Beyond the Interface: Co-evolution Inside Interactive Systems — A Proposal Founded on Activity Theory

Grégory Bourguin, Alain Derycke & Jean-Claude Tarby

Laboratoire TRIGONE, Institut CUEEP, USTL, 59655 Villeneuve d’Ascq, France
Tel: +33 3 20 43 32 70
Email: {gregory.bourguin, alain.derycke, jean-claude.tarby}@univ-lille1.fr

Task oriented and object oriented traditional interactive system design methods show more and more shortcomings in the light of recent evolutions. These evolutions are both external (organisational) and internal (technological) to the developed systems. The two main problems of traditional methods are their linearity and rigidity. Once a system has been introduced, it can only evolve through maintenance. These methods follow several steps segmenting time, actors, and work to be realised. Taking results from the human sciences, and particularly from Activity Theory, we show how we have defined the co-evolution concept as a solution for the above-mentioned problems. We also present the DARE system that we have developed for supporting this concept.

Keywords: co-evolution, evolving system, reflective system, design method, activity theory, task, exception.

1 Introduction

For many years, we have been involved in the design of interfaces for interactive and complex systems (IS) supporting collaborative and distributed human activities through the Internet. One of our main application domains is the E-Learning, i.e. implementation of interactive systems supporting distant and flexible learning activities. These activities may be individual as well as collaborative (Derycke &
We have particularly focused our research activities on the design of users environments offering real support for cooperative learning (Derycke & Kaye, 1993; Viéville & Derycke, 1998).

Since our first implementations, we have recognised that our technological platforms should offer functional malleability, i.e. create generic platforms supporting adaptation to specific needs, and organisational malleability supporting adaptation to the organisational contexts encountered. Our design approach was to try to provide solutions to deliver this malleability (Derycke, 1998). However, this flexibility was only provided to the designers, and only during the creation phase of a particular instance of our platform corresponding to a well-identified and well-defined need. We have encountered important problems during our experiments. These problems were particularly significant during real use: the users (tutors, administrators and learners) were faced with usability problems, as well as problems closely linked to the rigidity of their systems. They wanted the ability to adapt the existing running systems in order to respond to changes happening in the definition of their activity and/or in its organisational context. This brought us to deeply re-examine the way we design interactive systems by finding new theoretical foundations for creating a new approach. We have found that this work challenges the assumptions underlying traditional HCI design approaches. Our proposition has been implemented in a technological infrastructure called the DARE project that we briefly describe in this paper. We focus here on the fundamental aspects of our work and on the analysis of our approach regarding the general evolution of HCI science.

1.1 Criticisms of Traditional HCI Design Approaches

Recent technological developments such as the Internet in computer and network sciences are posing new problems and issues to the HCI community. However, we can focus on two different types of factors that we consider essential.

1.1.1 Factors External to the HCI Design

The first factors are the rapid evolution of interaction technologies and the new uses they are being put to, integrated as they are into everyday life and not limited to professional activities. The potential of these new technologies seems to be unlimited. However, this potential is still hidden behind the usability and the socio-cognitive appropriation problems that face the users.

We can add under the heading of new generic needs a strong demand coming from human organisations that their information systems require more flexibility and reactivity to remain in equilibrium with a rapidly evolving environment. These transformations of management, which can also be applied to the learning organisation concept (Senge, 1990), can be understood from a system viewpoint as the ability to support changes.

1.1.2 Factors Internal to the HCI Design Process

From our point of view, it seems clear that traditional methods for designing and developing interactive systems are not adequate any more. We would particularly like to show that most of the past approaches are founded on separation principles:

- Separation appears in the temporal divisions applied to the interactive system lifecycle; however, they enable iterations and concurrent engineering.