

## Changing roles of animals in structured design

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Production efficiency has been the master narrative of Dutch livestock industry for the past several decades. However, this exclusive emphasis has been the prime cause of a range of undesired side effects, for instance on animal welfare and ecology. Resistance from society as well as the animal itself instigated a shift in the role of the animal towards one of a stakeholder, rather than being a sole means of production. In order to improve sustainability in current practices, a more holistic systems approach is needed that is able to take into account the roles and interests of a broader set of stakeholders, including the animal.

Incorporating the roles and needs of a heterogeneous group of stakeholders in the design of integral sustainable animal production systems is a complex task. In order to do this, without depending on blissful art or strokes of genius, a systematic approach is needed. Structured design has become one of the central components in a broader approach called Reflexive Interactive Design (RIO) aimed at system innovation (Bos et al. 2009) in animal husbandry. In a number of design projects animal welfare was addressed within a broader set of sustainability goals, by a focus on fulfilling the *needs* of the animal. In this way, the animal was equally regarded as a stakeholder as other actors, like the farmer and the consumer. This has shown to be a fruitful way to systematically address important animal welfare requirements in sustainable system designs.

However, and this is the primary claim of this paper, this neglects at least two important other roles of animals in production systems, that are relevant to animal welfare *and* to the functioning of the system as a whole. Based on conceptual analysis, and informed and supported by appropriate case study material from a course in “Structured Design” at the Farm Technology Group of Wageningen University and several system innovation projects for sustainable development of animal production, we present a conceptual differentiation of at least five different functions and roles for the animal, that set them apart from mere components in a technical system:

- 1) As a producer. Animals produce animal products (eggs, milk, young animals);
- 2) As a product. Animals are animal food products in itself (meat);
- 3) As an user. Animal live 24/7 in the system and uses their technological environment;
- 4) As a stakeholder. The animal affects and is affected by the system and has an interest, a stake, in their environment;
- 5) As a contributor to specific functions. Animals can also contribute to system functions and goals.

We will present a preliminary analysis of the implications of integrating these roles and functions, conceptually and methodically, in a structured design approach to design livestock production systems. We will show how some of these roles can, while others cannot, be easily made compatible with a rational and quantitative engineering methodology like structured design.

Preliminary results show that structured design, originated in the mechanical engineering paradigm, inherited the technological perspective. This poses conflicts when applying the methodology on biological systems that are considered beyond mere production means. Foremost of the increased complexity and the sheer number of design criteria towards the system to be designed. On the other hand taking into account that the animal can contribute to system functions as well enlarges the space in which to find solutions.

The results are relevant for design projects in animal husbandry, but also contribute to a richer understanding and putting into practice of animal welfare in general.

Bos, A.P. (Bram), Peter W.G. Groot Koerkamp, Jules M.J. Gosselink, and Sjoerd J. Bokma. 2009. Reflexive Interactive Design and its application in a project on sustainable dairy husbandry systems. *Outlook on Agriculture* 38 (2):137-145.