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Monitoring co-design processes: which framework to support collaboration between agronomists, social scientists and users?

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Since 20 years, co-design has been a concept and a practice which the agronomists struggle with. It covers a range of design practices the particularity of which is to involve stakeholders at some stages of the design process. This involvement can occur in quite different ways. For example, farmers are mainly involved at the end of the design process in the prototyping approach described by Vereijken (1992). More recently, Stoorvogel *et al.* (2004) proposed a method involving the farmers at the different steps: analysis of the present farming systems, design and test of new technical solutions and extension of the results to other farms. In this paper, we firstly present a framework whose purpose is to support co-design processes of a new technology, e.g. processes in which users are involved at a quite early stage. Secondly, according to this framework, we argue that the management of such process requires a strong collaboration between agronomists and social scientists.

The results we present and discuss here are grounded in a collective and reflexive work among the researchers of seven co-design projects. This collective work was supported by a team of social scientists (Cerf *et al.*, 2009). Each project was monitored by agronomist researchers, sometimes associated with social scientists or/and users. The aim of the collective work was to build a framework, in order to point out the elements a manager of such a co-design project has to pay attention to.

1. A framework to support the monitoring of co-design processes

The framework described below should not be seen as guidelines, but as a tool which can be used to anticipate the monitoring work as well as to reflect upon it. The framework distinguishes three steps and describes them along three dimensions: purpose, agency and means. It points out the importance to have successive prototyping loops built around the lessons which can be drawn collectively about the coupling between the technology and the way it can be used within the local situations.

Step 1: acquiring cognitive and material resources to build a 1st version of a prototype

Purpose : To learn about acceptable and possible changes in work situations and to design a 1st rough prototype

Agency : Each participant has to acknowledge the diversity (knowledge, practices, values) among the participants and to identify the scope of the process. The researchers therefore have to make their own knowledge, practices and values accessible for the others, and have to catch those of the other participants

Means : (i) Diagnosis on the local situation : how do users invent some solutions to achieve change within their local situations ? Which representations do they have of their local situations ? Which transformations will be acceptable? (ii) Identification of the knowledge (scientific, technical, local) which has to be made available for all the participants and choice of the knowledge to be embedded in the prototype.

Step 2 : organizing successive loops around the prototype

Purpose : Enabling joint development of the prototype and of the acceptable changes within the work situations

Agency : Participants are involved in testing the prototype and building scenarios in which to test it. They discuss the consequences and the changes required or at stake within the prototype and the local situations. Researchers participate in creating space for these debates and in the development of new versions of the prototype;

Means : Establishing a framework in which each participant can be confident in the way others are engaged in the process: (i) acknowledging the dynamic of interactions among the participants; (ii) highlighting controversies as well as common agreement on required changes whether at prototype level or at local situations one. Enabling the coupling between the prototype and its use in local situations. Focusing the discussion among the participants on what emerge from this coupling (benefits and pitfalls). Building new version of the prototype.

Step 3 : Ending a co-design cycle

Purpose : Stabilizing an acceptable version of the designed object

Agency : Participants agree on the relevance of the prototype regarding the changes which have been achieved in the local situations

Means : Assessing what will be gained by further development of the prototype. Assessing if little changes in the local situations will imply deep redesign of the prototype.

According to this framework, the manager of a co-design project has to be open to social interactions which can result in unforeseen changes in the technology. He/she has to pay attention to the challenges posed to changes in the ways to act individually or collectively in local situations. Therefore, collaboration between agronomists and social scientists is useful.

2. A shared perspective but distributed roles among agronomists and social scientists

The collective work we undertook enables us to better qualify the collaboration which took place among agronomists and social scientists in some of the co-design projects.

a- Both share the vision that the design process should enable a co-evolution of the technology and of the users' situations, e.g. their work circles, their social interactions, the diversity of knowledge among users, their work situations and their needs. They share their way to interact with the users as well as their vision of users' work and environment.

b- They contribute differently to each step of the framework of the co-design process. During the first step, agronomists have a key role in building a prototype. Nevertheless, as the prototype is merely seen as a means to support the exploration of controversies and diversity among the participants in the second step, such prototype needs to be thought in relation to the users' situations. Therefore, an agronomic diagnosis, mainly addressing technical characteristics, is not sufficient. Social scientists contribute to the diagnosis by highlighting the users' situations as defined above. During the second step, the social scientists have a key role in supporting dialogue among the participants, in order to point out the controversies and the diversity of the viewpoints, while the agronomists have mostly to identify with users how to balance between changes in the prototype, or changes in the way users will act in the future. The agronomists have to develop new versions of the prototype and to acquire knowledge to be included in. The social scientists concentrated more on the way to carry on tests of the prototype with the users. Both have to collect data while the prototype is put into use or when discussions take place with users on their experiencing the prototype and its use. As well, both have a role in exploring, with users, how to achieve successive loops for experiencing the prototype in users' situations, and in highlighting how such successive loops make sense for all the participants. During the last step, both the agronomists and the social scientists need to join their efforts to facilitate the assessment, by all the participants, of what has been stabilized regarding both the technology and the ways it could be embedded in user's situations.

Conclusion

We argue that the monitoring of a co-design process needs not only the participation of potential users, but also collaboration between agronomists and social scientists. Managing such a process implies to support the co-evolution of the technology under design and of the potential users' situations. Indeed, any technology has a social dimension. Our framework helps to identify key elements which can support the collaboration among agronomists, social scientists and users to carry on a co-design process around successive versions of a prototype.

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