Towards efficacious groupware development: 
an Empirical Modelling approach

by

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Declaration

This thesis is presented in accordance with the regulations for the degree of Doctor of Philosophy. It has been composed by myself and has not been submitted in any previous application for any degree. The work in this thesis has been undertaken by myself except where otherwise stated.

The discussion of the process of co-evolution of the developer's understanding and the artifact in section 3.1 draws on the ideas presented in a paper (Beynon et al., 2008) published in the “The 20th Annual Psychology of Programming Interest Group Conference (PPIG 2008)”. The discussion of the role-shifting phenomena discussed in section 3.3 draws on a presentation (Chan, 2006) in the “Warwick Postgraduate Colloquium in Computer Science (WPCCS ’06)”, and a workshop paper (Beynon and Chan, 2006) presented in the Distributed Participatory Design (DPD) workshop that was held in conjunction with NordiCHI 2006. The preliminary results from the case study on the cricket project in section 6.4 were presented in the “Warwick Postgraduate Colloquium in Computer Science (WPCCS ’08)” (Chan, 2008). Part of the data used in the case study on the distributed jugs construction in section 6.2 was jointly collected by Antony Harfield and myself. The role-shifting phenomenon observed in section 6.2 and section 6.3 was briefly presented in the DPD 2006 workshop and in WPCCS ’06. The discussion of the case study on the cricket project draws on the technical research report CS-RR-444 (Beynon and Chan, 2009).

The ideas behind practising an EM approach to collaborative modelling presented in this thesis were also inspired by the reworking of the Clayton Tunnel railway accident model, the related presentation in the “Warwick Postgraduate Colloquium in Computer Science (WPCCS ’05)” (Chan, 2005) and the poster presented in the EU TEL Kaleidoscope Network of Excellence Showcase 2005 in Oberhausen, Germany (Harfield et al., 2005).
Abstract

Groupware development can be conceived as one particular branch of software systems development. Research into groupware development faces both methodological challenges as in classical software development, and socio-technical issues as identified in the CSCW literature. On the one hand, the paradigm needs to accommodate the changing context for use, facilitate the effective communication between developers and users, and maintain the conceptual integrity of the system. On the other hand, it has to deal with the dynamic nature of groups and the emerging work practices during the development process. As Grudin (1988) pointed out, the social and organisational aspects within the groupware development (and use) often lead groupware to fail. Individual differences make it unlikely that two groups are in reality identical. Consequently, groupware development should be seen and treated as an organic process, in which the groupware is grown by the owners with the aid of professional developers rather than constructed by professional developers alone. In this thesis, I propose a new conception of efficacious groupware development which draws on the ancient Chinese philosophical notion of shi (as interpreted by Jullien (1995)).

In this thesis, I argue that Empirical Modelling (EM) potentially offers a conceptual framework well-suited for efficacious groupware development. In the process, I propose a new conceptual framework for practising an EM approach in a groupware development context. EM is a body of principles and tools which embraces an experimental, interactive, and open approach towards systems development through the exploration of observation, dependency and agency. The proposed conceptual framework, known as GroupPIE, is based on the principles of EM. This is built upon previous research into EM, particularly Sun's Distributed Empirical Modelling (DEM). In contrast to DEM, this thesis focuses on the micro-level of collaborative modelling. In particular, it considers how EM might facilitate the collaboration amongst the modellers and interaction between the modellers and the evolving artifact which takes place in groupware development.

The thesis draws on various case studies from undergraduate projects and research projects which have practised an EM approach to collaborative modelling. The case studies suggest that the participants’ knowledge of the situation co-evolves with the artifact under construction and that there is role-shifting behaviour through the collaborative modelling. Drawing on the case studies, this thesis argues that an EM approach to collaborative modelling potentially facilitates genuine participation. This challenges the accepted ideas about the role of participants (or actors) and the relationship between them in the groupware development process. It also suggests that EM potentially facilitates a notion of participatory development which is “more” human-centred. On this basis, I argue that EM is potentially better-suited for realizing the vision of efficacious groupware development.
Abbreviations

ADM Abstract Data Machine (in the EM context)
AT Activity Theory
CM Collaborative modelling (cf. chapter 5)
CSCL Computer Supported Collaborative Learning
CSCW Computer Supported Cooperative Work
DCog Distributed Cognition
DEM Distributed Empirical Modelling
DPD Distributed Participatory Design
EGD Efficacious Groupware Development (cf. chapter 7)
EM Empirical Modelling (cf. chapter 4)
FOSS Free and Open Source Software
GD Groupware development
HCD Human-centred design
HCI Human-Computer Interaction
IS Information System
IT Information technology
ICT Interaction and Communication Technologies
LSD LSD Notation (in the EM context)
ODA Observables, dependencies, agents, and agencies (in the EM context)
PD Participatory Design
UCD User-centred design