ADInnov: An Intentional Method to Instil Innovation in Socio-Technical Ecosystems

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Abstract. This paper presents an intentional-based modelling method aimed to support the analysis, the diagnosis and innovations for socio-technical ecosystems. Understanding and improving socio-technical ecosystems is still indeed a major challenge in the information systems domain. Current information systems' methods do not consider the particularities of socio-technical ecosystems where breakthrough innovation is not always possible. The proposed method called ADInnov aims at guiding a continuous innovation cycle in socio-technical ecosystems by focusing on the resolution of their blocking points. It combines different user-centred techniques such as interviews, serious games or storyboarding. The method, represented with the MAP formalism, results from the lessons learned in a healthcare domain project (InnoServ). Through an empirical study, project managers evaluated the method appropriateness.

Keywords: Analysis · Diagnosis · Continuous innovation cycle · Socio-technical ecosystem · Organizational innovation · Service innovation · MAP

1 Introduction

Understanding, modelling and improving Socio-Technical (ST) ecosystems is still a major challenge in different information systems' areas such as virtual organizations (VO) [1], collaborative business processes (choreographies) [2] or multi-agent systems [3]. ST ecosystems refers to *an intricate ecosystem with a large number of actors playing various and variable functions, diversity of scenarios and special cases, abundance of flows, various interaction kinds, etc.* [4]. In particular, when trying to improve ST ecosystems such as healthcare, automating is not always possible and process-oriented approaches are extremely difficult to apply because of the aforementioned complexity [5]. When dealing with human-centred ecosystems, resistance to change is an important risk [6] and the integration and the mobilization of a wide group of stakeholders to support the potential improvements is critical [7]. In this context, breakthrough innovations are not always suitable. The innovations must be thought, accepted and ranked collectively. They must ensure the resolution of blocking points

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that are consensually recognized. In this context, our position is not to offer a method dedicated to innovation projects limited by time and costs and managed by a project team, but rather to instil in the ecosystems' heart an innovation culture. This is especially true in the current social innovation dynamics that impact many business ecosystems where traditional stakeholders and newcomers try to reinvent their businesses in order to optimise the "highest possible use value for the longest possible time while consuming as few material resources and energy as possible" [8].

Figure 1 presents a general view of the ADInnov method using the MAP formalism [9]. MAP models are directed graphs with nodes representing intentions and labelled edges capturing strategies. The main strategies presented in the paper are represented with thicker lines. The traditional approach *As-Is/To-Be* [10] is transformed into iterative cycles *As-Is/As-If*. The aim is to imagine innovation scenarios based on the question "And if?" that could be deployed in more or less long terms (even very long terms if the innovation requires legal or economic evolutions). Innovations should therefore be organized in a road map specifying when and how to be deployed. This could introduce new blocking points that require newer iterations implying new analysis and diagnosis and eventually the application of new innovation strategies. The iterative method will stop by choice of the consortium.

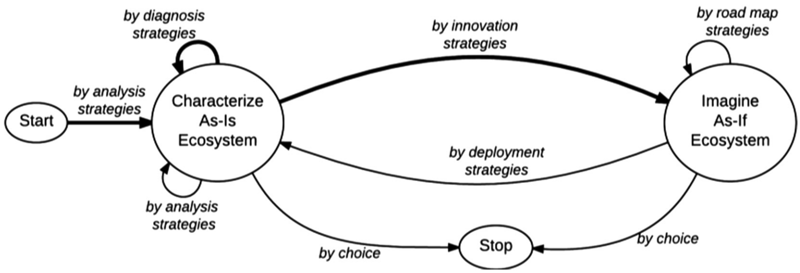

Fig. 1. General view of the *ADInnov* method

More specifically, the ADInnov method is dedicated to support the analysis and the diagnosis of ST ecosystems as well as to propose consensual innovations. *Analysis* explores the domain, identifies actors and their functions and divides the ecosystem in different views (responsibility networks and concerns) in order to manage its complexity. *Diagnosis* focuses on finding blocking points and inferring goals dedicated to resolve them. *Innovation* proposes organizational innovations (new functions, new groups of actors, etc.) and innovation services. ADInnov arises from the empirical user-centred method used during the InnoServ project[1] (*Innovation in Services for Frail People*). This project aimed to find organizational and low-tech-based solutions to maintain as long as possible frail people at home in total autonomy [11]. Soon became clear in this project that the traditional work-packages division was not adapted to the

[1] http://bit.ly/InnoServ_project.

project because a common understanding was essential. Instead, we adopted multi-disciplinary workshops with representation of the different partners of the project: the research laboratories, an innovation research federation, an association, a local authority and two private companies. Actors in the field such as physicians, nurses, council administrators or caregivers were integrated in the project progression and put forward essential information to understand and improve the ecosystem.

In a previous work [12], the main activities performed in the InnoServ project were extracted and represented as a BPMN business process diagram. In this paper, we aim to abstract and consolidate this previous work so that the method can be applied to other ecosystems. We use here the MAP formalism that allows achieving the desired level of abstraction, to easily support variability and to better represent the intentional considerations of innovative ecosystems, which tend to continuously innovate in an inductive way (based on inductive hypothesis or trials/errors). Moreover, compared to [12], this paper presents the ecosystem meta-model and a qualitative evaluation that we lead with innovation project managers in order to evaluate the appropriateness of the ADInnov method.

In the rest of the paper, Sect. 2 formalizes the main concepts of the method. Section 3 describes the ADInnov method, explaining the three main strategies (Analysis, Diagnosis and Innovation) and illustrating them through the InnoServ ecosystem. In order to prove the quality of the method, Sect. 4 details a qualitative study that we lead with several innovation project-managers (Sect. 4). The results of the InnoServ project were also evaluated and prove the efficiency of the method. Related works are presented in Sect. 5, where we give an overview of different methods, mostly focused on one of the three aforementioned strategies that we propose. Finally, we draw out conclusions and future work in Sect. 6.

2 Key Concepts Used in the ADInnov Method

This section presents the key concepts used in the ADInnov method. First, Sect. 2.1 gives the definition of the ecosystem according to the key concepts and presents our consideration of innovation in the context of ST ecosystems. Section 2.2 presents the detailed meta-model of an ecosystem and gives an instantiation example using the InnoServ ecosystem.

2.1 Innovation in an Ecosystem

Our focus is about intricate *ecosystems (Ec)* with a large number of actors playing various and variable functions, diversity of scenarios and special cases, abundance of flows, various interaction kinds, etc. [4]. Relying on this definition, an *actor (A)* is a type of physical or legal person who operates under its own business. Note that we call « actor » a type of actor. For instance, “nurse”, or “physician” are (types of) actors. A *function (F)* corresponds to a skill or responsibility in the *Ec* involved in the realization of a service. This notion is equivalent to the well-known notion of “role” in the business process management domain [13]. In order to manage the *Ec* complexity, a decomposition approach is needed [14]. We propose the concept of *responsibility networks (RN)* to tackle this problem. A *RN* is a view on the *Ec* determined by the proximity (national, regional, individual, etc.) to the target (e.g., the frail person) and the actors involved on it. A *concern (C)* relates to a cross-cutting issue in the *Ec* that determines a point of interest of a provided service (e.g., financial, medical). A *blocking point (BP)* corresponds to a concrete problematic in the context of a *RN*. Several *BP* can be identified in a *RN*. *Goals (G)* are prescriptive statements about the system, capturing desired states or conditions [10]. Goals are hierarchically organized, starting from high level goals which can be iteratively refined into sub-goals. Goals do not define here the intentional process level, but the aim to resolve *BP*. A *service (S)* relates to a delivery consisting in the provision of technical and/or intellectual capacity or the provision of useful work for a beneficiary. It helps resolving a goal. A service contains a set of *concern services (CS)* that deals with the different concerns of the service. This leads us to the definition of the As-Is ecosystem that results from the application of the analysis and diagnosis strategies illustrated in Fig. 1 and detailed latter. The As-Is *ecosystem* is a set of *actors*, *functions*, *responsibility network*, *concerns*, *blocking points* and *services.* We consider a *blocking point* as a set of *goals* that resolve it, and a *service* as a set of *concern services:*

$$As\_Is(Ec) : \{\{A\}, \{F\}, \{RN\}, \{C\}, \{BP\}, \{S\}\}$$
$$BP : \{G\} \qquad\qquad S : \{CS\}$$

The innovation strategies (Fig. 1) transform an ecosystem *Ec* in an As-If ecosystem by the identification of a new set of *actors ({A'})*, *functions ({F'})*, *responsibility networks ({RN'})*, *concerns ({C'})*, *blocking points ({BP'})* and *services ({S'}).* The resulting set of blocking points ({*BP'}*) should be a subset of the previous one ({*BP}*) or the resulting goals linked to the blocking points *({G'})* have to be contained in the previous set *({G})*:

$$As\_If(Ec) = \{\{A'\}, \{F'\}, \{RN'\}, \{C'\}, \{BP'\}, \{S'\}\}$$
$$\{BP'\} \subset \{BP\} \vee \exists\, BP \in \{BP\} \wedge BP' \in \{BP'\} / \{G'\}_{BP'} \subset \{G\}_{BP}$$

The latter statement means that innovation leads to the identification of new actors, functions, responsibility networks, concerns or services but can also imply removals. For example a possible innovation could be to remove a (type of) actor in the ecosystem. The main objective of innovation, and therefore of our method, is to reach an ecosystem with less blocking points than before, or at least to have less goals to be achieved. Note that the deployment strategies of the imagined innovations can produce new blocking points that will have to be treated in a new iteration of the method. The adoption of risk management methods in the road map strategies could anticipate and therefore limit the introduction of these new blocking points.

This definition of an *Ec (As_Is or As_If)* is limited to the objectives of the method. More complex models would be more suited in case of different objectives. For instance, the requirements elicitation of the information system supporting the ecosystem may require the use of more complex modelling languages such as KAOS [10], URN [15] or i* [21].

2.2 Ecosystem Meta-Model

This section presents a generic ecosystem meta-model. Figures 2 and 3 capture the meta-model and provide two instantiation examples based on the InnoServ ecosystem. As a reminder, the InnoServ project seeks to understand and support innovation strategies and services around a frail person at home. Figure 2 instantiates *actors*, *functions*, *responsibility networks* and *concerns*. The latter ones are inspired from an organizational meta-model proposed by Russell et al. [13]. An actor can be qualified for several functions and a function can be played by several actors. Figure 2 shows that a nurse and a physician are both health professionals (the explanation of the defined functions is out of the scope of this paper, a more detailed information about the InnoServ functions is found in [1]). Responsibility networks (RN) are represented as ellipsis more or less close to the frail person. RNs can be composed of other RNs. In the InnoServ ecosystem, the following responsibility networks are identified: *Regulation,* which deals with new laws and rules concerning home care for frail people; *Coordination*, which deals with home care organization for frail people; and *Execution,* which focuses on the direct interaction with the frail person. Seven concerns were identified: *Social*, *Medical*, *Human Resources*, *Technological*, *Financial*, *Legal* and *Strategic*. Several functions can be necessary in a RN and zero or more functions can be part of it. An actor can be involved in several RNs and a RN can have several actors.

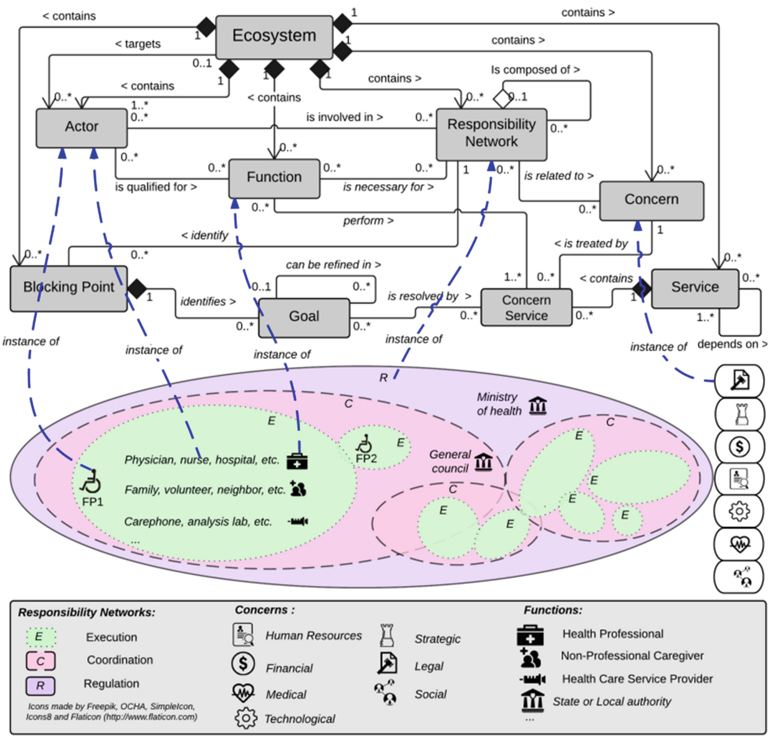

Fig. 2. Ecosystem meta-model and a first instantiation

Figure 3 presents the notions of *blocking point* and *goal*, both related to *responsibility network*. An example of blocking point for the *Execution* RN is: "*There are skill's identification problems for the care activity",* which is translated in a positive form *("Identify function").* Figure 3 shows an excerpt of the execution goal model. Note that the root and the first level goals respectively correspond to the responsibility network and the blocking points. Figure 3 also gives an example of *services* and *concern services*. The refinement of the blocking points results in a set of goals that overtake the blocking points. The meta-model also shows that a concern service is performed by zero or more functions and treats one concern in the context of one service. Figure 3 illustrates the service: *"Improve the recognition and salary of healthcare acts"*. This recognition points out a human resource concern (*recognition of the caregiver status*) and a financial concern (*increase salary or tax reduction for caregivers*).

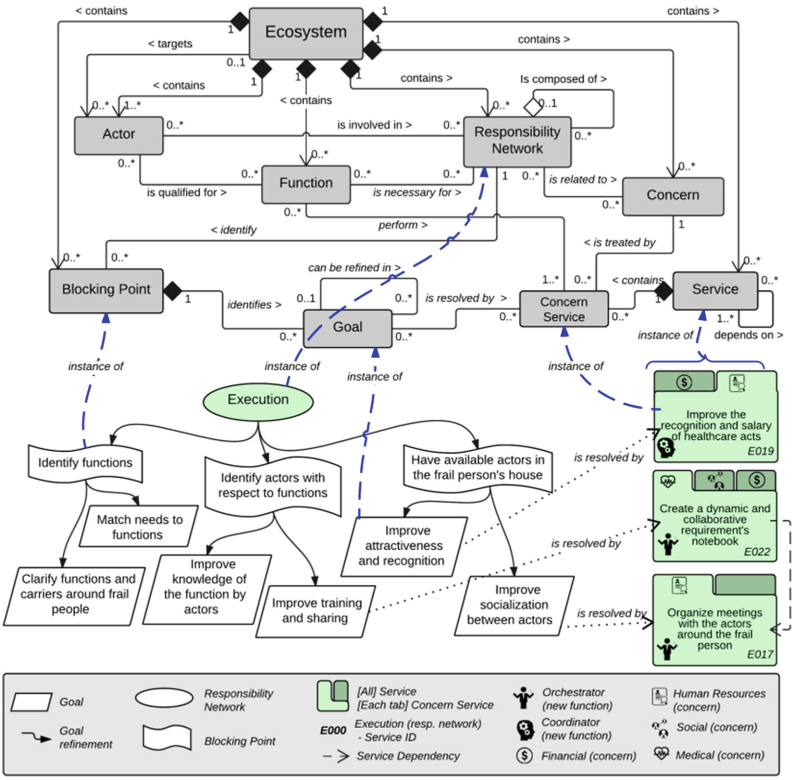

Fig. 3. Ecosystem meta-model and a second instantiation

The concepts presented in this section are generic terms that can be considered independent from the InnoServ ecosystem and transposable to other domains.

3 The *ADInnov* Method

We detail the three main sections presented in Fig. 1 that give the name to the *ADInnov* method: *Analysis*, *Diagnosis* and *Innovation*. The other sections presented in Fig. 1 (concerning road map and deployment) have not yet been studied in detail because they need long term implementation. For each section, application examples in the context of the *InnoServ* project are presented.

3.1 Analysis of the Ecosystem

Figure 4 refers to the section <*Start, Characterize the As-Is Ecosystem,* ***by analysis strategies***> of Fig. 1. This section analyses the As-Is ecosystem. The results expected for this phase are: the characterization of the elements in the ecosystem (*glossary of terms*), a *list of actors and their functions*, a views separation in order to manage complexity (*responsibility networks and concerns*), and the *services* provided by the ecosystem. The resulting model corresponds to the one presented in Fig. 2. Table 1 summarizes the main sections highlighted in Fig. 4 with thicker arrows.

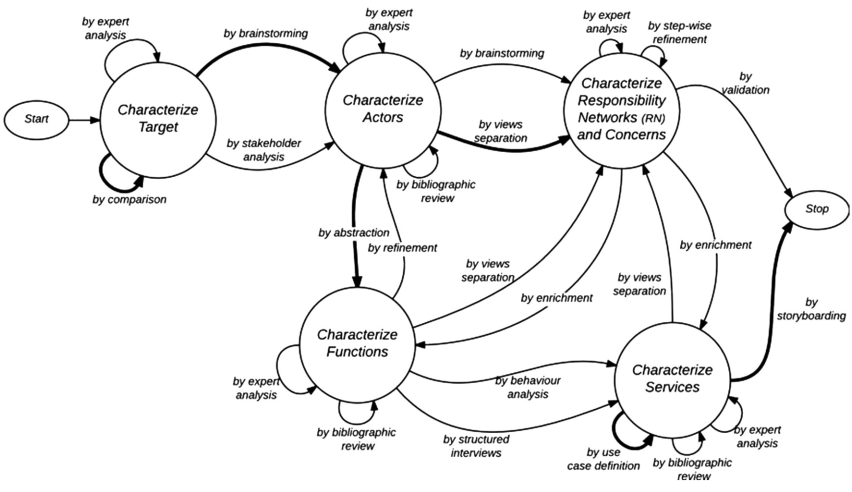

Fig. 4. Analysis of the ecosystem

3.2 Diagnosis of the Ecosystem

Figure 5 refines the section <*Characterize the As-Is Ecosystem, Characterize the As-Is Ecosystem,* ***by diagnosis strategies***> of Fig. 1. This section corresponds to the diagnosis of the As-Is ecosystem. The results of the diagnosis should provide insights about the *major blocking points* and *the elicitation of goals in order to achieve them*. Table 2 summarizes the main sections highlighted in Fig. 5 with thicker arrows.

Table 1. Description of the selected analysis sections

Section	Description
<*Characterize Target, Characterize Target**, by comparison***>	Identifies and describes the target comparing with similar ecosystems in other countries. *The target in the InnoServ project was the frail person*
<*Characterize Target, Characterize Actors,* ***by brainstorming***>	Identifies and defines the actors in the ecosystem by spontaneous ideas in a grouped session. *Some actors of the InnoServ ecosystem (e.g., hospital, nurse, etc.) are illustrated in* Fig. 2
<*Characterize Actors, Characterize Functions,* ***by abstraction***>	Identifies and describes functions gathering several actors and proposing a generic concept. *Some functions of the InnoServ ecosystem (e.g., health professional) are illustrated in* Fig. 2
<*Characterize Functions, Characterize RN and concerns,* ***by views separation***>	Decomposes the ecosystem in different views in order to manage complexity. *The RNs (Execution, Coordination and Regulation) and Concerns (financial, social, medical, etc.) of the InnoServ ecosystem are illustrated in* Fig. 2
<*Characterize Services, Characterize Services,* ***by use case definition*** >	Identifies and defines several use cases to find concrete services of the ecosystem. *The InnoServ project used 4 use cases (homecoming, toilet, Alzheimer, and diabetes) described in* [11] *to provide a list of services*
<*Characterize Services, Stop,* ***by story boarding***>	Creates a story board to illustrate the use cases. *The InnoServ project developed in detail 2 of the 4 use cases*

3.3 Design Innovations

Figure 6 refines the section <*Characterize the As-Is Ecosystem, Imagine the As-If Ecosystem,* ***by innovation strategies***> of Fig. 1. This section corresponds to the design of the innovations in the As-Is ecosystem in order to reach the As-If ecosystem. The results expected for this phase are *a set of services* that help achieving the goals defined in the previous phase (each service responds to a specific goal and proposes a set of alterations on the ecosystem) and *a set of organizational innovations* in terms of alterations of the actors, functions, responsibility networks or concerns. In the InnoServ ecosystem, several organizational changes were proposed, such as the introduction of new functions. For example, we proposed the new function of *Orchestrator* that uses the resources near the frail person and performs the prescription services for a frail person. New functions imply extending the prerogatives of some actors. Nurses, for instance, could become orchestrators. Table 3 summarizes the main sections highlighted in Fig. 6 with thicker arrows.

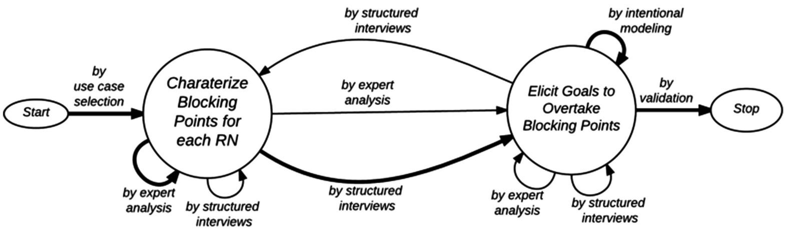

Fig. 5. Diagnosis of the ecosystem

Table 2. Description of the selected diagnosis sections

Section	Description
<*Characterize BPs for each RN, Characterize BPs for each RN,* ***by expert analysis***>	Identifies and describes a set of blocking points guided by the responsibility networks and the concerns. *Some BPs of the InnoServ ecosystem are illustrated in* Fig. 3
<*Characterize BPs for each RN, Elicit Goals to overtake BP,* ***by structured interviews***>	Inquires actors in the field considering their responsibility network in order to cover all of them. *In the InnoServ project, we performed 22 interviews of a representative panel of actors in the homecare service domain. We relied on actors to validate and identify blocking points and to imagine possible solutions*
<*Elicit Goals to overtake BP, Elicit Goals to overtake BP,* ***by intentional modelling***>	Proposes goals that overtake the blocking points. Simple goal models can be built relying on responsibility networks. Figure 3 *provides an excerpt of the goal model used in the InnoServ ecosystem. Sub-goals are developed by analyzing the interviews, so they will correspond to a potential solution of the BP*
<*Elicit Goals to overtake BP, Stop,* ***by validation***>	Validates the goal models by comparing the identified goals with the solutions proposed by actors' interviews. *The InnoServ project worked on the correspondence between the solutions proposed by actors in the field and leaf goals by double transcription*

4 Evaluation of the ADInnov Method

We evaluated the ADInnov method thanks to a qualitative methodology recommended by sociology and also by computer designers: the semi-structured interviews [17]. We conducted 8 interviews with senior researches that lead innovation projects such as the

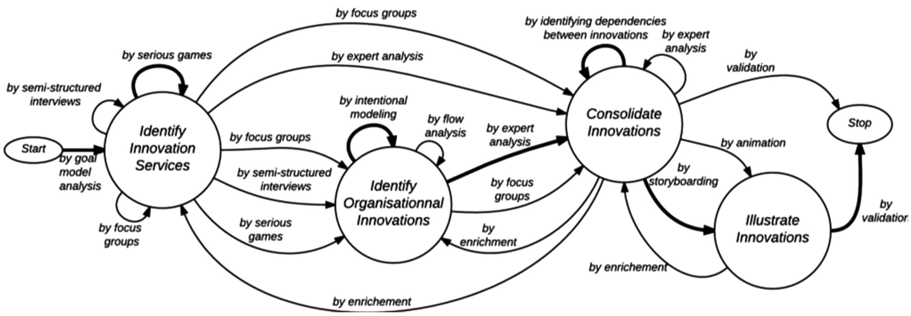

Fig. 6. Design innovations

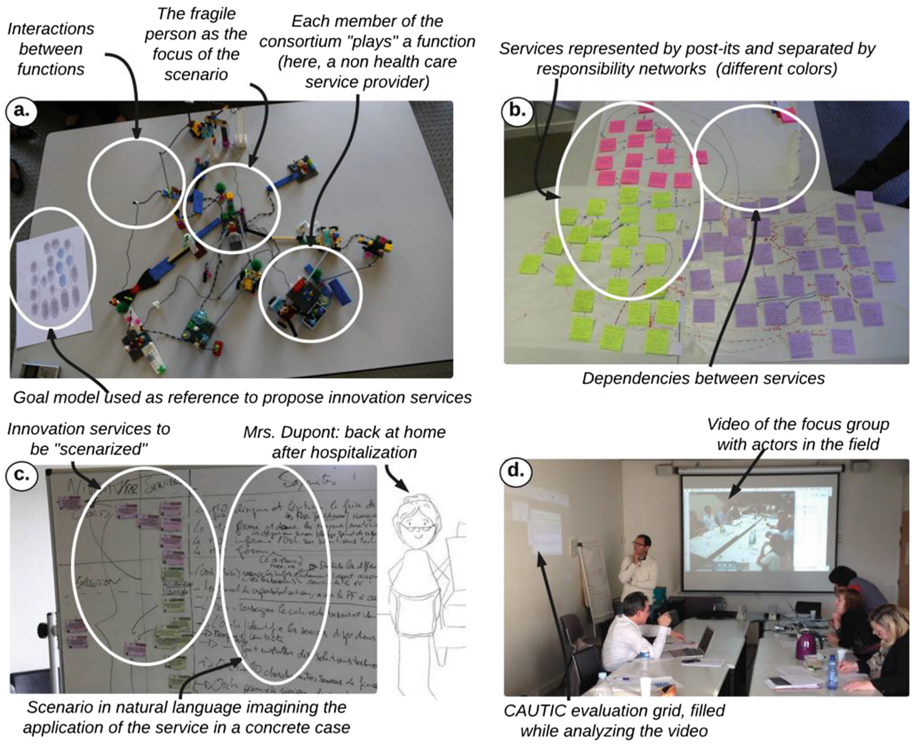

Fig. 7. Different innovation strategies used in the InnoServ ecosystem: (a) Lego serious play (b) Identification of dependencies (c) Storyboarding (d) CAUTIC method for validation

Nexus project[2], focused on the identification of innovations in eco-districts or the ACIC project[3] focused on the improvement of knowledge absorptive capacity for

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[2] http://www.nexus-energy.fr/.

[3] http://bit.ly/acic_project.

Table 3. Description of the selected innovation sections

Section	Description
<*Start, Identify Innovation Services,* ***by goal model analysis***>	Chooses the more fine grained goals to infer concrete solutions. *In the Innosev ecosystem, we relied on leaf goals to infer concrete services (cf.* Figure 3*). For each leaf goal, we tried to propose a concrete solution in terms of new service or organisational innovation*
<*Identify Innovation Services, Identify Innovation Services,* ***by serious games***>	Uses Lego Serious Play[a], a serious game where the different participants put on a function hat in order to propose innovation services to resolve the blocking points in the context of a use case. *In the InnoServ ecosystem, subjects relied on use cases and goals extracted in the previous phase to infer services.* Figure 7(a) *shows a resulting model from a serious game session*
<*Identify Organizational Innovations, Identify Organizational Innovations,* ***by intentional modelling***>	Identifies functions that contribute to reach the identified goals. *In the InnoServ ecosystem, attaching functions to the leaf-goals highlighted potential lacks that implied the proposition of new functions such as the Orchestrator*
<*Identify Organizational Innovations, Consolidate Innovations,* ***by expert analysis***>	Consolidates propositions by checking with experts the coherence and the good alignment between goals and innovation services. *In the InnoServ ecosystem, a workshop implying healthcare experts from the consortium's socio-economic partners was organized to check the overall coherence*
<*Consolidate Innovations, Consolidate Innovations,* ***by identifying dependencies between innovations***>	Identifies dependencies ("proceeds", "composes") between innovations. *In the InnoServ ecosystem, we used post-its to analyze dependencies between services.* Figure 7(b) *depicts the result of this workshop*
<*Consolidate Innovations, Illustrate Innovations,* ***by storyboarding***>	Defines storyboards relying on dependency relations between services. *In the InnoServ ecosystem, scenarios in natural language completed with illustrations were proposed in order to imagine the implementation of the proposed services as well as organizational innovations.* Figure 7(c) *shows the storyboards and one of the two illustrated characters (Mrs. Dupont)*

(*Continued*)

Table 3. (*Continued*)

Section	Description
<Illustrate Innovations, Stop, ***by validation>***	Validates the evolution scenarios by actors in the field before building the animated scenario that serves as demonstrator of the project's innovations. *In the InnoServ ecosystem, we used the CAUTIC method* [16] *to evaluate innovations in a focus group taking into account the following aspects: Assimilation (to the subject's technical know-how), Integration (with the subject's daily practices), Appropriateness (with regard to the subject's role and identity), Adaptation (to the subject's environment)* Figure 7(d) *shows one of the analysis sessions where 2h30 of focus groups implied 25 h of analysis*

[a] http://www.lego.com/fr-fr/seriousplay/.

innovation projects in collaborative SMEs networks. Table 4 shows the evaluation protocol, where we asked subjects to face the evaluation with an innovation project in mind. Data was gathered following an interview grid, where we asked subjects about the appropriateness of the proposed formalism and the proposed intentions, strategies and results. Due to the lack of space, we summarize the important points of the results.

The evaluation permitted to validate important aspects of the method but also highlighted some limits. A good point is the support of iterations, as new blocking points could be induced by the proposition of innovations. The simplicity of the MAP formalism was also appreciated. However, three researchers highlighted the difficulty to follow the models sequencing. The clear link between intentions and the expected results simplified the method understanding. Subjects highlighted the necessity to define different categories of blocking points (ex. financial, cultural, dysfunctions, etc.). In the same line, several researchers pointed out the necessity to analyze the risks as well as the potential opposite goals of the different actors as for example between private, public and associative actors.

This evaluation confirmed the appropriateness of our method, and helped us to understand its value and possible application. Moreover, the subjects described organisational mechanisms in which the method could work as a machine to permanently innovate in the ecosystem. The method was seen as a heuristic toolbox that the ecosystem can use in order to continuously think about its future and to find innovative ways to make it happen. By enabling this continuous and reflexive innovation loop process in the ecosystem, ADInnov supports the dissemination of the innovation culture in the organisation. Describing these mechanisms, the subjects characterized some improvement perspectives for the method. In particular, the method should supports characterizing the "stop" outputs in order to build a roadmap or a strategy that support decision-making when implementing innovations in the ecosystem. These "stop" could

Table 4. Evaluation protocol of the ADInnov method

Hypothesis
The ADInnov method is useful and can be applied in multi-disciplinary innovation projects
Protocol
Method Presentation ~ 20min
Evaluation ~ 1h30min – Questionnaire about the innovation project (goals, components, research methods) – Question about the appropriateness of the use of the MAP formalism. – Analysis of the *intentions* proposed in ADInnov. – Analysis of the *strategies* proposed in ADInnov. – Analysis of the *results* proposed in ADInnov. – Global appropriateness of the method and its applicability in other domains.

be characterized with regard to the responsibility networks (RN) so we can infer the feasibility framework. For instance the innovations concerning the *Execution* RN are supposed to be achievable in a short-term perspective involving a reduced number of actors, while outputs concerning the *Regulation* RN should involve a representative number of actors over a long time period. In addition, it should be possible to characterize the innovations depending of their class in terms of "products", "services", "infrastructure" or "financial and legal rules": this classification can help the actors to prioritize the implementation of innovations into the ecosystem.

5 Related Works

Several domains offer methodological tools that can be used in our method. Some are relevant because of the used language or by the steps they propose. Others propose participative techniques that make sense in our context.

Domain analysis methods in the Information System's community such as Merise [18] or SSADM [19] provide systems' analysis techniques relying on sub-problem decomposition. This decomposition is governed by the flow of information between the system and its environment or between different actors in the ecosystem. Kang et al. [20] proposed FODA (*Feature Oriented Domain Analysis*), in order to analyze the scope of the system and the functionality requirements. **Goal-modelling approaches** such as KAOS [10], URN [15], i* [21] or MAP [9] are also well known methods to study a system by focusing on its goals or intentions. The aforementioned methods facilitate the understanding of the studied ecosystem, the delimitation and the modelling of the domain. They may be useful to improve the system (as they help to understand it). Nevertheless they are limited when it comes to guide innovation. Note that our method is strongly inspired (in terms of concept usage) by the GORE method [10]. For instance, the term "blocking point" is similar to the KAOS obstacle [22]. However, these domain analysis methods focus on information systems requirements engineering, while we focus on innovation in ST ecosystems.

Multi-agents methods such as DIAMOND [23] are also considered as analysis methods. The latter proposes a spiral method with the following phases: *definition of the needs*, *analysis, generic design, and implementation.* An interesting point here is the decomposition approach into agents in order to build a system with a bottom-up approach. In our case, we are not in a building-from-scratch approach: the studied ecosystem is already established, like most of the current systems [24].

In the innovation domain, empirical methods such as CAUTIC [16] have been proposed. Serious games or focus groups are also commonly used to infer innovations and their effectiveness was already proved in the context of business process management (BPM) [25]. Creativity methods [26] are also well known to help inducing innovations. However, these methods focus in a very specific area and a one-shot view of innovation. In addition, they do not contemplate a rigorous analysis (and modelling) of the actual system or product. **User-centred methodologies** used for example to build domain specific languages [7, 26] propose similar phases as the previous ones: *Analysis*, *Design*, *Implementation* and *Testing*. These approaches show the benefits to integrate the end-user in the understanding and co-construction of a complex task. However, these approaches are not generic enough to be adapted to the evolution of ST ecosystems.

Generic methods in business process management domain promote continuous improvement. The PDCA method (Plan Do Check Act) [27] or the one described by van der Aalst (*Process Design, System Configuration, Process Enactment and Diagnosis*) [24] are well known examples. In the healthcare domain, Winge et al. [5] rely on PDCA to propose a generic process that supports care process conglomerations, referring to the tangle of processes around a patient. We think that process oriented approaches are limited for ST ecosystems, where automation is not always possible, in particular for the configuration and the enactment phases.

To resume, to our knowledge, there is no method accompanying iterative innovation for ST ecosystems. The ADInnov method mobilizes different methodological tools from different spectrums such as domain analysis, multi-agent, business process management and innovation domains.

6 Conclusion and Future Work

Understanding and improving ST ecosystems, where many entities interact in different ways and where a lot of special cases exist, is still a great challenge. To overtake this complexity, this paper presents *ADInnov*, an iterative method that supports the analysis, diagnosis and the design of innovations in such ecosystems. Our goal is to assist the study and guide the improvement of ST ecosystems by instilling an innovation culture that allows the stakeholders to permanently improve the ecosystem. The notion of As-If ecosystem appears to represent an improved vision of the As-Is ecosystem where innovations are introduced in order to resolve blocking points. The As-if ecosystem becomes an As-Is ecosystem when innovations have been deployed. New blocking points may appear implying an iterative process of innovation. This work is the consolidation and abstraction of an empirical method with the aim of applying it to other innovation projects. The method is represented using the MAP formalism and relies on a generic ecosystem meta-model where blocking points are considered as an inner part.

At present, the analysis/diagnosis/innovation strategies are limited by the best practices used in the InnoServ project. A larger deployment of the method is needed in order to improve it and study its applicability in other ecosystems such as smart-cities and eco-cities. The qualitative evaluation of the method with innovation project managers helped us to position the method with respect to other ecosystems and gave us some valuable clues to improve the method. The current strategies must be completed, in particular by creativity methods [26]. Road-map and deployment strategies have to be defined by integrating risk management methods. In addition, metrics regarding the resolution of blocking points have to be introduced in order to measure the grade of innovation.

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