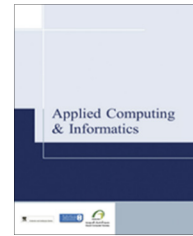




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ORIGINAL ARTICLE

Managing legacy system costs: A case study of a meta-assessment model to identify solutions in a large financial services company

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Abstract Financial services organisations spend a significant amount of their IT budgets maintaining legacy systems. This paper identifies the characteristics of legacy systems and explores why such systems are so costly to maintain and support. Three models for the assessment and management of legacy system costs are then examined and a new meta-model that addresses differences between the existing models is proposed. The new meta-model is then applied to a large UK financial services company - FinCo. Input data for the new meta-model are provided by the company's senior business and IT executives and the results compared with the firm's actual legacy system management plans. The paper concludes by identifying improvements the company should make to these current legacy system management plans and its longer-term strategy for managing legacy systems.

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1. Introduction

The financial services industry is one of the biggest spenders on IT but the majority of this spend is on maintenance activities required to keep legacy systems operational [1]. By some

estimates, seventy-five per cent of the IT budgets of banks and insurance companies are consumed maintaining existing systems [2,3]. Consequently, identifying and implementing appropriate solutions to contain the maintenance cost of legacy systems is a significant requirement for many organisations.

Over fifteen years ago Bennet et al. [4] observed that research into legacy system assessment approached the subject as a technical issue rather than as a broader business problem. More recently Alkazemi et al. [5] recognise this technical "bias", noting the need for tools for senior management to be able to make informed decisions about legacy systems, while Plant [6] identifies the difficulty of engaging senior management in such decisions.

Extant literature proposes a number of models for use in assessing legacy systems and recommending approaches for

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41 how these systems should be managed to minimise their
42 maintenance costs [5,7,8]. However, while the earlier published
43 models include a wide range of assessment criteria they do not
44 include more contemporary architectural considerations such
45 as extensibility and interoperability. Conversely, a recent
46 model by Alkazemi et al. [5] lacks recognition of detail such
47 as lines of code and control flow as proposed by De Lucia
48 et al. [7]. In an attempt to address these anomalies and unify
49 the positive features of the varying approaches, this paper pro-
50 poses a new meta-model derived from a range of existing mod-
51 els. The utility of the meta-model is then assessed through its
52 application to FinCo - a large UK financial services company.
53 By using a case study we seek to answer the following research
54 questions: is the meta-model effective for analysing the com-
55 pany's core IT system, Customer Service System (CSS), to
56 assess whether it is a legacy system? And, if so, does the
57 meta-model identify appropriate solutions to contain its main-
58 tenance costs? Further details of our research methodology,
59 findings and conclusions are discussed below.

60 2. What is a legacy system?

61 In 2001, Brooke and Ramage [9] concluded that no standard
62 definition of a legacy system exists. Some of the current sugges-
63 tions include the following:

- 64 • old information systems that remain in operation within an
65 organisation [10, p. 314].
- 66 • any business critical software system that significantly
67 resists modification and their failure can have a significant
68 impact on the business [11, p. 36].
- 69 • a legacy application or system may be based on outdated
70 technologies, but is critical to day-to-day operations [12].

71
72 Many of today's legacy systems were built in a time when
73 computer processing and storage capacity were far more
74 expensive than they are today [15]. Consequently, efficiency
75 frequently took precedence over a system being understood
76 or maintainable, with the inevitable consequences in terms of
77 degradation [13]. System degradation can also be caused by
78 poor documentation and version control amongst other fac-
79 tors, but as De Lucia et al. [7] observe, whatever the cause such
80 deterioration inevitably increases maintenance costs. This lar-
81 gely explains the high proportion of total IT expenditure
82 organisations commit to system maintenance. Furthermore,
83 Alkazemi et al. [5] contend legacy systems do not reflect con-
84 temporary architectural advances such as the emphasis on pro-
85 gram reuse and construction of component libraries. These
86 more recent approaches facilitate the constant evolution of sys-
87 tems and help prevent systems becoming legacy with their
88 resultant high maintenance costs.

89 The definition of a legacy system adopted in this paper is a
90 system that is business critical and demonstrates one or more
91 of the following additional characteristics: old age, obsolete
92 languages, poor if any documentation, inadequate data man-
93 agement, a degraded structure, limited support capability
94 and capacity, change to meet business needs, increasing main-
95 tenance costs, and lacking the necessary architecture to evolve
96 [14,10,9,17]. It is this definition of a legacy system that is
97 applied to FinCo to determine whether the company's system
98 can be identified as legacy.

3. Legacy system cost management solutions

99
100 A number of solutions to minimise the cost of maintaining
101 legacy systems have been proposed. For example, De Lucia
102 et al. [7, p. 642] refer to "ordinary maintenance, reverse engi-
103 neering, restructuring, reengineering, migration, wrapping,
104 replacement with commercial off-the-shelf software and dis-
105 carding". These authors acknowledge that there is confusion
106 in the use of some of these terms in the literature, noting
107 reengineering and migration as examples.

108 Bennet et al. [4] are more concise in proposing, "discard",
109 "wrap", "outsource", "freeze", "carry on" and "reverse engi-
110 neering" as potential solutions. As it is unlikely that out-
111 sourcing would negate the need to implement one of the
112 other solutions proposed, the suggestion that outsourcing
113 offers a solution for managing legacy systems must be ques-
114 tioned. The viability of carry on as a solution for an indefinite
115 period also seems questionable for a business critical system.
116 Additionally, it is highly likely that even a very stable old sys-
117 tem will need some form of remediation at some point. For
118 example, if the availability of people with the skills required
119 to support an obsolete language is in decline this will require
120 some form of corrective action.

121 Where there is consistency in the legacy system literature is
122 in recognising that a decision on the best option to manage
123 such systems should be based on a structured assessment
124 incorporating economic and quality factors. These decisions
125 must be taken and supported by a broad range of stakeholders
126 within the organisation and not limited to technical consid-
127 erations alone [14,18–20]. Additionally, research by Khadka
128 et al. [11] suggests that the characteristics of an organisation
129 operating and supporting the legacy system must be consid-
130 ered. It is essential that organisational factors such as resis-
131 tance to change and/or weakness in systems support be
132 reflected in any proposed system solution.

4. A new legacy system assessment model

133
134 Ransom et al. [8], De Lucia et al. [7] and Alkazemi et al. [5]
135 each propose models that assess a legacy system based on
136 defined business and technical attributes and then propose
137 solutions to manage the system. Each model emphasises
138 different attributes. De Lucia et al. provide more detail than
139 the others on business value and technical quality. However,
140 Ransom et al. offer important insights into gaps in organisa-
141 tional capability and culture that must be mitigated in an
142 implementation plan. Alkazemi et al., in turn, add a number
143 of contemporary architectural considerations. Each model
144 therefore incorporates valuable features but without being as
145 comprehensive as it could be. To address this issue our
146 approach is to propose a new meta-model derived from the
147 three existing models which combines business and technical
148 factors with contemporary architecture attributes and organi-
149 sational considerations to produce a more extensive, unified,
150 approach that recognises the real-world complexity of legacy
151 systems (Fig. 1).

152 The model output can then be plotted on a decisional
153 matrix [14] that indicates a recommended solution (Fig. 2).
154 In the case of FinCo the model's output was compared with
155 the company's actual legacy system management plans to iden-

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