Something for nothing: management rejection of open source software in Australia’s top firms

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Abstract

Organisations have traditionally relied on commercial software products to support their operations. However, rising software costs and recent corporate failures have brought the provision and value of commercial software into question. Recently, open source software, as a relatively new development in the IS field, has risen in popularity as a possible panacea for these ills. If firms value low acquisition cost, ostensibly plentiful support, and source code access, why have not more firms adopted open source software? The lack of published empirical research in the area means this issue has been inadequately addressed.

This paper examines why firms do not adopt open source software. This study surveyed 500 of Australia’s top firms to see why managers rejected open source software. The study found that managers rejected open source software because they could not see that it had any relevance to their operations, perceived a lack of reliable ongoing technical support of it and also appeared to see substantial learning costs or had adopted other software that they believed to be incompatible with open source software.

1. Introduction

Firms ostensibly perceive value in their hardware and software and are prepared to pay substantial acquisition and maintenance costs to gain efficiency and effectiveness benefits. The commercial software model has recently come under threat in the literature along two fronts. First, the acquisition and maintenance costs can be significant: the practitioner literature, in particular, has been quick to observe the effects of ongoing licensing and support costs [40,56,93]. Second, the literature has documented the apparent inability of adopters to quantify the benefits of IT acquisition [17,46]. If managers are unable to quantify benefits in the long term, they must be unable to justify the costs of any software.

Environmental circumstances may have exacerbated these problems. Bankruptcy and failure of apparently well-established firms has caused some
anxiety in the corporate community [20]. Additionally, corporate, IT and legislative governance concerns may have adversely affected both the acquisition and use of commercial software as firms struggle to align their behaviour. Both governmental and commercial organisations may be re-evaluating their software holdings in the light of ongoing corporate upheavals. Managers may, as a result, be turning their minds to new technology provision models. This could be a significant undertaking: if policy is “the operationa-

lised substance of strategy” [3], then a substantial shift in technology acquisition places significant demands on corporate strategy.

Recently, open source software has come to prominence as a possible alternative to some of these problems. Under the open source model, enthusiastic groups develop software applications which are, depending on the license, available free of charge for private or commercial use [19]. Also, because the open source model affects the licencing and ownership of the source code and not the underlying operating platform, it can be applied to most operating systems and software environments [13,69]. The open source model means application users are not beholden to commercial software providers for upgrades and support [11] and ostensibly do not require persistent reinvestment [84]. Additionally, end users and support groups may freely explore and modify the source code as necessary.

However, critics of open source development reason that ambiguous leadership of these projects undermines product quality [78]. Further, the provision of open source software and an apparent lack of regular ongoing support may hamper the reliability of these software products. Weak or complicated introductory support material [71] may aggravate these problems. Additionally, because the development is generally conducted outside the organisation, managerial or equity incentives, such as increased salaries, may be ineffective as incentives for value and benefits of the work [60].

The implication is that low dollar acquisition cost does not compel a firm to adopt a given technology and that management are not sure as to how to proceed with this new technology model.

There is demand for research on the issue of benefits in the practitioner areas also. Consultants may be faced with client firms wrestling with open source software. Despite the apparent low dollar cost of acquisition, clients may perceive substantial learning costs as well as other barriers. Foreknowledge of these will assist consultants in predicting firm behaviour and supporting management intention. Practitioners in open source software development will also value this information. If software development is largely the purview of enthusiasts, experts and consultants will be interested in observing how they can better marshal this enthusiasm for wider and its more effective use.

The effort is also of value to IS researchers. First, acquisition research is based on the fundamental premise that technology products are costly to acquire [65,96]. Additionally, innovations are costly when acquired incorrectly [38] or not acquired at all [81], even if the benefits are short-lived [5]. If IS research lives with this premise, it risks remaining closed to technology development models that take an unorthodox approach to “cost” and, hence, “value.” Also, there appears to be a paucity of published empirical research on “inhibitors” to technology acquisition [39] and open source software [54]. Finally, much of the published research originates from or relates to the North American theatre [12,90], and it would be dangerous to assume that management theory can be generalised across geographical borders and cultural regions [80].

Some rigorous analysis of management attitudes to this new paradigm would be of benefit. Given the dearth of extant research, this study aims to understand how managers in large firms approach open source software, the extent to which these firms use open source software in their operations, and which technology they use (if any). Hence, this paper poses the following questions:

1. What management barriers to open source are identified in the literature?
2. Do these management barriers apply to open source software?

2. Theoretical development

There is a lack of research into inhibitors to technology adoption. This is unfortunate, as knowledge of
the factors causing technology rejection should be as valuable as that on technology adoption. Further, one is not simply the inverse of the other [41]. While authors such as Damanpour [31] and Beatty and Gordon [9] have discussed barriers to the adoption of particular technology products, holistic analysis of technology rejection is missing.

Importantly, Debreceny et al. [32] has conducted useful summary work. Inhibitor determination methodology (IDM), developed out of work by Chwelos et al. [25] and Iacovou et al. [49], appears to be appropriate for conducting of research in this area (Fig. 1). Cook and Campbell [28] argued that, where possible, a structured approach to research should be used. This is especially important in situations where ex post facto research is experimental or novel.

Covering the entire IDM spectrum would prove to be too great an undertaking for a single document. Accordingly, this study covers phase 1A of the IDM by identifying the population of inhibitor factors by way of a literature review and questionnaire survey. The review of the literature was conducted to identify principal barriers to technology adoption. Searches initially covered key outlets such as MIS Quarterly, Information Systems Research, Information and Management, Journal of Management Information Systems and Communications of the ACM. It was felt that this would give an indication of factors in use and was similar to other studies such as [34,47,88]. Additional keyword searching, citation indexing and textual analysis were used to develop a list of inhibitors. The members were subsequently sorted into appropriate categories.

Table 1 shows the results of this search. We followed a broad classification method similar to that of Ngai and Wat [70] and Lai and Mahapatra [51]. We only note studies that specifically discussed the item as a barrier or inhibitor to adoption. This explains, for example, why legacy systems received little coverage (despite this topic’s popularity in the research literature).

The table shows a number of important points. First, in pure frequency terms, system cost, lack of skills, lack of resources and insufficient market acceptance are the most common inhibitors. Second, the table shows that they result at several levels. Managers should observe that they are not always within their sphere of control. Additionally, while each factor has been classified into environmental, firm, individual and system level effects, managers might offer any of these as a factor for system rejection. Predictably, managers are key ‘gatekeepers’ [48,74] in the adoption process, and their own attitudes clearly must affect the outcome [8]. To some extent, this can be attributed to a managers’ psychological intention [79] and degree of personal innovativeness [63]. Finally, system cost appeared to be a common factor in conventional non-adoption: Madden et al. [57] found this to be true for telecommunications carriers, Bouchard
and Lee observed this with EDI. However, this barrier may not apply to open source software, where the initial acquisition cost is negligible.

### 3. Research method

In order to answer the research questions, a mail survey of Australia’s top 500 publicly listed firms was conducted. The survey was developed using the IS and social science research literature, with particular concern given to structure and content (see [87]). The survey was printed on paper bearing the university crest and letterhead [64], and was pilot-tested on two local businesses [36]. Survey length was kept to three pages in order to minimise adverse effects of length on response rates [24]. Respondents were offered a copy of the final report [10].

Sample firms were selected from lists provided by the Australian Stock Exchange (ASX). Respondents were encouraged to give their opinions on both open source and commercial software models by way of open-ended questions. The Chief Technology Officer (CTO) or Chief Information Officer (CIO) was asked to answer the survey. Relevant sections of the survey instrument appear in Appendix.

### 4. Respondent demographics

The survey yielded 108 responses resulting in a response rate of 18%. Response bias analysis, on the advice of Grover et al. [44], suggested that little such bias existed, however, the lower than usual response rate may not support this contention. Table 2 shows the respondent group’s industry demographics.

Given industry trends over the past two decades, “computers and office services” and “banking and financial services” firms were predictably prominently featured in the respondent group. It was also interesting to note the prominence of gold speculation and production, in particular among primary producer respondent firms. These data generally suggested an even mix of service, retail and industrial firms.

The largest category of firm size for respondents in Table 3 was the 0–10 and 11–25 employees. The ranges appeared to drop significantly after the 100-employee mark. According to the Australian Bureau
of Statistics (ABS) comparisons, if number of employees is used as a gauge of organisational size, most respondents are medium to large firms. In this respect, the significant skew in organisational size is obvious: there are more smaller, younger firms than larger, older ones (Table 4).

Most businesses were less than 10 years old and, interestingly, a small group had only been in existence for less than 12 months. These firms were in the biotechnology and computer and office supply industries.

5. Respondent IT use

The survey first explored respondent choices of processing platforms: Apple Macintosh, Microsoft Windows, or Unix variants. Space was allocated on the survey for respondents to add their own operating system platform.

Table 5 shows the spread of operating systems used. A number of respondents listed “other” (for example, one respondent listed Windows NT 4.0 in this section). The results were therefore corrected to account for such misclassification. One respondent listed OS/2 as the main operating platform. Roughly a quarter (23%) of all respondents used Linux, and 40% used a Unix variant. Linux was by far the most common Unix platform.

Two respondents used all three Macintosh, Windows and Unix operating systems in their operations: both respondents were involved in media production.
Clearly, a number of respondents were using more than one operating system. This might be because they are migrating to a new platform, have recently acquired a subsidiary with a different platform, or are unable to meet all of their processing requirements with a single operating system [7].

6. Respondent open source software use

Almost half of all respondents (47%) had considered open source software. Predictably, only a quarter of respondents (26%) had actually adopted it. Twelve respondents signalled that they had not heard of open source software or open source development models and hence did not answer.

Table 6 shows the common applications. For each, the application’s purpose and an approximate closed source/commercial equivalent were also listed.

It shows the sheer variety of open source software in use. In particular, mainstream application requirements appear to be satisfied as easily as more specialized needs. Two respondents noted that ongoing developmental flexibility was a key factor in their adoption process. A closed source alternative could be found for each of these software tools: the more popular tools were especially well covered.

Open source operating systems included FreeBSD and RedHat Linux. One respondent in the gambling...
and gaming industry had developed proprietary version of Linux to use across all of their 1700 servers. Two respondents used two Unix versions at the same time: both were RedHat Linux and SCO Unix implementations. One respondent in the telecommunications industry made use of four different Unix versions (RedHat Linux, HPUX, Solaris and SCO Unix) in addition to Windows NT 4.0. Many respondents used Linux primarily as a firewall and a document and application server in a secondary capacity.

7. Management attitudes to open source software

The study also sought to examine why respondents that had considered Open Source software and subsequently rejected it. Fig. 2 sows the breakdown of reasons for open source rejection.

7.1. Relevance

Most respondents, who had analysed and rejected open source technology, had perceived little relevance of it to their business, and could not see any benefits to using it. One respondent wrote, “it’s just not right for us — our users need everything clear cut and obvious. We have a big budget so purchasing is no trouble.”

Four respondents noted that while they were currently not using open source software, they might be open to adopting it in the future. To this end, one 20-year-old firm noted, “there are no business drivers as yet [though we] may do as time and systems evolve.”

This suggests that some businesses may still be evaluating the technology.

One firm argued that they had not adopted because other nearby firms had rejected open source software. This suggests that, for at least some managers, peer information networks are significant. Without the more established marketing avenues of commercial software distributors, managers may have to rely more on word of mouth or other information sources. As such technology products become more common in the consumer marketplace, they take advantage of this [61].

7.2. Lack of support

The second largest segment cited a lack of conventional and ongoing support as a critical factor in their decision not to adopt and perceived a lack of reliable support avenues: “we think there’s a real lack of tangible support.” Managers appeared concerned that, if no equivalent to commercial support existed, they would risk having to support their software applications with their own resources. One respondent wrote, “We’re not interested because it’s not a commercial offering.” Tellingly, another wrote, “we really don’t know anything about them and don’t want to know. We want someone we can sue when things go to the wall.”

If this segment is added to those citing “Not a commercial application” and “already committed to Microsoft,” this suggests that managers are reluctant to adopt OSS because they rely on commercial software provision models. Anecdotal evidence supports this contention: “[We can] work with vendors to supply our kit. Open source technologies often are less robust and lack support services.”
7.3. Requirement

The next group had evaluated open source technology but had determined no business requirement for it: “at the moment it’s just not feasible — we have no requirement for it.” This finding was interesting on two fronts. First, it suggested that managers might be unwilling to explore extant software models while their existing holdings were deemed sufficient. Second, given the range of open source software, firms would rather stay with their closed source offerings. This would be consistent with some anecdotal evidence: “our requirements as determined by head office are minimal for this stuff.” The role of the ‘technology champion’ may prove important in the adoption of open source software here.

7.4. Resources

A number of respondents noted a lack of time (4%) and resources (8%) as the barriers to open source software: “it would take too much time to change everything over if we went that way” and “we don’t have time for that area right now.” It was interesting to note that some of the respondents who cited a lack of resources did so in terms of organisational size (as did Raymond [75] and Delone [33]): “we’re too small a company.” Managers appear more willing to devote organisational resources to their existing IT holdings. Despite much corporate upheaval, managers seemed prepared to stay with commercial providers. Given the rising software costs, managers may perceive some sunk cost in their software holdings, so switching provision model may simply be unattractive. Further, the extra time involved in converting systems appeared to offset the initial acquisition benefits: “open source software is only free if your time has no value.”

7.5. Committed to Microsoft

Interestingly, 8% noted that they were already committed to Microsoft and that this precluded them from making use of open source software. Respondent comments such as “we’re already committed . . .” and “we adopted Microsoft instead” appeared to typify this response. It seemed that, for some businesses, the two software models were incompatible and mutually exclusive. If this were the case, the number of Microsoft suggest that the barriers to open source adoption could be significant, as it would require the devotion of extra resources to reconciling technology products both within the firm and with other firms in the marketplace. Reduced dependence on commercial software providers could also undermine supplier/firm relations.

Consistent with Bagwell and Riordan [6] and Monroe [66], some managers may see high software costs as an indicator of quality, possibly because production inputs are perceived to be more expensive and hence do not require as much scrutiny [89]. One respondent wrote of open source software, “it’s free for a reason.” Similarly, whereas managers may perceive open source providers as disaggregated interest groups, organised firms such as Microsoft can leverage their reputation and popularity in other firms to spread knowledge of new products and upgrade paths [23,26]. One respondent raised the issue of application consistency: “Microsoft stuff all looks the same so the marginal cost of learning is low. We can’t be sure of that with other products.”

8. Discussion and conclusions

8.1. What are the management barriers to open source adoption in commercial environments?

The main reasons for rejecting open source software is that managers perceive no relevance in its offerings, are concerned about unreliable or transient support sources, lack available resources, or perceive no requirement for open source technology in their businesses. The smallest groups noted that they did not have time to implement it: they were already using commercial closed source software. This suggests that at least some respondents see the adoption of and migration towards open source software as a significant undertaking, with a long and steep learning curve. Also, as with technology such as the Internet [94], many respondents had evidently simply not considered open source software.

Anecdotally, there was a strong feeling that a lack of available application support was a critical barrier. Managers appear willing to forego application flexibility if it means added developmental and support
cost: the ample support communities cited by open source proponents appear to have little sway.

8.2. Do the management barriers apply to open source software?

The literature adoption barriers generally reflect those raised here. However, one finding not accurately reflected in the research framework is the effect of customer loyalty to Microsoft. It seems that prior studies have not encountered conditions where a single dominant software provider faces competition from a compatible, comparable and ostensibly cheaper product, yet adopters still prefer the incumbent provider.

The study is, however, subject to a number of limitations. First, there might be a degree of inter-relationship between the factors. For example, if a firm is already “committed to Microsoft,” then they may subsequently perceive a “lack of relevance” of open source software to their business operations. Second, this study examined organisations that are considered to be among Australia’s top ones: they may have greater experience, resources, or public attention. Third, the study’s findings are based on a reasonably small sample. The response rate of 18%, while generally in line with other studies (see [55, 86, 85]), may also mean that the factor list is incomplete. The findings, in this respect, require re-examination before they can be generalised upon.

The study raises a number of important implications for managers, practitioners and researchers. First, managers should be aware that open source software appears to be more difficult to adopt than the popular literature, as noted earlier, would seem to suggest. If managers are concerned that insufficient support avenues exist for open source software, they should explore the firms such as RedHat that now offer support for open source and Linux-based products (though there has been some upheaval in this support-provision market also). Additionally, legacy issues are also prominent: first, managers at this stage appear to prefer their current systems and, second, these existing systems do not seem hospitable to open source software. While some argue that managers occasionally overstate innovation barriers [35], this study does present evidence that existing or legacy systems, consistent with theory, pose significant barriers to adoption. The effect of Microsoft, in this instance, appears substantial.

Practitioners in the consulting and software support areas should understand that firms clearly value their technology support avenues. When recommending new software products or development models, practitioners should observe that ancillary support is also important. Additionally, consultants may observe that, because open source software may not always be developed under a standard application appearance or management model, software products may not have consistent functionality. Practitioners in the open source software development area should observe that, if commercial adoption of their software is important to them, they should pursue the provision of tangible ongoing support methods. Developers could also explore increased aggregation and organisation if they wish to appear more ordered and reduce the adverse effects of indeterminate innovation provision (consistent with Attewell [4]). Authors should also aim for consistency of appearance and function.

There are numerous implications for researchers. First, in contrast to other studies (such as [35]), outright acquisition cost is not deemed to be a significant barrier to adoption. Instead, consistent with Berger, firms perceive a hidden cost to open source software implementation. In terms of acquisition risk, this hidden cost raises the perceived probability and severity of an adverse outcome. This paper posits, then, it is not acquisition cost per se that deters adoption in conventional environments, but rather risk. This would be consistent with the arguments of authors such as Meyer and Goes, who observe that risk can constitute a significant barrier to adoption.

Appendix A. Survey instrument

This study is part of a larger research study into Australia’s largest firms. The dearth of published empirical work in this area made it difficult to base questions on those used in other studies, so this part of the survey used a similar structure to that used in Goode and Stevens [43]. The survey sections which focused on both open and closed source software use relevant to this study are included below.

Open-ended questions were used in preference to closed-ended questions and questions were deliberately phrased so as not to lead respondents. Axial post-coding was subsequently used to categorise responses.
10. How much would your business typically spend on computer software annually?

☐ Less than $1000  ☐ $10,001 - $20,000  ☐ $50,001 - $75,000
☐ $1,000 - $5,000  ☐ $20,001 - $30,000  ☐ $75,001 - $100,000
☐ $5,001 - $10,000  ☐ $30,001 - $50,000  ☐ $100,001 or more

11. Please indicate if your organisation currently uses or intends to adopt the following in the next 12 months (tick all that apply):

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12. Has your firm considered open source software (such as Linux, Apache or Samba)?
   ☐ Yes  ☐ No (go to question 14)

13. If Yes, which software have you adopted?

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14. If No, please give reasons, if any.

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