The Virtual Enterprise from a Governance Perspective

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Abstract. Virtual Enterprises (VEs) are temporary alliances of enterprises that share a common goal towards responding to a competitive collaboration or business opportunity. VEs need suitable governance principles that can only be achieved if during the VE creation they have been properly defined through a negotiation process. This paper presents the VE from a governance perspective and how fundamental the negotiation process in the VE creation phase can be.

Keywords: Virtual Enterprise, Governance, Negotiation, Agreements, Contract

1 Introduction

Virtual Enterprise (VE) governance principles can be understood as a set of guidelines to adapt, coordinate and safeguard autonomous actions, performed by different VE actors, collectively working in a joint plan determined by a collaboration or business opportunity, where risks, resources, responsibilities and rewards are shared to achieve a common goal during the VE lifecycle. In this sense, VE governance is defined as the ground rules and principles by which a Virtual Enterprise will be governed and managed during its lifecycle, i.e. creation, operation/evolution and dissolution. Furthermore, it is important to mention that the VE governance approach and rules for each Virtual Enterprise will be negotiated and agreed between the VE partners during its creation process. Considering the VE creation process within the context of a VE Breeding Environment (VBE) [1], most of the VE governance principles will be instantiated from the common principles adopted in the VBE and some will be defined by the VE partners (if need) taking into account the collaboration or business opportunity requirements and the VE model characteristics. As a result of this "inheritance" from the VBE, the VE set-up time will be reduced noticeably by decreasing the number of governance issues to be negotiated and agreed regarding the VE governance structure, including the supervision, control and coordination mechanisms related to the VE management. Therefore, authors propose to use the VBE governance model defined by Romero et al [2] as a starting base to instantiate a VE governance model that will inherited the most important principles, bylaws and rules to define a governance framework for the VE management, which will provide to the VE planner/coordinator a set of guidelines to make decisions, negotiate and assign/allocate tasks and resources among VE partners aiming to optimize the VE performance (Fig. 1).

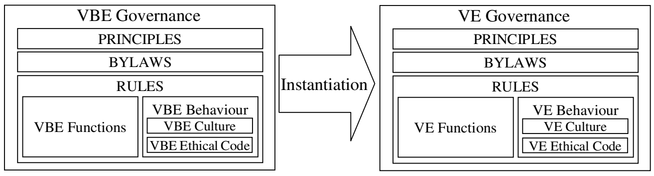

Fig. 1. From a VBE Governance Model to a VE Governance Model [2]

The following sections will introduce a set of guiding principles to support the design and management of an effective VE governance model founded on the results of an empirical research study based on 10 collaborative networks (CNs): IECOS (MX), ISOIN (ES), ORONA (ES), Virtuelle Fabrik (DE/CH), CeBeNetwork (FR/DE/UK), Virfebras (BR) Swiss Microtech (CH/CN), Torino Wireless (IT), Virtual Enterprise Network (UK), and Supply Network Shannon (IE).

The methodology followed for this research study included an extensive literature review on available knowledge on governance in the CNs domain* and a set of interviews/study cases to the CNs listed.

2 Contribution to Technological Innovation

For the accurate operation of a Virtual Enterprise, its creation represents a crucial phase, because it is at this stage that most of the VE details are defined. The fact that the VE creation is supposed to happen in the context of a VBE also gives a good indication of the level of the desired agility of the collaboration system, as it provides the suitable environment for such collaborations, such as collaboration history, trust and similarity of ICT infrastructure. Moreover, in order to have an effective operation of a Virtual Enterprise, proper governance principles and models have to be settled during the VE creation negotiation. Hence, this paper intends to contribute in this direction. Simultaneously, some examples of technological tools that may help the process are also suggested.

3 Virtual Enterprise Governance

Virtual Enterprise Principles. *VE principles* are defined as the values that should govern the VE partners' behaviour during their involvement in collaboration or business opportunities. Table 1 introduces some of the values understood as social attitudes which will impact the VE partners' collaborative performance.

Virtual Enterprise Bylaws. *VE bylaws* underline the VE actors' roles, rights, responsibilities and procedures for participating in collaboration or business

* The present ideas are based on a number of papers that cannot be referred due to the restricted space.

opportunities (VE creation), and the manner for conducting proper VE management as a set of supervision, control and monitoring activities to guarantee reaching the goals settled for a collaboration opportunity. In addition, VE bylaws may include some other governance mechanisms aimed at rewarding good performance, sanction opportunistic behaviours, providing guidelines for conflict resolutions, and managing intellectual property rights in collaborative endeavours.

VE Actors' Roles, Rights and Responsibilities. In a Virtual Enterprise several *roles* can be played by a number of actors. A VE actor can be represented either by an enterprise or by an individual representing an enterprise. Some of these *roles* can be assumed simultaneously by the same enterprise or individual. Each actor's participation in a VE is related to a specific *role,* including a set of *rights* and *responsibilities* associated to that *role.* Each of these *roles* requires assigning different *rights* and *responsibilities.* Table 2 describes the main roles, rights and responsibilities for each VE actor in order to define certain levels of responsibility and information access associated to each role.

Table 1. VE Principles (VE Partners' Expected Behaviours)

Principle	**Description**
Honesty	• When providing profiling and competency information. • When providing trust criteria information for trustworthiness evaluation.
Trust / Integrity	• When acting loyalty with good faith for all VE stakeholders. • When playing different VE roles always avoiding opportunistic behaviours.
Openness	• When sharing risks, resources, responsibilities and rewards. • When negotiating different VE related issues.
Performance Orientation	• When performing the tasks assigned by the VE coordinator, always meeting or even exceeding the cost, time and quality frames expected. • When collaborating, always trying to enhance collaborative performance by improving reliability, flexibility, responsiveness and communication.
Responsibility	• When attempting to keep promises such as delivery times and quality levels.
Mutual Respect	• When diverse opinions may arise during negotiation processes.
Commitment	• When complying with agreements reached. • When meeting the VE contracts terms.

Table 2. VE Actors' Roles, Rights and Responsibilities

Broker	• **Role.** Performs as identifier and/or designer of new collaboration or business opportunities. • **Rights.** Access to information about new collaboration or business opportunities; Access to VE partners profiling & competency information. • **Responsibilities.** Identify, acquire and design collaboration opportunities; Market the VE competences; Negotiate with VBE customers; Discover competency gaps as weak points and missing competences when evaluating collaboration or business opportunities or when VE creation failed due to lack of competences.
Planner	• **Role.** Performs as designer of the VE rough plan and as the integrator of potential VE partners to fulfil a collaboration or business opportunity, being responsible for setting-up the consortium. • **Rights.** Access to information about new collaboration opportunities; Access to VE partners profiling & competency information; Access to VE partners past performance record. • **Responsibilities.** Search for the most suitable VE partners according to the collaboration or business opportunity requirements; Create, configure and negotiate the VE rough plan structure by scheduling activities and assigning tasks to VE partners to achieve the required time, cost and quality frames requested by the VE customer.
Coordinator	• **Role.** Performs as coordinator/manager of a VE during its operation and dissolution phases. • **Rights.** Access to VE partners profiling & competency information; Access to VE partners past performance record; Access to VE inheritance information; Access to the VE related information. • **Responsibilities.** Define the VE profiling and competency information; Coordinate the VE partners in order to fulfil the goals settled in the creation phase; Monitor the VE activities status according to the VE plan; Supervise the VE performance; Intervene on VE corrective actions.

Partner	• **Role.** Performs the tasks assigned by the VE coordinator according to VE contract and/or agreement(s). • **Rights.** Access to VE related information. • **Responsibilities.** Keep updated own VE partner profiling and competency information; Negotiate contracts and/or collaboration agreements; Report on tasks progress.
Customer	• **Role.** May perform as the trigger of a new VE by originating a business opportunity. • **Rights.** Depending on the VE business, the customer may access to VE activities status to track progress. • **Responsibilities.** Describe the product (good and/or service) to be delivered according to preferences and constrains (e.g. time, cost and quality).

VE Membership Policies. Once a collaboration or business opportunity has been identified, a set of enterprises will be selected from a VBE to form a VE according to the collaboration opportunity requirements [1]. The *VE membership policies* refer then to the governance of all activities related to the VE partners search and selection process, following certain regulations to guarantee the VE partners fair selection under equal opportunity bases and based-on transparent criteria. In this direction, a ‘template’ for providing detailed/updated information about the potential VE partners’ competences should be provided, so the candidates can provide on equal bases their related information about processes capabilities, free resources capacities, production costs and conspicuous proof of the validity of the provided information [4]. Thus, the VE planner may have the proper information to select the best-fit VE partners for a new VE according to the collaboration opportunity (CO) requirements. Moreover, the VE broker should make public the collaboration opportunity requirements under a definition of the necessary competences to perform certain activities/tasks concerning the VE work breakdown structure. In this way, the potential VE partners may compare their available competences against specific activities/tasks that need certain processes capabilities and resources capacities to be carried out and apply to perform them during the VE operation [4]. Depending on the CO constrains, the VE planner may also use other assessment/selection approaches as performance indicators, and/or trust level, to filter and select the potential VE partners [3].

VE Management Recommendations. VE management can be defined as a set of activities, measures and operations needed to guide the VE partners and to control the VE operational processes and their interdependencies in order to achieve the VE objectives without breaking any legal, contractual and governance agreement [5]. In a VE context, both the governance and management activities are devoted to support the VE coordinator in its responsibility of ensuring that all VE partners will contribute and perform according to plan during the VE lifecycle. Nevertheless, the VE management activities cannot be to fully regulated. Therefore, the VE governance principles can provide, in this sense, some common basis to guide the VE partners’ behaviours in any situation that could not be regulated in the consortium agreement. Consequently, the VE governance principles as the VE partners’ expected behaviours (Table 1) will motivate a proactive conduct towards the VE objectives achievement and good relationships among the VE partners.

VE Incentives & Sanctions. Incentives & sanctions can influence the motivation and performance of VE partners. For example, if a VE partner is always performing within a certain collaborative performance level, this should be recognized and rewarded, perhaps during the VE partners search and selection process. On the other hand, if a VE partner is not performing at the expect level, having long delivery times and bad quality during the VE operation, it should be positioned in a passive role (e.g. poor VE involvement) for a certain period of time, till the enterprise demonstrates an improvement in its readiness for collaboration [3].

VE Security Issues (Confidentiality of Information). A Virtual Enterprise can be simply based-on trust relationships, informal knowledge and intellectual property sharing. Nevertheless, it is recommended to establish interchange agreements and confidentiality agreements to safeguard the confidential information and intellectual property at the necessity of their disclosure and sharing. During the VE creation process, potential VE partners may be required to provide some confidential information regarding their competences to the VE planner and even to other potential VE partners in order to promote themselves towards VE involvement and also to facilitate the VE configuration. Therefore, a preliminary 'confidential agreement' should be put in place in order to protect any information that may be disclosed during the VE creation process in order to maintain the necessary level of secrecy regarding all information that will reach all parties involved, both during the course of negotiations and afterwards for an unlimited time period. When a VE is created in the context of a VBE it is likely that such principles have been part of the VBE bylaws. Furthermore, during the VE operation, VE partners should establish an 'interchange agreement' to delimitate the use of intellectual property shared by any VE partner for the purpose specified and the time period defined in the agreement. Also, a confidentiality agreement should establish bilateral non-disclosure agreements that will facilitate the communication between VE partners and the information provision to the VE coordinator for decision making. Finally, as part of the VE dissolution, VE partners should establish an agreement for the right use of the know-how gained during the VE lifecycle, under the condition that they should maintain secrecy regarding those outside of the former VE partners. General templates for all these agreements can be established at the VBE level and thus avoiding lengthy negotiations at the VE creation phase.

VE Lifecycle Support Tools – Use Guidelines. This *bylaw* is related to the use of technology as a supporting mean to provide access to the information and interactions required by each VE actor to perform its duties. As mentioned before, VE partners have different rights and responsibilities, according to their roles, that demand the use of different *software tools* and access to different *information repositories* for supporting their activities in which they enrol during VE lifecycle. Table 3 introduces some of the examples of software tools developed in ECOLEAD [1] [6] aimed at supporting the VE lifecycle and the actors that directly interact with them.

VE Conflict Resolution Policies. Possible *conflicts* and *disputes* that may arise among VE partners will be worked out by a steering committee headed by the VE coordinator, and if necessary by an advisor according to the conflict domain. In case of not solving the problem according to internal VE bylaws, VE partners may proceed to take case into legal statements.

VE Financial Policies. Being a VE shareholder (a VE partner) means to provide resources: financial, physical, technological and/or knowledge in order to support the VE existence and benefit from dividends as a result of getting involved and respond to collaboration or business opportunity identified in the market. In the VE context, payments and the accounting structure must be defined during VE creation in order to guarantee a fair distribution of the revenues according to the roles played, contributions made and tasks performed by each VE partner during the VE operation. Additionally, the *VE financial policies* should include other financial obligations like tax payments and insurance coverage for the VE customer after the VE dissolution.

Table 3. Examples of VE Lifecycle Tools

Creation	• **Broker** - The *Collaboration Opportunity Identification (**CO-Finder**)* is a supporting tool for the identification of new COs available as call for tenders in e-marketplaces [1]. • **Planner** - The *Collaboration Opportunity Characterization* and *VE rough planning (**COC-Plan**)* is a supporting tool for identifying the required competences to respond to an identified CO, as well as for defining a rough structure of the potential VE [1]. • **Planner** - The *VE Partners Search and Selection (**PSS**)* is a supporting tool devoted to the identification of potential VE partners, their assessment and selection by matching their competences with the required competences to respond to an identified CO [1]. • **Planner/Coordinator & VBE members** - The *Agreement/Contract Negotiation Wizard (**WizAN**)* is a supporting tool aimed at assisting the VE planner and the potential VE partners during the negotiation processes towards the VE constitution. It includes features for the formulation and modelling of internal consortium contracts and agreements [1] [6].
Operation/Evolution	• **Coordinator** - The *VO Modelling Environment (**VO-MOD**)* is a supporting tool for modelling the VE structure and its related information such as: VE topology, VE work breakdown structure, budget elements, key performance indicators, etc. [7]. • **Coordinator** - The *Supporting Indicator Definition (**SID**)* is a supporting tool for configuring a set of key performance indicators for case-specific applications [7]. • **Coordinator** - The *Distributed Indicator Information Integrator (**DI3**)* is a supporting tool for information retrieval from different repositories namely belonging to different partners [7]. • **Coordinator** - The *Monitor and Finance Functionalities (**MAF**)* is a supporting tool for monitoring the VE performance during its lifecycle [7]. • **Coordinator** - The *Decision Support System (**DSS**)* is a supporting tool for re-scheduling and reconfiguration of the VE rough plan structure [7].
Dissolution	• **Coordinator** - The *Virtual Enterprise Information Management System (**VIMS**)* is a supporting tool for managing all VE related information as well as the VE inheritance information [5].

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VE IPR Policies. The *VE IPR policies* deal with the intellectual rights shared during the VE lifecycle, but in special with the intellectual property (IP) created during the VE operation (e.g. a patent). Proper IP agreements should depict that the involved VE partners will share reasonable legal fees, costs and expenses related to the filing, prosecuting and maintaining a patent protection. Also, the respective share to obtain revenues from the invention licensing or commercialization should be considered.

VE Amendments to Bylaws. Bylaws are subject to *amendment* at any regular meeting of the Virtual Enterprise. Consensus and approval by the majority of the VE partners must occur so an amendment can be modified.
Following paragraphs will introduce some key **VE rules** identified in this work:

VE Behavioural Rules. VE behavioural rules refer to those guidelines for VE partners to properly act and conduct during the VE lifecycle, including the VE ethical code and culture. The *VE ethical code* intends to define the core-values, ethical principles and ethical standards to guide the VE partners' decision making and conduct during the VE lifecycle, so VE partners have common bases for acting in all situations. Furthermore, the *VE culture* aims to create a collaborative culture where a shared belief between potential VE partners is promoted under the premise that by working together the VE partners can best accomplish a common goal that would not be possible, or would have higher cost, if attempted individually.

VE Functional Rules. VE functional rules are aimed at supporting both *operational* and *administrative processes* along the VE lifecycle. Most important functional rules for VE management may include: guidelines for configuration and launching; VE operation guidelines for collaborative business processes management, including collaborative performance measurement; VE evolution guidelines for activities re-scheduling and resources reallocation; and VE dissolution guidelines for inheritance information management.

4 Supporting VE Creation Process: Negotiation & Contracting

To guarantee that during the VE lifecycle phases everything is performed in a proper and legal manner, the VE creation phase is of extreme importance, since during this phase it is essential to carry out a *negotiation process* with all the VE partners until final agreements related to the VE consortium formation, VE rough plan structure and VE governance model (Section 2) are achieved. The establishment of collaboration commitments, represented by *contracts* and/or *agreements,* corresponds then to the most crucial step in a VE creation process [1] [6]. During the VE creation phase, negotiation is an iterative process to reach agreements and it can be seen as complementary to the VE rough planning and VE partners' selection processes, and might in fact require going back to previous steps if a solution cannot be found with the current the VE partners' configuration.

The VE creation process is not as simply as selecting the right VE partners and matching their competences to the CO requirements; there are many other factors which can also affect the VE creation process. The contract/agreement(s) negotiation shall then proceed in parallel with the other VE creation phases. In each step, specific elements for the contract/agreement(s) should be collected as a result of a focused negotiation process. Table 4a describes the VE creation process when a contract for a new collaboration or business opportunity is already guaranteed, while in contrast, Table 4b describes a scenario where the collaboration or business opportunity is not yet acquired. In each case different negotiation agreements should be reached.

Table 4. VE Creation Phases according to its Trigger

(a) VE Creation Phases for acquired Collaboration or Business Opportunity
Preparatory Planning: (1) CO/BO Identification and Characterization - Identification and characterization of a new collaboration or business opportunity (CO/BO) that can be detected by a broker or promoted as part of the VBE business strategy. **(2) VE Rough planning** - Identification of the required VE partners competences, as well as the VE possible configurations as work breakdown structure structures to execute the VE tasks. At this stage it is crucial to define the VE partnership form and its cooperation agreements.
Consortium Formation: (3) Partners Search & Selection - Identification of potential VE partners and their assessment and selection. **(4) VE Composition** - Iterative process to reach agreements and align needs with offers. It can be seen as complementary to the other steps in the VE creation process.
VE Launching: (5) Detailed VE plan - Once the VE partners have been selected and agreements are reached, it is necessary to refine the VE rough plan and its governance principles. **(6) Contracting & Set-up** - Formulation of contract and agreement models and set-up the necessary infrastructures to start the VE operation.
(b) VE Creation Phases for Quotation/Bidding
Quotation/Bidding Phase: (1) CO identification, (2) VE rough plan, (3) VE partners selection, (4) Prepare bid - When an opportunity is identified it is necessary to prepare a bid/quotation in order to try to get a contract with the customer. For the preparation of this bid, it is necessary to make a rough plan of the foreseen VE and also to select the core VE partners. The bid is often prepared by the initial VE consortium.
Contract Attainment (5a) - In case the bid is "unsuccessful", the core VE consortium dissolves; otherwise the VE creation continues.
Final VE Creation: (5b) Revise VE rough plan, (6) Select additional VE partners, (7) VE details & contracting, (8) VE set-up - In case the bid is "successful", the VE rough plan needs to be revised based-on the specific contract conditions with the customer; new additional VE partners might be necessary, and the VE will be detailed and launched.

Contracts/Agreements: Classes, Topologies and Lifecycle. In a VBE context, which offers a common ground for the establishment of cooperation agreements, common operation principles and mutual trust, the VBE members (potential VE partners) can take advantage of the breeding environment to prepare themselves to collaborate in potential VEs that will be established when a collaboration or business opportunity arises. Nevertheless, being VEs temporary alliances triggered by specific opportunities, their structure and governance may differ from one to another, therefore several and/or different *classes of contracts* and/or *agreements* may be required to support its creation. Most VE related agreements rely on the number of parties involved and on the implied promises. Regarding the first case, the number of parties involved may imply 'bi-lateral' or 'multi-lateral' contracts, while in the second case, contracts can be classified according to their promises as (a) 'adhesion contracts' - recognized as standardized contracts that in general are offered without affording a realistic opportunity to bargain/negotiate and under such conditions the only way to obtain the desired result is by accepting all the contract terms; (b) 'internal contracts' - understood as contracts that do not include any supply to third parties (although the partners' goal might include it); and (c) 'external contracts' - understood as contracts that represent a joint activity with third parties [1] [6].

The most suitable application for these types of contracts in relation to a VE creation process within a VBE would be: (a) the VBE members adhesion contract to join the breeding environment and inherit/accept the VBE governance principles; (b) the internal contract as the agreements that will regulate the VE consortium behaviour, in which the VE governance principles and rules will be explicitated; and (c) the external contract where the VE commitment to the customer will be detailed.

Table 5 describes different types of VE governance according to the *VE topology*. In addition to the traditional supply-chain topology, the most typical solution for the consortium internal contract/agreement are the cases of (1) explicit consortium - the collaboration is regulated by a contract between the VE customer and the VE consortium that clearly describes the VE consortium composition; the VE consortium by itself is regulated by an internal agreement, and (2) internal consortium - there is a contract between the VE customer and one VE partner, which does not necessarily explicit the VE consortium composition; in this case there is only one VE partner that is committed to the VE customer, being the other VE partners committed to the one that signs the contract.

Table 5. VE Governance Topologies

Supply-Chain: Process Oriented	• **Topology:** In a supply-chain topology, partners' interaction pattern follows a value chain. • **Governance Characteristics:** Long-term partnerships; Inexistence of a leader; Linear relations (one-to-one); Independent decision-making; Limited organisational flexibility depending on the value chain. • **Governance Implication:** Limited communication; Limited information exchange; Alignment of activities so that more efficient results can be achieved; Partners' relations limited to their pairs (neighbour partners); Organisational integration limited to pairs; Bilateral agreements.
Hub & Spoke: Main Contractor	• **Topology:** In a star topology, partners interact through a central hub or strategic operation centre, allowing a more rapid configuration of the partners' network. • **Governance Characteristics:** Medium-term partnerships; one leader; centralized relations (all-to-one); centralized decision-making; limited organisational flexibility determined by a leader. • **Governance Implication:** Limited communication and information exchange restricted by the power centralization; division of labour among partners coordinated by the strategic operation centre; the central hub (contractor) assumes the responsibility for the group; some tools available to share information; possibility to limit the potential participation of partners; association agreements.
Peer-to-Peer: Project Oriented	• **Topology:** In a peer-to-peer topology, partners' interaction pattern relies on personal networks and social relationships. • **Governance Characteristics:** Short-term partnerships; Multiple relations (all-to-all); Democratic decision-making; High organisational flexibility determined by the possible network configurations. • **Governance Implication:** Partners share: risks, resources, responsibilities, benefits, etc; Partners' preparation to play/assume multiple roles; Clear definition of the roles, rights and responsibilities; Extensive use of tools to share information; Multiple kinds of agreements.

Similar to VEs, contracts also have a lifecycle that includes several phases, starting with the intention of establishing a contract and ending with its actual enactment. This last phase, the contract enactment, is the fulfilment of the promised obligations of the parties involved (the VE partners) and the corresponding benefits. Nevertheless, the relevance of this work is put into the contract establishment phase that is when the process of finding suitable contracting parties and negotiating contract/agreement(s) with them happen. With the purpose of illustrating a tool that intends to support the negotiation process during the VE creation phase, below, it is briefly described the WizAN tool that was developed within the ECOLEAD project.

Agreement Negotiation (WizAN) Tool. The WizAN [1] [6] is an example of a tool to support the negotiation process during the VE creation process and its operation/ evolution phase in case a VE partner might be replaced. The WizAN aim is not to fully automate the negotiation process, but rather to assist the human actors in the process itself. WizAN tool inputs are collected along the steps of the VE creation phase (e.g. rough plan, scheduling, budgets, needed competences, suitable partners, shared assets, liability allocation, etc.). The full negotiation process involves a number of elementary negotiations in order to reach the necessary agreements to accomplishing a VE internal agreement. The VE internal consortium contract is then the synthesis of all agreements established among the VE partners that will regulate and govern their collaboration.

Table 6. WizAN's Main Functionalities

Functionality	Description	Outputs	Actors
Contract Editor	• Uses the contract editor repository and agreed negotiation items/clauses to add sections to contracts.	Contracts/ agreements	VE Planner
Virtual Negotiation Room	• Virtual place where negotiation participants can access the various items/clauses being negotiated and can "discuss" them in order to reach agreements	Agreed Negotiation items / clauses	VE Planner & VE partners
Support for Agreement Establishment	• Facilities for contract signing, notification of events or new agreement documents relevant to parties, and repository/ archive for its storage (e.g. eNotary).	Signed Contracts Repository	VE Planner & VE partners
Contract System	• Collection of contract and negotiation clauses templates to support the contracts creation.	Contracts Skeletons	VE Planner

5 Conclusions

The need of a VE governance model arises from the necessity of having common operating principles and rules to allow an effective communication and coordination between VE partners during the VE lifecycle. This paper provides a set of guidelines to define a VE governance model by presenting its main elements (principles, bylaws and rules), and introduces a supporting tool (WizAN) for the negotiation of those contracts and/or agreements needed to formalize a VE collaboration.

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