

A preliminary illustrative classification will be attempted after Afsarmanesh and Camarinha-Matos (2007). The MAP VSN/VBE is present in more than one category, since mutual exclusivity among categories cannot be assured by this semi-typology.
So, the concept of CN matches the structural needs of the MAP sector well, since it brings together all the agents of the value added chain in a shared VSN/VBE, through an integrated interactive collaboration in emerging or innovation driven domains – types A3 and A4 of Afsarmanesh and Camarinha-Matos (2007). These agents range from the commercial brokers or even final customers, to the producers and entrepreneurs, including rural development associations, funding partners, logistics service providers, certifiers, entrepreneurs, governmental agencies, universities and other R&D institutions (Almeida and Vilas-Boas, 2014). However, the interactions between the agents should be supported by a computer network since the involved organisations are autonomous, geographically distributed, and heterogeneous. This competence-network or VS could enable:

1. the sharing of core competences within the partnership
2. the sharing of physical resources, through common and effective management at distance, reducing investment
3. the sharing of services, e.g., training, ICT maintenance, consultancy, research, etc., and so, reducing indirect costs.

This configures a VBE oriented towards complementary competencies – type B3 of Afsarmanesh and Camarinha-Matos (2007) – which allows each entity to focus on its core competencies while keeping a high level of flexibility to capture new markets, products or dimensions.

For commercial MAP firms oriented towards producing economic profit – type C1 of Afsarmanesh and Camarinha-Matos (2007) – some examples of other attractive benefits besides infrastructural benefits might also apply, such as: profitability, more commercial visibility, better strategic positioning, access to complementary skills, innovative potential, negotiating power, among others. There are fears there might be no return in the short term, and there could also be a loss of decision making power, a lack of trust, the negotiation process concerning partner selection could be affected by too much commitment, etc. However, other benefits and fears can also be expected to come to light because the agents involved have a much broader range of activity than a strictly commercial purpose. Thus, more reasons to join a VSN/VBE should also be added to those specifically linked to the commercial business that Camarinha-Matos and Afsarmanesh (2006) suggest. For instance, MAP VBE may also concern the regional ecosystem, formed to preserve local specificities, tradition, culture, that benefit from government incentives – type B4 of Afsarmanesh and Camarinha-Matos (2007).

In short, demand for MAP demand appears to be market or customer led. Whether targeting several customers or one big customer, it requires the merging of organisations with complementary competences (or volumes) and different sizes to respond to the market’s demands, in the medium term, with a high degree of readiness. Challenges include integration/interlinking of formalised knowledge, developing rules of cooperation and establishing trust and recognition among members. The critical collaboration driver appears to be the regional ecosystem, formed to preserve local specificities, tradition and culture. Moreover, it benefits from government incentives. Despite economic sustainability being an important expected benefit for both private and some non-profit organisations, profitability should not be, either ignored as a significant outcome of the VS, or merely considered as a spin off, for a MAP VSN/VBE.
3.4.2 Network topologies

One could debate whether the proposed star topology (§2.3.2) – where there is a dominant organisation – is the most adequate model for MAP VSN/VBE (or even the only one); especially when compared to a peer-to-peer topology – where all the nodes cooperate on an equal basis preserving their autonomy, i.e., a democratic alliance. We believe that an empirical inquiry might help to clarify which situations each model best matches. For the time being, the star alternative is accepted as the most popular choice. However, to ensure balance, equity and trust, self-control mechanisms should be introduced in the VBE. These might be, as follows: mediating roles, continuous scrutiny and evaluation on a peer-to-peer basis, democratic access to decision making options, among others.

In fact, the guidance available for implementing a peer-to-peer network topology does not look as developed as the one for star topologies; perhaps, a benchmarking exercise with successful initiatives in other domains should be pursued to overcome this gap. For instance, virtual professional communities (Katzy and Ma, 2002), e-businesses like e-Bay, or the early initiatives in the domain of music exchange like Napster, Kazaa or Morpheus are successful illustrations of looking for other social groups with common interests, where participants are loyal and stay for a long time. Furthermore, integrating knowledge and defining rules of cooperation raise a significant future concern about establishing an Interoperability Framework, i.e., the overall sets of policies, standards and guidelines, which describe the way in which organisations have agreed, or should agree, to do business with each other (e.g., Gruber, 1993; Vernadat, 2007; Wang et al., 2011). This is a core requirement that needs to be fulfilled prior to creating an ICT platform, which has not yet been addressed in MAP.

3.4.3 The MAP VSL: roles and tasks in the several stages

The broker, strategic centre or ‘dominant organisation’ (§2.3.2) proposed for operationalisation within the scope of the EPAM project (§3.3), should be able to identify projects that create value for their partners beyond primary business and also, to be able to perform a SWOT analysis. It is now suggested that a competence manager (§2.3.2) should also come from the EPAM structure to work together with the broker. This would be in order to specify the required competences, processes and resources and, thus, to identify potential partners to enable the suitability of the VS. Access rights and sharing level, as well as procedures for joining/leaving are also functionalities to be clearly established at the configuration stage. The lowest level of the design process of the VSN/VBE requires a project manager (§2.3.2) who should also come from the EPAM structure, due to the sensitivity of the handed over data. He/she should build up a library with processes, related costs and expected lead times for specific customer requests. This would generate the need to choose potential partners for a VO that must ensure their full commitment. This is important because those partners might be involved in several VOs, which could generate conflicts of interest. Moreover, the in/outsourcing managers, as partners’ representatives, should feed project managers with customised sensitive data.

The role of the VSN/VBE operation, which occurs at the intra-partner level (§2.2), is to make sure that the following inter-partner and upper level mechanisms are in place: secure data exchange mechanisms, information sharing and visibility rights, orders management, incomplete orders processing, distributed and dynamic planning and
scheduling, distributed task management, high levels of task coordination, among others, as confirmed by Camarinha-Matos and Afsarmanesh (1999). These are the tasks of the network-coach and since they are more of a technical nature than political, we argue that this role be outsourced. However, issues relating to managing the continuous progress of the VO should also be allocated to the competence manager. These issues concern any possible need to change the composition of the partners, in order to relaunch the VO due to disputes or, to objectives not being achieved.

Thus, after the operation stage has taken place, there might be a requirement for the dissolution of the VO. Should that be the case, there will be a need to keep, to store and to disseminate all knowledge resulting from the VO. The latter tasks should also be part of the network-coach’s role. Finally, the auditor should close the accounting and control reports, at this point. We argue that the role of auditor is a technical one that could be performed by someone within the scope of the EPAM project or that could also be outsourced. His/her role is also required during the operation stage to ensure neutral financial solidity.

4 Overall discussion and conclusions

This research aimed at pursuing adequate organisational structuring to address critical requirements in the MAP sector. To this end, the EPAM project was identified as performing a core central function in the selection, allocation, assessment and replacement of most of the source network (VSN/VBE) roles, as regards the broker, the competence manager, the project manager, the network-coach and, even, the auditor. We believe that EPAM’s prominence, i.e. its centrality and prestige, is absolutely critical to ensuring the basic foundations of the VSN/VBE cohesiveness. These foundations regard trust, fairness, and sharing, which are important because the influence on the basis of legal rights is limited and complexity can only be managed if there is a common idea that is as clear as possible (vide Fuchs, 1997).

Therefore, three critical roles were identified during the lifecycle of the MAP VS that might be positioned within the EPAM project domain. The broker and the competence manager roles are the first of them. They have strong political influence and are very critical to the breeding environment (VSN/VBE). A collegial nature might be adequate to avoid bias towards some partners, by applying a peer-to-peer logic. On the other hand, the three main operational tasks which are part of the participation management process – i.e., choice of VSN/VBE partners, the development of the competence-network and the configuration of project-networks – demand a strong leadership attitude, as follows:

1. strong prominence in the network
2. unquestionable charisma and confirmed negotiation skills
3. ability to avoid bias
4. fairness but determination
5. business orientation and area knowledge
6. lateral mediating aids.
As a consequence, the biggest challenge for the EPAM project is to supply very well-prepared managers to assume those roles, otherwise the success of the VSN/VBE might be seriously threatened. Secondly, despite its being a more technical role, the project manager does handle sensitive information, which makes it another critical role to be allocated within the scope of EPAM. The network coach and the auditor are tactical roles and less influential, politically speaking, so they could even be outsourced to professionals or professional firms. On the other hand, the in/out outsourcing managers are positioned within the scope of each of the partners, and they appear to be easy-going roles to be carried out in-house. Furthermore, there are now arguments for a new role – the ‘neutral mediator’ – perhaps to be allocated to a respected, undisputed outsider, whose task should concern moderation in situations of extreme conflict, to ensure a trustworthy and a long-term confidence basis. This configures a potential contribution to theory.

Moreover, the existing EPAM platform mainly works as a one-way repository of basic information and an appreciation of it has shown it far from able to satisfy the theoretical requirements of the VSN/VBE reference model of Romero et al. (2008). Furthermore, a couple of extra-requirements to bear in mind also arose from secondary empirical data, as follows:

1. the VSN/VBE broker role must not be overtaken by the State ‘nomenclature’ because this role belongs to the partners and depends on both the motivation and will of the partners, which confirms the findings of Almeida et al. (2014)
2. the need to raise enough funds to pursue the development and implementation of an adequate web-based ICT platform
3. the requirement for an orientation towards simple, non-proprietary and cheap tools, perhaps, open source, running on popular public infrastructures, easy to learn and to use by SMEs
4. the need for visibility and transparency of processes in the VSN/VBE, as well as for a continuous scrutiny and evaluation on a democratic peer-to-peer basis
5. the requirement for forming types of VOs other than those with a profit purpose, e.g., research VOs or VOs targeting rural development.

We argue that these findings are relevant contributions to practitioners aiming at VSN/VBE environments.

Two research questions (RQs) guided this investigation and set the guidelines that led to these conclusions. As regards the 2nd RQ, a relevant framework for defining a source competence-network (VSN/VBE) was identified to enable and guide the incubation of dynamic VOs that were previously proposed as the adequate organisational arrangement for the MAP context (Almeida et al., 2014; Almeida and Vilas-Boas, 2014). This CN reference model was borrowed from the ECOLEAD project and further developed by Romero and Molina (2010). It was preliminarily characterised by the core dimensions suggested by Luis Camarinha-Matos and, it was also supported by the seminal work led by Bernhard Katzy. Secondly, this framework set the terms of reference with regard to appreciating the existing ICT platform for the MAP sector, which was sponsored by the EPAM project, and enabled understanding of the state-of-the-art of the sector in general, and the technological support in particular (1rst RQ). One might argue that this is a relevant contribution to practice. Moreover, it was understood that there still is a long...
way to go to reach a VSN/VBE specific model for the MAP sector by pursuing an instantiation methodology, in a systematic way. In fact, the state-of-the-art of the existing technological support of the social network does not seem adequate to achieve this, despite the amazing social momentum led by EPAM, which is a truly unique entrepreneurial initiative, as Almeida et al. (2014) have already recognised.

Consequently, we argue for further development of this innovative social momentum, as regards the definition and implementation of the VSN/VBE roles, as the biggest challenge to be addressed, in the near future. This is an extension of the social process already in progress, led by the EPAM initiative within the scope of the ‘Méditerranée Innovation Senteurs Saveurs’ (MEDISS) project. In fact, dynamic VOs require a fundamental change in the cooperative culture of most independent firms and individuals in the CN, since cooperation and teamwork are essential pre-requisites for successful virtual enterprises. Moreover, collaboration involves the mutual engagement of participants to solve a problem together, which implies mutual trust and, thus, time, effort, and dedication are needed to overcome this significant limitation. Furthermore, it involves seeking divergent insights and spontaneity and not simply a structured harmony towards ‘working together’ to reach the desired outcome, as Camarinha-Matos and Afsarmanesh (2006, 2008) have already recognised. To sum up, we argue that approaching the nascent and emergent MAP industry in this way might be considered a relevant innovative contribution to research, if contrasted with the work pursued in the traditional and mature industries, as well as with the classical views of rural and local development.

On the other hand, it is recommended that rural development is also addressed in a sustainable way, by inviting new members to the VSN/VBE with broader interests than the strictly commercial, and by taking advantage of their participation, as well as of its full potential. This means simultaneously involving the financial, social and environmental performance of the industrial network, as well as developing non-profit projects. According to Lawler and Conger (2014) there is a growing demand for the adoption of new approaches to organisational design and business policy, e.g., by taking green, or holistic standpoints. Thus, collaborative networking might be a relevant part of this alternative process of rural development, which is both integrative and inclusive, in the way that favours “all human beings being able to live with their basic needs met, with their dignity acknowledged, and with abundant opportunity to pursue lives of satisfaction and happiness, all without risk of denying others in the present and the future the ability to do the same” (The Worldwatch Institute, 2012).

Finally, we also argue for the role played by the OM knowledge area, as providing a significant contribution to theory, practice and research, in this farming context for the incubation of dynamic VOs that is ultra-modern, experimental and entrepreneurial. In fact, these trends and the generic stages of the supply network evolution within emerging industries might, very well, be a key factor for a more balanced progress of society. Therefore, a few recommendations for providing guidance to future developments of this line of research are summarised, as follows:

1 to extend the VSN/VBE reference model, e.g., to the peer-to-peer topology, to the non-profit context and to services (§2.4.2; §3.1)
2 to develop a systematic design specification to farming, in general (§3.1)
3 to implement the reference model in the MAP sector (§3.1).
In addition, different modelling standpoints, such as function, information, resources, and organisation should be considered for each modelling level, in order to cover the identified gap. On the other hand, the most feared limitation to a successful OM policy is difficulty establishing trust among the participating partners. As a final recommendation, the research line should be complemented with studies concerning sustainable rural development that focus on environmental, social and economic dimensions.

References


Collaborative networks as incubators of dynamic virtual organisations


Notes

1 The European Collaborative networked Organizations LEADership initiative (ECOLEAD) was funded by the European Community, FP6 IP 506958; it involves 27 partners from 15 countries in Europe, Brazil and Mexico.

2 An example of virtual organization could be a virtual municipality. A virtual enterprise (VE) is, therefore, a particular case of virtual organization (Camarinha-Matos and Afsarmanesh, 2006).

3 Networked Organization is the most general term referring to any group of organizations inter-linked by a computer network, but without necessarily sharing skills/resources, or having a common goal. Networked organizations correspond to a very loose type of organization (Camarinha-Matos and Afsarmanesh, 1999).