The role of semi-formal enterprise models to support flexibility management in farm enterprise

Vincent Abt, Marie-Angélina Magne

CEMAGREF, Unité de recherche "Technologies et Systèmes d'Information pour les Agro-systèmes", Aubière, France - vincent.abt@cemagref.fr

Abstract: *In today's highly competitive global economy, the farm enterprises are confronted, as any manufacturing enterprises, with permanent changes in their environment. Responsiveness and flexibility are required to support farm enterprise performance and adaptation to their new contexts of production. Enterprise Modeling is a powerful tool supporting the design process of adaptive enterprise system in the manufacturing sector. It allows semi-formal models to be defined to provide a common understanding and communication on various enterprise aspects. This paper explores the use of such enterprise models to characterise and manage flexibility in farm enterprise through the example of the relationships between a farm enterprise and its business environment.*

Keywords: *semi-formal model, farm enterprise, flexibility management, enterprise modeling, knowledge explicitation.*

Flexibility management and Enterprise Modeling

The new requirements of the society (e.g. traceability, multi-functionality, risk management, etc), the technical innovations, the economic and environmental regulations and the Common Agricultural Policy reforms are typical factors that induce important changes in the European agricultural sector. Farm enterprises are particularly affected in terms of production, management and organization. In today's highly competitive global economy, they are confronted, as any manufacturing enterprises, with "permanent changes in their internal and external environment" (Kalpic et al., 2002). They must stay in business and so meet customers' requirements and be innovative in order to produce quality products and services at low cost in a reactive environment (Abt et al., 2007). Responsiveness and flexibility are required to support farm enterprise performance and adaptation to their environment.

Different types of flexibility can be identified in an enterprise such as organizational, operational, product and manufacturing ones (Vernadat, 1996). In order to manage these different types of flexibilities within an enterprise, enterprise engineering techniques, such as Enterprise Modeling (EM), are powerful tools supporting the design process of adaptive enterprise system. In the manufacturing sector, EM consists in making models of the structure and behaviour of an enterprise. EM provides a better understanding and a uniform representation of the enterprise complexity through the use of semi-formal models providing a common understanding and communication among people. Those models are expressed in terms of a graphical language based on defined syntax and semantic, facilitating reusability and knowledge explicitation.

Such models and languages are very rare in the agricultural sector. Indeed, farm models are either too informal (ie schematic) or too formal (ie computational) to provide communication, knowledge explicitation and design (Abt et al., 2006). Our present researches aim at adapting these EM languages from the manufacturing sector to the agricultural sector, and particularly at defining specific modeling languages adapted to farm enterprises (Abt et al., 2005). We propose in this poster to investigate the use of a semi-formal language to represent the relationships between a farm enterprise and its business environment. Through the example of a mixed-crop livestock farm, we propose to discuss the contribution of such a modeling language to enterprise flexibility management.

Example of a semi-formal model in farm enterprise

The semi-formal model presented in this poster is based on three main concepts: *business process*, *contract* and *client* (Fig. 1). A *business process* represents the value chain providing goods or services to a *client* according to a possible *contract* established between two organizations: the farm enterprise

and the *client*. The *business process* is represented by a large arrow, linked to the list of *clients* by a small arrow annotated by the type of *contracts* established between the two organizations. Through the example of a french mixed-crop livestock farm, and the analysis of its recent evolution, it is possible to characterise the changes in its business processes and environment. Fig. 1 shows two models, based on the same modeling language, representing this evolution (from "as-is" to "to-be" model). Business processes have so been added or modified to face new market demands (organic ovine production, ovine breeder production, material and labour lending), to better enhance farm ressources (contract subscription, surplus crop production, rural area maintenance), or both (services offer for research and pedagogy).

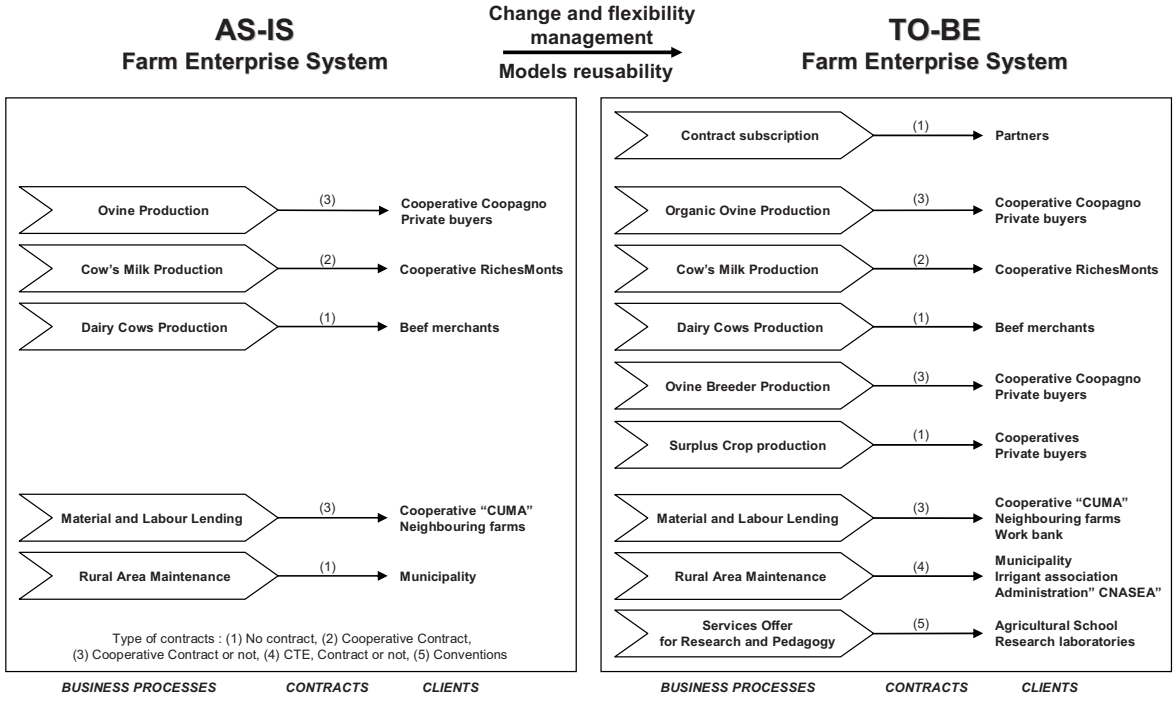

Figure 1. Enterprise Models to support flexibility management

Discussion and conclusion

The farm enterprise models reveal an interesting way of knowledge explicitation to characterise and manage changes in a farm enterprise. In case of changing environment, they allow enterprise system to be designed. For instance, models can be used by farmers or advisers to analyze and formalize the current enterprise system ("as-is" model). Thanks to established models, actors can point out which business processes or contracts will be directly or indirectly affected by an external environment change. Actors can then establish and design the future enterprise system ("to be" model, expressed in the same modeling language), to better respond to the new enterprise stakeholders requirements (Fig. 1). Reusability and communicability of the proposed languages allows modellers to propose "as-is" and "to-be" farm enterprise models. This facilitates flexibility management and design. Thanks to a shared knowledgebase supported by these models, actors can discuss more easily on what is and would be the farm enterprise system. They can characterise the existing enterprise system ("as-is" models) but also the target enterprise system ("to-be" models). The combined analysis of "as-is" and "to-be" models allows actors to propose and think about actions farmers should implement to face the external change. This study underlines the role of semi-formal enterprise models to explicit knowledge in a farm enterprise. Through the knowledgebase supported by graphical formalisms, adaptive design of farming system is facilitated. The example used in this poster proposes a way to characterise and manage organizational flexibility. Other types of models and languages could be further proposed to support operational, product and manufacturing flexibility management.

References

Abt, V., Pierreval, H., Nakhla, M., 2007. Evolution du contexte et nouvelles perspectives pour l'exploitation agricole en génie industriel, *in 7e Congrès international de génie industriel*, Trois-Rivières, Canada, 12 p.

Abt, V., Pierreval, H., Lardon, S., Steffe, J., 2006. Modéliser le fonctionnement et l'organisation des exploitations agricoles : quelles méthodes pour le secteur agricole?, *in 6e Conférence Francophone de MOdélisation et SIMulation MOSIM'06*, Rabat, Maroc, 805-814.

Abt, V., Vigier, F., Pierreval, H., Bigeon, J.-B., Durand, C., 2005. Using enterprise modelling methodologies for modelling agricultural activities and identifying information requirements. A case study of a livestock farm, *in EFITA/WCCA 2005 Joint Conference*, Vila Real, Portugal, 33-38.

Kalpic, B., Bernus, P., 2002. Business process modelling in industry--the powerful tool in enterprise management. *Computers in Industry*, 47, 3, 299-318.

Vernadat, F., 1996. *Enterprise modeling and integration. Principles and applications*. Chapman & Hall, London.