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Focus Issue on Legacy Information Systems and Business Process Change: Introduction

Christopher P. Holland
Manchester Business School, University of Manchester, c.holland@fs2.mbs.ac.uk

Ben Light
Manchester Business School, University of Manchester, b.light@fs2.mbs.ac.uk

Peter Kawalek
Warwick Business School, University of Warwick, pk@warwick.ac.uk

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Manchester Business School, University of Manchester
c.holland@fs2.mbs.ac.uk

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ABSTRACT

This editorial is an introduction to a focus issue on legacy information systems research that has been conducted under the aegis of the UK Engineering and Physical Sciences Research Council (EPSRC) research programme into systems engineering and business process change. An overview of the legacy information systems problem is presented in terms of its scale, definition, and relevance to practicing managers and academics. It is shown that legacy systems represent a critical area of study in both software engineering and strategic information systems. The legacy system issues include the software methods and costs of maintaining and evolving existing systems, the technical problems of migrating complex legacy systems to new technology, and the difficulties of designing and implementing novel business processes in the context of existing structures, strategies and systems. In addition to the problems associated with legacy systems, the strategic opportunities of exploiting legacy systems are also outlined. Six related papers, which together cover the identification of the problem, planning and modelling of change, and the implementation of new systems and business processes, are described.

KEYWORDS: legacy information systems, business process change

I. INTRODUCTION

This focus issue is concerned with the impact of legacy information systems on the management and technical strategies associated with implementing new information technology systems and business models. It draws heavily on initial results from the UK Engineering and Physical Sciences Research Council (EPSRC) funded programme targeted at systems engineering for business process change. More than two million pounds from Government and industry have been invested to fund a wide range of software engineering and business-focused research projects.

Legacy systems as a subject area is often overlooked in favour of apparently more exciting forward looking areas such as new technology developments and strategic planning of information technology. One method of demonstrating the importance of the subject area is to examine the estimates of what is spent maintaining legacy systems. To define what is meant by maintenance, Pressman's framework (1997) is adopted. Pressman categorizes software engineering into three generic phases that apply to all software projects regardless of their purpose, size and complexity. The three phases are definition, development and maintenance. The maintenance phase is concerned with change in the context of existing software, which we term legacy systems. The maintenance phase is sub-divided into four types: correction; adaptation; enhancement; and prevention. Correction is fixing defects in the original software. Adaptation is modifying the software to accommodate changes in the external environment such as technical developments and changes to the business rules of the organisation. Enhancement, or perfective maintenance, is an extension of the original functional requirements of the software. Preventive maintenance is change to the original software that makes it easier to correct, adapt and enhance.

Although these types of maintenance appear to offer a clear structure, in practice most companies would find it difficult to differentiate between adaptation and enhancement. For example, a large number of adaptive changes over a long

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period of time may constitute a high degree of additional functionality beyond the original specification. Should these changes be classified as adaptation or enhancement? Our own research into legacy systems and that of Slee and Slevin (1997) who are practicing consultants, indicates that managers distinguish between two broad categories of information systems development: legacy maintenance and new, innovative developments. Legacy maintenance includes corrective maintenance, small incremental adaptive changes and preventive maintenance. New, innovative developments include the large-scale enhancement of existing systems, the development of new software and the implementation of standard package solutions. Using this broad category, DePalma and Woodring (1993) estimate that over 40% of IT costs to firms are spent on maintaining legacy systems, i.e. correcting mistakes, minor adaptive changes and preventive maintenance. An even higher estimate is given by Slee and Slevin (1997) who estimate that 80% of information systems budgets are spent on routine maintenance activities such as corrections, minor enhancements, and preventing catastrophe. They argue that over time, investment in legacy systems maintenance returns fewer benefits and absorbs resources that would otherwise have been spent on new developments. Therefore, this topic is one of the most significant problem areas in software engineering and business information systems. This investment in the routine maintenance of systems typically maintains current operations and does not include novel developments. The consequences of legacy systems failing can also be dire. The year 2000 problem, whilst often being overstated, is a powerful example of the potential for legacy information systems failure to affect all types of application areas and industries (De Jager and Bergeon 1999, Computerworld 1999).

The seminal literature on the influence of information technology on organisations clearly identified the relationships between changes in information technology and concomitant changes to business processes, structures, strategies and the roles of individuals (Mumford 1983, Whisler 1987, Scott Morton 1991). However, the information technology strategy literature is

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concerned primarily with future states and pays scant regard to historical evolution and existing legacy systems. For example the topics IT planning, alignment of information technology with business strategy, and methodologies for systems design typically do not take into account the important influence of organisational and technical antecedents. Important exceptions here are Keen (1991) and Broadbent and Weill (1998). Keen (1991) identified the tensions between multiple, incompatible systems that were designed to support specific functions or geographic locations of a business, with the need for integration both within and between organisations. Similarly he identified the importance of being able to connect and communicate across different platforms to support changes in business strategy such as moving from a product focus to a relationship one in retail financial services. More recently, Broadbent and Weill (1998) demonstrated that legacy systems are not always a burden, and can instead be a valuable asset that can be exploited for competitive advantage. The obvious example here is the airline industry where systems that evolved over a long period of time are still delivering superior performance.

Although improvements in technical standards reduced some of the technical integration problems during the 1990s, the legacy constraints of information systems are broader and more complex than just the technical issues of multiple hardware platforms, software versions, and legacy code. For example it is clear that many retail financial institutions in Europe and the US have layers of different hardware technologies and software systems dating back to the 1960s. Bound up with the technical infrastructure is the design of products, business processes, and distribution channels to market. In addition to managing the information technology infrastructure, and its continuous evolution is the parallel problem of managing the transition from existing organisational forms and distribution channels to novel structures and marketing strategies. In this focus issue, these types of problems are analysed in detail across a range of different industries and from multiple perspectives. A common characteristic of all the papers is their inclusion of topical, empirical data.

The six papers (Articles 3 through 8 in Volume 2 of CAIS) can be grouped into three broad areas: (1) identifying the nature of the legacy problem and its key components (Randall et al, Kelly et al); (2) planning and modelling the change process (Kavakli and Loucopolous, Giaglis) ; (3) implementation of technical and organisational change (Coakes and Elliman, O'Callaghan). This collection of papers is a valuable resource in identifying and exploring the problem of legacy information systems, and identifies an agenda for research in this important and often overlooked area.

II. IDENTIFYING THE NATURE OF THE LEGACY PROBLEM AND ITS KEY COMPONENTS

In the lead article (Volume 2, Article 8), Randall, Hughes, O'Brien, Rodden and Rouncefield, explore the issue of 'legacy' through the use of a long-term empirical investigation into how information technology is employed in a major UK bank. The closeness of their investigation into the day-to-day operations of the bank from the perspectives of individual users (using ethnographic techniques) identifies the embedded nature of the technology and the impact of cultural, organisational, and individual employees' legacy on organisational and technical change. It is a fascinating account of the practical difficulties involved in managing large-scale change of this type which are often overlooked or ignored by many commentators on business process reengineering. Kelly, Gibson, Holland and Light (Volume 2, Article 7) adopt a strategic perspective to investigate the nature of legacy systems across 15 different organisations. Similar to the article by Randall et al., they clearly demonstrate that in addition to the technical complexities of legacy information systems there is also a business dimension which is critical in understanding how to plan and implement new business models and systems. They show that radical change to legacy information systems is required because of instability in the business

environment which forces the rate of change to the strategic vision of companies to change much more quickly than in the past. It is the inability of legacy information systems to adapt and support the new strategic vision which forces technical change, rather than the technical problems associated with ageing and complex information systems per se.

III. PLANNING AND MODELLING THE CHANGE PROCESS

In a detailed modelling paper, Kavakli and Loucopolous (Volume 2, Article 6) describe the application of a novel modelling language that integrates the concepts of enterprise knowledge modelling and process guidance. This paper is based on a large project into the problems of modelling knowledge to support organisational change, and is an attempt at using software technology to support this complex process. The ideas are supported by references to electronic learning resources that can be accessed from the body of the paper. From a management perspective, Giaglis (Volume 2, Article 5) presents a critical analysis of the business process reengineering literature by analysing its core reference disciplines: process-based organisational design, IS development, and IS evaluation. He raises a series of research propositions that are supported by case study research of a pharmaceuticals company.

IV. IMPLEMENTATION OF TECHNICAL AND ORGANISATIONAL CHANGE

Coakes and Elliman (Volume 2, Article 4) present a study of implementation using stakeholder analysis. This is a topical area. It addresses the difficult problem of what is an appropriate membership structure for information systems steering groups and how this group is related to the organisation change process. They demonstrate that in addition to the difficulty of defining the boundary of an IS project, the appropriate membership of a steering group needs to be dynamic and change in accordance with the evolution of the

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project. The final paper is by O'Callaghan (Volume 2, Article 3). It contrasts sharply with Coakes and Elliman by focusing on the nature of large-scale technical change, albeit in an organisational context, using a pattern language to capture software architecture information from legacy systems. The paper demonstrates an approach for migrating from large-scale legacy systems to a component-based architecture. It uses an empirical example to demonstrate how the concepts work in practice. Component-based systems received widespread attention recently as a software architecture that is both technically sound and managerially useful.

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REFERENCES

Computerworld (1999),http://www.computerworld.com/res/year_2000.html, June 30th.De

Jager, P. and R. Bergeon (1999), *Countdown Y2K: Business Survival Planning for the Year 2000,* New York: John Wiley & Sons, Inc.

Keen P.G.W. (1991)*, Shaping the Future, Business Design Through Information Technology*, Boston, MA: Harvard Business School Press, pp. 179-209.

Mumford E. (1983), *Designing Human Systems for New Technology: The ETHICS Method*, Cheshire, UK: Wright's (Sandbach) Limited

Donald A. De Palma and Stuart D.Woodring (1993), "Breaking Legacy Gridlock," *Software Strategies*, Forrester Research Inc., (4)9 pp. 1-16, December 1.Pressman R. S. (1998), *Software Engineering, A Practitioner's Approach, 4th Edition*, New York: McGraw-Hill, p. 25.

Scott Morton M.S. (Ed.) (1991), *The Corporation of the 1990s, Information Technology and Organizational Transformation*, New York: Oxford University Press.

Slee C. and M. Slovin (1997), "Legacy Asset Management", *Information Systems Management*, (14)1, pp. 12-21.

Whisler T.L. (1987), *Information Technology and Organizational Change,* Chicago, IL: University of Chicago Press

ABOUT THE AUTHORS

Chris Holland is Professor in Information Management at the Manchester Business School. He conducted research and consultancy projects with a wide range of companies in the US and Europe in the areas of strategy, implementation and global information systems. He was awarded a B.Sc. in computer systems engineering from the University of Warwick and received his Ph.D. in business administration from the University of Manchester.

Ben Light is Research Fellow at Manchester Business School, UK. His research interest is information systems strategy, particularly legacy systems, Enterprise Resource Planning systems, and Business Process Reengineering. He is currently working on an EPSRC project that is investigating the strategies organisations employ to overcome legacy problems. His publications include

papers in refereed journals and at several major international information systems conferences. Prior to embarking upon an Academic career, Ben was employed in Human Resource Management. He also undertook consultancy and research within a wide range of national and international firms in the areas of information system strategy and implementation.

Peter Kawalek is a member of the Information Systems Research Unit at Warwick Business School. His experience includes of a large number of modelling and process improvement projects for industry (e.g. software development, sales team support, telecommunications, insurance). Dr. Kawalek's work contributed to the formulation of the process approach to IS development described in the book "Business Information Systems: A Process Approach" (with B.C. Warboys, I. Robertson, and R.M. Greenwood). He is also co-editor (with David Bustard and Mark Norris) of the forthcoming book "Systems Modelling for Business Process Improvement".