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« Smarterizing » urban project with Living Lab approach : exploration through study case

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Abstract— This article explores the field of town and country planning by studying the practice of the project of territorial and urban transformation as a urban innovation management process. By the Living Lab project-mode, the practice of the project can generate a collaborative environment of open-innovation mobilizing all the actors of the urban project process and taking into account the Use. The Use is envisaged here as a shared language. Its point of view gives the sense of the design of the solution to improve the appropriation and connect the functional purposes of the project management design team. Innovation management combined with urban project study allow a theoretical positioning, completed by a state of the practices of the urban project and an actors mobilization in Focus Groups. We propose an exploratory model showing the interactions between urban project process and Living Lab as project-mode and as an ecosystem.

Keywords— *Living Lab, Urban project, Spatial planning, Open innovation, Use*

I. INTRODUCTION

Spatial planning is a scope which evolved a lot during these last decades. It is marked by a normative and economic context differentiated for every country and have impact on its management. It is also impacted by the social and societal context of transformation of territories [1]. Given new requirements, the field of the territorial development calls a renewed practice of the project in France. It actually limited by a thought which was mark by planner and which moved in programmatic thought divided up in sequences which does not allow the transversality [2]. This programmatic urban project management is based on an engineering which approaches the stakes as the isolated constraints which generates a succession of isolated answers and not taking into account enough the complexity, few or the not fed by the real context. This project-mode does not thus generate global solutions in territorial contexts which impose stakes in various natures [3] to connect or to make compatible, what leads a more global approach [4].

The urban project is difficult to manage and all the territories are different and generate contexts and specific stakes in urban transformation [5]. A large variety of territories

[6] generates variety of engineering, understood as the means and the skills which a territory and its actors can spread to bring to succeed a project, from political definition until its realization [7].

Urban territories are intermediate spaces [8], [9] which suffer from a lack of engineering to manage project of territorial and urban transformation. Peri-urban area is an emerging of a third category of area, complexe combination neither to city nor to countryside, at the middle-city the middle-campaign, spatial situation which establishes a new organisation of the space and some specific representations [10]. Nevertheless, these territories are perceived as areas where can build up themselves and implement new procedures and new devices [11], [12], so many opportunities to change project management and generate global and innovative solutions. The low implication of the citizens in the projects is added to the lack of financial means [13].

The stakes in the territorial and urban transformation are many, for example the energetic performance, the mobility, the housing environment, which have to join a global design taking into account the uses by a project management open to the transversality taking account of complexity [14]. Peri-urban territories also have to answer imperatives regarding health and well-being, local lifestyle and territorial attractiveness to generate solutions crossing these stakes [10]. Think about various scales is necessary because the complexity of the stakes in the territorial and urban transformation requires to produce a more global answer connecting these stakes. "Global thinking" imposes to associate the actors within the framework of a collaborative work more integrative and convenient the enrichment of the knowledge and the practices [15]. It also imposes to rethink the succession of sequenced contributions by the actors and to solve the gap between the representations of the current project engineering and the every day's actors of the territory's experience in particular by the consideration of the Use.

We study in this article the problem of the enrichment of the practice of the urban project to allow him to answer as much

the global stakes as the local stakes. For that purpose, we approach the influence and the constraints put by the legal and procedural contexts as well as those of the practices and professional postures. We also enlighten the temporality in which to introduce a collaborative work into the design and its implementation to produce more global solutions. It will be also necessary to reflect how to improve the consideration of the reality by the engineering and how to generate a better acceptability of the solutions by the actors of the territory by taking into account the use in all the stages of the process of piloting of the urban project

The answers to the complexity of the territories's stakes motivate the experiment of the implementation of tools from the innovation engineering. For that purpose, our demonstration crosses a state of the art and of practices with an experiment within the framework of a territorial project of transformation on the French-Luxemburg border, the Opération d'Intérêt National d'Alzette Belval. The objective is to make the urban project more effective, more integrative of actors and transverse considerations of the stakes and the problems of the impacted territory when project actors work most upstream possible of the process and when we make of its understanding a resource to innovate.

We suggest implementing the practice of the urban project by the contribution of an opened innovation engineering taking into account the use. The new approaches taking into account the determiners of Smart City do not standing up to transform the practice of the project and its process. Peri-urban territories are not able to use these practices [16] because of a technological approach badly accepted by the users [13]. Developing practice of the urban project passes by an adaptive approach [17]. In Innovation Management, the Living Lab approach is a practice which is at the same time an open-innovation [18] project-mode [19] and an ecosystem [20] which allows to mobilize the actors. The Living Lab project-mode is an innovation practice more opened taking into account the uses understood here as a language shared by all the actors and allowing to integrate the user into the collaborative work. Use gives the sense of the construction of the solution and help to improve the appropriation by the users and it connects the functional purposes during design [21].

We suggest working on the urban project process and on its ecosystem to understand how to implement an innovation management and thus a solutions optimized research. It is thus about an innovation research by a process optimization, an « out of the box thinking » [22] to change the representations with passing the organization from a closed system to an open system of open-innovation which generate new interactions and new knowledge. The innovation management can thus take a social character because it transforms the actors. We put the theoretical frame of innovation management of the urban project, by means of an innovation engineering approach by the implementation of a Living Lab as space in open-innovation. We use a methodology which allows more innovative, more

agile urban project practice, anchored in its territory and mobilizing all the resources of its ecosystem.

The paper is structured as follows. Initially, we put the theoretical bases of the notion of urban transformation and innovation engineering adapted to this context. Then, we present our methodological approach and our first results. Finally, we propose a conclusion.

II. RELATION WITH EXISTING THEORIES AND WORK

A. *Notion of urban project and its process of urban transformation*

Urban project is studied [2], [23] and could be described as « a public initiative which has for object to define a executive and a strategy of action to lead urban dynamics or process of urban transformation by taking into account the actors' logics and by articulating the various registers of action in the various scales deducing on its conditions of realization » [24]. The urban project process in France is marked by its technical nature approach forced by some normative reference tables and the analysis of needs according to formatted indicators. It also puts a tripolar model of organization between project ownership and two parts of the project management, for design and for realization. The urban project is also marked by a sequencing and a strong linearity [25] been imperative by the legal framework regarding Planning Rules and the procurement contracts. The complexity is all the more difficult to take into account in the process that actors' large number intervenes throughout the process with a specialization of the actors and a lack of interaction. It has consequences with a bad consideration of territory's ecosystem, with its dynamics of evolution and its transformative interactions [26]. Defining moment of the project is the transfer of the responsibility from project ownership to project management team when the call for tender is formulated and when a project management design team is selected [1]. This sequencing divides up the work of the actors. This organisation come from short scale building construction engineering but it's impose upon projects of large-scale transformation. The citizens consultation is compulsory at the time of the formulation of the project by project ownership and at the time of the design phase by the project manager [25], but without integration objective.

The urban project process by six stages, starting by the emergence of the problem, the formulation of the problem and its demarcation, the technical formulation of the project, the formulation of the solution, the realization of the solution and ending by the appropriation of the solution [27]. Step 4 of solution formulating is an influential sequence that is being prepared at the start of the urban project [1], [25]. The phases which preceded it are considered as upstream. Urban project uses places and spaces concepts as conceptual tools for understanding environments, change processes and innovation processes. The territory appropriation questions place, space as a social construct [28]. The urban project therefore passes through a stage of characterization and analysis of the

determinants of the territorial context directly influencing its success [29]. The urban project has to pass by a necessary holistic approach [30].

B. Innovation engineering implemented in territories and in urban area

We suggest here enlightening the applicable innovation concepts to the urban project.

1) Innovation and open-innovation

The concept of innovation means at the same time developing the process which aims at generating concepts of adapted solutions and the concrete result of this process [31]. It is a feasible and desirable answer for a problem. The urban project is marked by its complexity and requires an approach by interactions and negotiations which allow the adaptation and the acceptance of the solutions [32]. The innovation process is characterized by triggers, in particular evolutions of the company, the knowledge of the uses, the awareness of the social aspiration expressed by the society, the identification of the new motivations of communities. To renew the way of making project on the territory and of making intelligent the approach requires to innovate in its approach, to generate particular processes to accompany this specific project ecosystem [33] which is different for every project. This reading of the innovative process thus invites to envisage the evolution of the urban design process, from a linear design to a systematic innovation approach.

Open-innovation is a process of enrichment of organization internal knowledge by the integration of external knowledge to accelerate internal innovation [34]. Open-innovation sees its definition becoming refined according to the scale or the reserved object [35] and could be implemented in urban project where it favors the exchanges of knowledge and ideas [36]. Open-ecosystem of innovation regroups communities of various stakeholders which co-create some value by adopting an open approach [34].

2) Innovation by the use

Upstream phase characterizes the stages of the project where the uncertainty is the biggest, where it is advisable to shape, to make mature at the same time the technology, the ideas of application, the potential markets and the uses to come [37]. Use innovation approach intends to understand interactions between the user and an object in its context, what asks for a specific work on the understanding of the users, the solution and the context [38]. Uses sociology is part of Use innovation approach which aims at understanding the appropriation process of a solution or an innovation by citizens and users [27], [39], [40]. The use consideration reduces the risks of bad or not appropriation [41] which lead additional costs [42] damaging the project economy. It is thus a question of thinking and of designing experiences as a design mode

integrating the user and the object into a more holistic approach [43], [44].

3) Living Lab

Living Lab is a recent domain of research in innovation engineering [45]. This project-mode is experimented for the first time on the scale of a district [46] and it is considered as an open-innovation tool [35] developing a project ecosystem [45] turned to the urban transformation and stake. Living Lab passes by a particular approach of Concurrent Engineering which consists in integrating all the causes of a problem into a complete answer. This holistic development approach consists in conjugating several programs of support and not only in bringing a sectorial answer for every identified stake, in particular for the territorial development [47]. Living Lab is also an opened innovation ecosystem in which the practices of open-innovation are adopted to identify and handle the urban problems. These problems are complex because they affect generally several domains simultaneously [48]. The presence of various actors returns the management as particularly difficult because it is requiring to mobilize the actors and the resources of the ecosystem [49]. Open innovation practices have to spread spaces and methodologies adapted to involve the stakeholders identified to develop practicable and desirable innovations. The literature counts very numerous approaches centered on the urban, with Urban Living Labs [50]–[53] or on a regional frame, with Regional Living Lab. The deployment of a Living Lab can also dedicate itself to a single stake in particular, as an ecological determiner (Sustainability Living Lab [51], Urban Transition Labs [54]) or the social determiner (Social Living Lab [38]). Urban Living Lab can also integrate a Smart City approach [48], [55], [56].

The living Lab concept is mobilizable in Smart City strategy [52]. It represents a methodology which combines an User Centered Approach and an approach mobilizing the technology to innovate in the urban. Living Lab is a collaborative project-mode which allows the implementation of a systematic governance of the stakeholders and connect their interactions to approach the Smart City [56]. The literature also proposes to integrate Smart City determiners by an approach of Human Smart City [13]. The Living Lab concept could mobilize tools and methodologies centered on the consideration of the use and allowing a better acceptability of the solutions but also wishing to give more strength to the point of view of the user in the urban project [57]. Users are perceived as key actors of an urban ecosystem and as experts of their everyday life, like in the Urban Centered Innovation approach [50]. Design taking into account the situations and studying the link between the context and the users, the urban experiences of the inhabitants and the citizens is the "Activity Centered Design" [58]. The notion of appropriation allows to make the link with the territory [59], widely studied in social sciences and thus mobilizing of concepts and transversality in the Living Lab. In conclusion, we hold the following definition of Living Lab. It is a practice which is at the same time a mode-project [18] of open-innovation [19] and an ecosystem [20] which allows to mobilize

the actors of one territory and around the project. The Living Lab project-mode is a practical approach to innovation taking into account the uses, understood as a language shared by all the actors and allowing to integrate the user into the collaborative work. The Use gives the sense of the construction of the solution to improve the appropriation by the users and it connects the functional ends in design [21].

III. RESEARCH APPROACH

This exploratory research proposes a state of the art enlightening the notion of innovation in urban context and brought to foreground original orientations. Working on urban project process raises the question of the positioning of a Living Lab and its impacts on the transformation of ideas in solutions. The search questions the enrichment of the urban project piloting by implementation of a Living Lab and its modalities.

This research leans besides on Smart City Living Lab's project carried by the University of Lorraine and the laboratory ERPI since January 2016. This Living Lab accompanies the transformation of an peri-urban territory in interaction with public authorities in presence (an Etablissement Public d'Aménagement in charge of the management of an Opération d'Intérêt National with an association of local authorities, the Communauté de Communes du Pays Haut du Val d'Alzette)

since its launch. This territory was dominated by a steel-industry mono activity having occupied a central place both on geographical and identity terms [60]. The Smart City Living Lab of Alzette Belval will not be the object of an exhaustive presentation in this article.

Our methodological approach is the following one. We suggest questioning the urban project process already studied in a state of the art by six focus groups with six actors of the project ownership for the first one and forty-five professionals actors of the urban project groups in five different focus groups (project ownership support, architects, town planners, public agencies of town planning, representatives of citizens, experts of construction and energy, representatives of local authorities) for the others. A state of the practices pulled from the professional literature comes to complete our approach to propose a simplified model the urban project process. In interaction with our state of the art, we propose a modelling exploring the interaction between a process of French urban project and a space in open-innovation such as the Living Lab. We shall bring to the foreground some principles where the Living Lab supports the process of project urban as an ecosystem and as an open-innovation space begun the most upstream and mobilizing diverse actors.

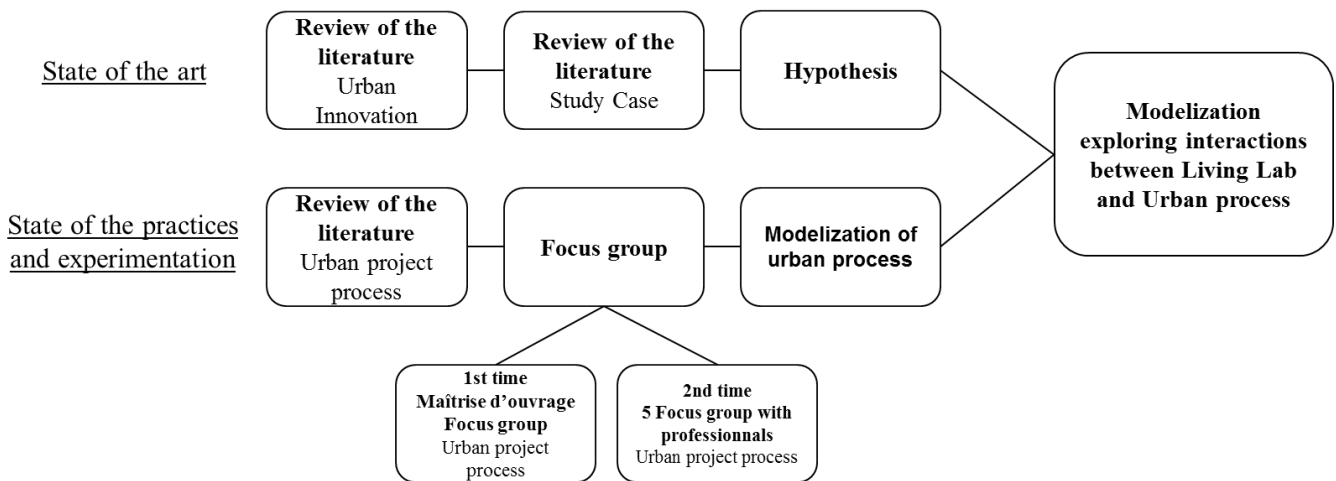


Fig. 1 : Synthesis of the approach

IV. FINDINGS

A. Urban project process

1) Focus group

The Focus Group is an exploratory tool of collect data [61] used within the framework of a qualitative approach [62]. The method allows to involve a community by recognizing it as expert of the questioned field. Six Focus Groups were organized and lived up by the research team, which questioned the various panels about urban project process. The participants worked to positionate reflections within the framework of the Smart City Living Lab of Alzette Belval, after an introduction presenting the Living Lab concept.

About urban project proces	Data from Focus Groups	
	Perspectives and values brought by different participants	Put into perspective with the Smart City Living Lab of Alzette Belval Subhead
Key moments	<ul style="list-style-type: none"> -Sequences before the formulation of call for tender, which transfers responsibility from the Project ownership to the Project management -Room for maneuver if project management have enough time for programming and bend the direction taken by the solutions -Potential uses are thought and integrated during the design 	<ul style="list-style-type: none"> -Specific milestone at the time of the formulation of the call for tenders and the response to tender -Steps 2 and 3 of the urban project process are potential negotiation times -Opening of the upstream steps to users and stakeholders
Interaction between actors	<ul style="list-style-type: none"> -Respect of the sequences provided by the Law which defends the principles of stakes in competition -Local elected representatives have a strong impact on the orientations and the decisions -Division of meta project in different projects which does not allow a transverse vision 	<ul style="list-style-type: none"> -Need for a neutral space which accompanies the project without conflict with the legal framework -Place for sharing, rebalancing, developing a vision, programming with the aim of an

About urban project proces	Data from Focus Groups	
	Perspectives and values brought by different participants	Put into perspective with the Smart City Living Lab of Alzette Belval Subhead
Where the knowledge come from ?	<ul style="list-style-type: none"> -Knowledge and individual skills of every professional in urban project process context -Technical studies paid to engineering consulting firms to enlighten technical points -Formal and informal interactions between actors not capitalized as knowledge -Contact between project ownership and project management team during step 2 -Problem of knowledge management, badly shared and often too late acquired in the project when it is not possible anymore to bend the project without it has an important cost 	<ul style="list-style-type: none"> -Generate knowledge as soon as possible to feed the urban project process
Barrier for innovative approach	<ul style="list-style-type: none"> -Local engineering in project management has an impact on the quality of the answers because of a good context knowledge -Urban project has a process which tends to produce the same solutions everywhere because does not adapt itself enough to the context -The economic datum is the first criterion to make chooses Implementation of technologies is not the only way to innovate 	<ul style="list-style-type: none"> -Space which can welcome as soon as possible professionals of project management -Contextualization of every step of the process to generate local determiners of the future solution by the prism of the use -Approach the economical factor as soon as possible as a shared critical datum

TABLE I. DATA COLLECTION FROM THE FOCUS GROUPS

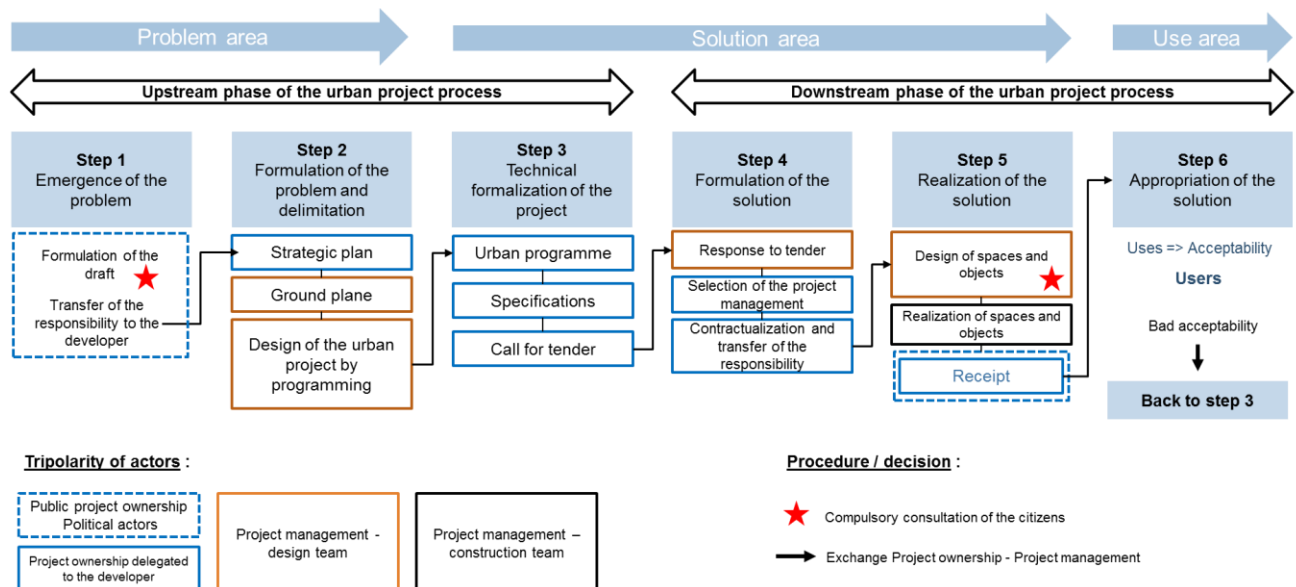


Fig. 2: Simplified model of urban project process

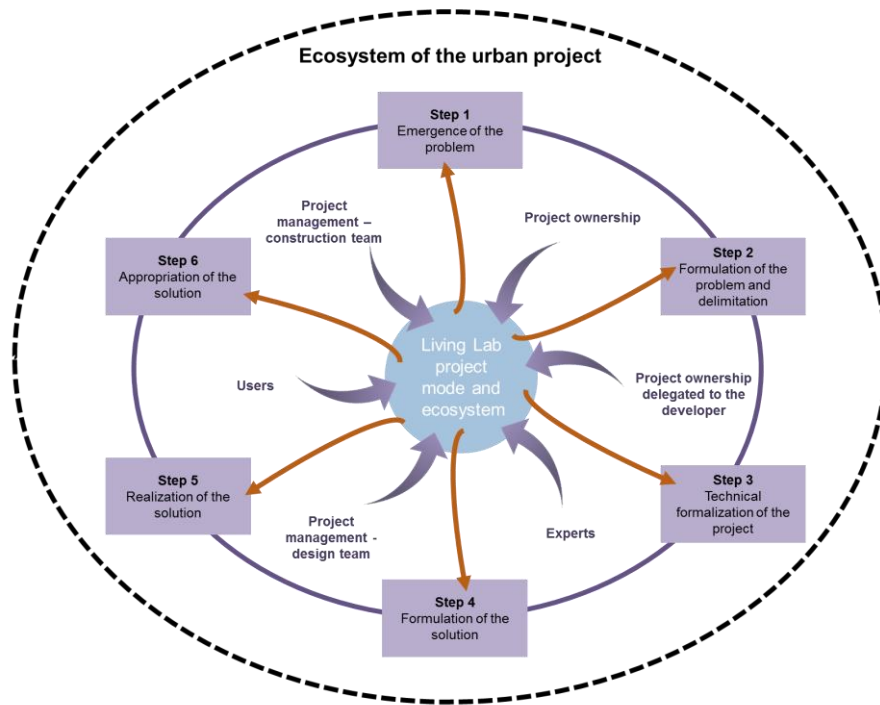


Fig. 3: Ecosystem of the urban project interacting with Living Lab

2) Modelling of the process of urban project

Based on the information collected during the six Focus Groups and completed by a state of the art [63], [64] we propose a first modelling of the process of urban project completing the state of the art. This modelling (fig.2) allows to notice the sequencing, the linearity and the partition between actors of the project ownership and the project management. Every sequence is separated by a milestone which contractualizes the relation between actors until delivery of the solution designed within the framework of the urban project.

B. Bases of an approach Living room Lab accompanying the process of urban project

a) The upstream phase of the urban project is essential

The urban project (fig.2) is structured by sequences [25] and we put the hypothesis that the implementation of a piloting of the innovation is completely effective only if he is active from the starting up of the project. The urban project extends over sometimes long durations (20 years or more) and the Living Lab as the space of open-innovation is relevant from the starting up to accompany the carriers. As see in La Fabrique Nancy Grand Coeur [65], experiment of a collaborative workspace aim at enriching the practice of the urban project. With a formalized methodology and a link with the actors of the project, this experiment proposes besides a reflection succeeded on spaces allowing to welcome and to carry this collaborative

work [66]. It emerges from it that the impact is limited because of a work on objects and urban spaces in phases after call for tender. The sense given to the experience of the object or the space is already put in this sequence.

So, we understand the importance to work as soon as possible in the project where the capacity to inform the project and its solutions is the strongest. This principle is common to any design process where everything takes place in the first months, 80 % of the decisions having an impact on the costs are taken in upstream phases [31].

b) An open-innovation ecosystem

Living Lab mobilizes the ecosystem of the urban project in an open-innovation ecosystem (fig. 3) which permits to integrate all the causes of a problem into a complete and holistic answer [47]. This ambition rests on the animation of a transverse collaborative work gathering the actors resting on a specific language, "Use", allowing to approach the stakes under a multidisciplinary point of view and to find solutions guaranteeing the acceptability by the users. This specific language allows to amend the process of urban project by generating integrable knowledge throughout the process, in particular in call for tenders where use as language give sense to future solution to design in concrete object. The technical and concrete answer use these data of use allowing a better contextualization and assure a bigger acceptability. The contribution of "Use" allows to characterize the fundamental data giving meaning to the action, about experiences lived on the generated spaces with urban objects created [58].

The use becomes then a knowledge produced and capitalized with the aim of its integration in the process of urban project as improving the acceptability of the solutions. This work becomes then a process of mutual adjustment where manages the interrelation between knowledge and skills of the user [67] and knowledge and skills of the project management team, enriched of looks of the actors of the project. Open-innovation allows the construction of a knowledge favoring the acceptability of the solutions by the users and the stakeholders. This knowledge management [35], [68] is imperative to assure the transfer between Living Lab and urban project process to bring an intelligent answer to the challenges of the support the change of the territory [12]. Living Lab vocation can also become social [38] because centered on the human being to integrate Smart City solutions [69].

C. Exploratory « model of dialogue » between operational piloting of the urban project and Living Lab

We make the proposal of an approach of Concurrent Engineering, developing the sequential approach towards a simultaneous approach supported by the collaborative work (fig. 4). The open-innovation makes think of the knowledge management [35], [68] on the various types of sources, the usual and the new sources stemming from the Smart City

Living Lab (by its activities and the change of posture that it brings on the organization, the project managers, the territory and its actors).

The model underlies the improvement of the quality of the formulation of the demand because the collaborative work concerns to the stakes, the uses and more transversely on the sense of the project. It postulates that the Living Lab allows to improve the quality of the answer during the call for tenders.

V. CONCLUSION ET PERSPECTIVES

This paper explore the practice of the urban project and the implementation of a Living Lab, defined as project mode in open-innovation and as an ecosystem integrating the dynamics of the actors of the territory and outside the territory.

This exploratory work allows to put several hypothesis:

- The understanding of the urban project process allows to act on the project as political, economic and social vision of an action on a given territory. Detecting project milestones where decisions are made and where the responsibility is transferred from project ownership team to project management team to the design justifies to act during upstream phase,

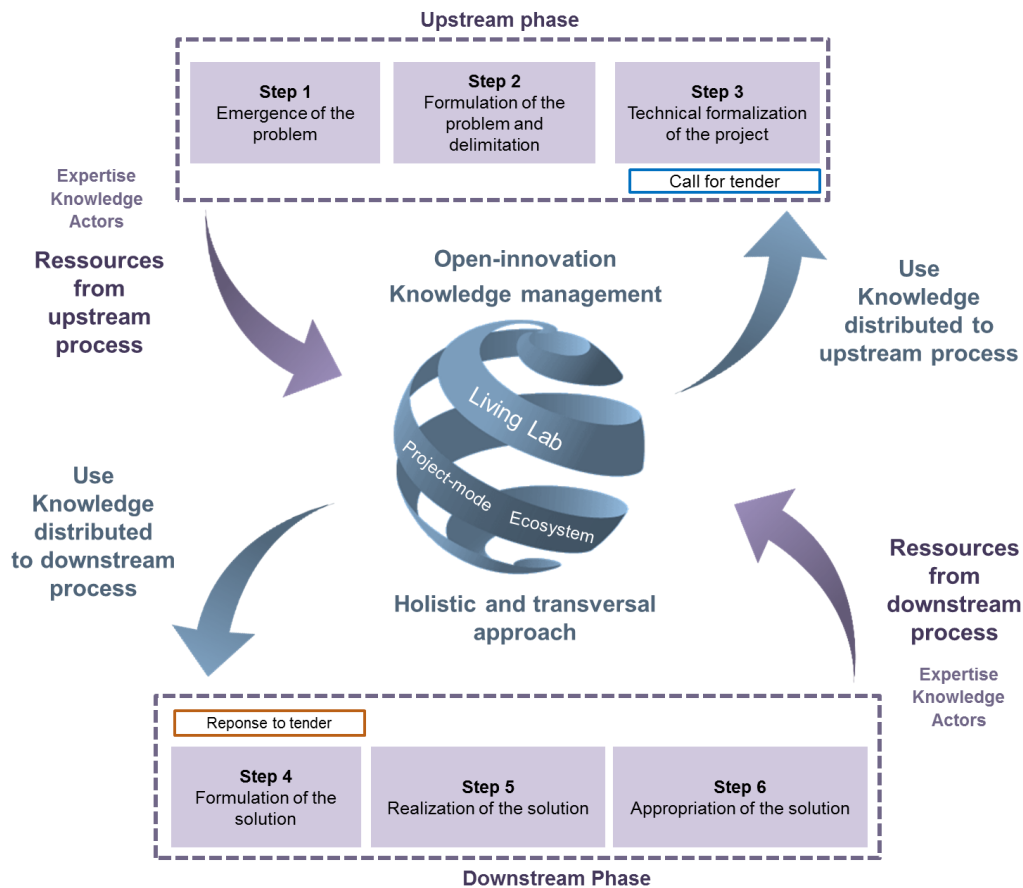


Figure 4: Exploratory "model of dialogue" between the operational management of the urban project and Living Lab project-mode and ecosystem

- Taking into account uses as a knowledge generated in an open-innovation framework give to every actor the possibility to contribute on any point of the project,
- The consideration of the use introduces a language shared by all the actors. Use as language improve the transfer of the knowledge generated by actors from the upstream phase to the downstream phase,
- The consideration of the use permit to improve acceptability and quality of the solution because the methodology implies to work on user representations and context of life. To design a contextualized solution allows to estimate the quality of the consideration of the use.

The urban project generates a specific model of Living Lab carried by public authorities. As defined by Leminen [70], enabler-driven Living room Lab invites us to consider that this specific model could interest private economic actors, contrary to others definitions. We shall verify this hypothesis. The limits of this work are numerous. The notion of use is reflecting all the complexity of the context of urban project, its dynamics and actors. It emerges from a research on an ecosystem and the methodology to reach must be refined there and experienced within the framework of the experiment of the Smart City Living Lab. The hypotheses will also have to be enriched by the literature and experiment. The process of urban project described in this paper experiences french urban engineering and have to be confronted to others urban project engineering. Future work will aim to confirm or reverse the assumptions made in this paper.

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