Perspectives on E-Business Software Project Risk

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Abstract

The assessment and management of risks associated with software projects is a perennial problem and has received considerable attention in the IS literature. A number of recent studies have found that e-business projects differ from more traditional development projects and these differences may have implications for software project risk. This paper reports the findings of a study that sought to identify these project and risk differences. The study involved a ‘roundtable’ of CIO’s and senior IS managers of leading financial institutions. The study identifies a number of key differences in e-business development projects, including: broader scope and reach of e-business applications, changes in the development outcomes to smaller and more modularised components and a marked increase in the diversity of stakeholders. Key software project risk changes identified include: risk associated with branding and reputation risk (these are now being addressed at the software project level), a marked increase in the risk associated with software integration and addressing stakeholder diversity (such as requirements risk). The study also identified a trend towards rationalization of e-business offerings. This trend and the changes in risk have considerable implications for the ways in which organizations assess and manage the risks associated with e-business software development.

Keywords
E-business, E-commerce, software risk, software project risk, systems development, business process disintermediation

Introduction

E-business and e-commerce have brought about changes in the way many organizations conduct business activity (Holsapple & Singh 2000, Laudon & Laudon 2002 p.106). The adoption of e-business is seen to magnify typical business risks such as loss of revenue, business interruption, fraud, and loss of reputation (Freeman 2000, O’Neill 2000).

As with all applications development, the development of e-business applications is a complex task (Standing 2002). A number of authors have suggested that the development of e-business applications is different to that of traditional applications (Earl and Khan 2000, Standing 2002). These differences can be grouped into four categories: development
outcomes; development processes, methods and techniques; stakeholders; and scope and requirements.

In terms of development outcomes, e-business applications are built with an expectation of a shorter lifespan and ‘time to market’ becomes a key outcome measure (Standing 2002). The development ethos has changed from ‘built to last’ to ‘launch and learn’, resulting in smaller systems that are considered ‘disposable’ (Earl & Khan 2001).

Changes in development processes, methods and techniques have also been observed; methods used to develop e-business applications tend to be less structured, more iterative and evolutionary. The notion of project completion has been considered inappropriate since the need to constantly modify and update systems (Standing 2002) and faster revision cycles have lead to a blurring of development and maintenance phases (Li, Chan & Chan 2000). Development process outcomes are small, highly modularised, components that are added, used, then redeveloped or discarded as required (Standing 2002).

With e-business projects the stakeholder groups, both internal and external, tend to be broader. Web-based systems are multi-functional, requiring user representatives from throughout the organization (Standing 2002). Stakeholders also represent greater diversity in terms of their computer skills, domain knowledge, culture and language (Hasselbring 2002).

Project scope and the nature of project requirements have also been noted as different in e-business projects. Accommodating the diversity of both internal and external user groups creates broader requirements (Hasselbring 2002). Requirements tend to be more volatile or harder to identify and evolving business models and competitive market forces create a situation in which the requirements are in almost constant flux (Earl & Khan 2001, Gordijn, Akkermans & van Vliet 2000).

However, whilst differences in e-business development processes have been identified the impact of these differences on software project risk is unclear. This paper presents preliminary research into changes in software project risk in e-business projects.

**Software Project Risk**

Recent studies of the risks associated with, and inherent in, the software development process confirm the findings of earlier studies that the high failure rate of software projects is related to the poor management of risk during the software development process (e.g. Keil, Cule, Lyytinen & Schmidt 1998).

Software project risk is defined as the product of uncertainty associated with project risk factors and the magnitude of potential loss due to project failure, where a risk factor is defined as a condition that can present a serious threat to the successful completion of a software development project (Boehm 1991, Schmidt, Lyytinen, Keil & Cule 2001).

This definition of software project risk is limited to the software development project. This distinguishes it from the broader concept of software risk, where organizational impacts and the business risks that arise from the use of the software application over time are considered.

The narrower construct of software development risk, as defined in the information systems literature (such as Barki, Rivard & Talbot 1993) and in the software engineering literature (such as Gluch 1994, Higuera & Haimes 1996), is incorporated within this definition of software project risk.
Software project risk factors are the ‘sources’ of risk to a software project. They are those factors that can have a detrimental impact upon one or more of the success criteria of a project, such that they cause the project to run over time, cost more than anticipated or result in the application not having the functionality or usefulness required. The level and combination of factors that apply to a specific project are seen to constitute that project’s risk profile.


<table>
<thead>
<tr>
<th>Rank</th>
<th>Risk Factor</th>
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<tbody>
<tr>
<td>1</td>
<td>Lack of top management commitment to the project</td>
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<tr>
<td>2</td>
<td>Failure to gain user commitment to the project</td>
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<td>3</td>
<td>Misunderstanding of requirements by the developers</td>
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<td>4</td>
<td>Lack of adequate user involvement in the project</td>
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<td>5</td>
<td>Failure to manage end user expectations in regard to the project’s outcomes</td>
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<td>6</td>
<td>Changing scope and / or the objectives of the project</td>
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<td>7</td>
<td>Lack of required knowledge / skills in the project personnel</td>
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<td>8</td>
<td>Lack of frozen requirements, such that the requirements continue to change throughout the development project</td>
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<td>9</td>
<td>Introduction of new technology</td>
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<td>10</td>
<td>Insufficient / inappropriate staffing</td>
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<td>11</td>
<td>Conflict between user departments</td>
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Table 1: Top 11 Software Project Risk Factors (Keil et al. 1998)

Keil et al. (1998) findings are generally consistent with other studies (such as Barki et al. 1993). Typically, these studies do not distinguish between the types of application under development, nor do they explore the relationships and dependencies between risk factors. This generic approach to understanding software project risk factors has resulted in few, if any, studies of the development of specific classes of systems, including e-business.

If, as set out in the introduction, e-business development projects differ from other types of development project, then it is possible that these differences carry different software project risks. Furthermore these differences are likely to have implications for the assessment and management of those risks.

Appropriate methods for assessing and managing software project risk have been found to improve the likelihood of project success, or at least help guard against its failure (Ropponen & Lyytinen 1997). Despite its importance, risk assessment and management in regard to software projects has been found to be something that is done minimally, if at all (Smith, McKeen & Staples 2001). Given the linkage between appropriate risk assessment and management methods and project success and failure, there is a need for further research to understand the potential changes in risk factors associated with e-business projects. The
remainder of this paper presents a preliminary study of e-business software project risk and outlines a longer-term research agenda in the area.

**E-business software project risk: a preliminary study**

An early report from a large government/industry funded research project to assess the impact of e-business on Australia’s wholesale financial markets identifies a number of key industry and research imperatives (Elliot & Briers 2001). The management of risks associated with e-business and e-business development projects were identified as areas of particular concern to industry. As discussed above, the current literature on software project risk has not focused specifically on e-business projects and there is currently little published research to assist in our understanding of the potential changes in risk factors associated with e-business projects. Research that seeks to understand the changes in risk factors associated with e-business projects would seem timely and important for practitioners and academics alike.

In order to explore the changes in e-business project development and their associated risks from an industry perspective, a preliminary research project was undertaken. This study forms part of the research project mentioned above, the industry sector of interest is the Australian Wholesale Financial Markets. The objectives of the study are to establish the differences, if any, between “traditional” software projects and e-business software projects, and to identify the perceived risks associated with e-business software projects.

The following research propositions were established in order to investigate these objectives:

- **Research Proposition 1 (RP1):** e-business related development projects are no different from any other software development projects
- **Research Proposition 2 (RP2):** e-business development projects carry the same risk profile as other software development projects.

**Research method**

To investigate the research objectives and propositions outlined above, a focus group approach was adopted. This approach allowed us to bring senior managers from key organizations in the Australian Wholesale Financial Markets (AWFM) together for a round table discussion. Organizations active in the AWFM and acknowledged as leaders in e-business development were selected as participants. Focus group participants, representing six different organizations, included 3 CIOs, 2 senior managers and a senior e-business consultant. In addition to the industry participants there were four academic researchers. One researcher facilitated the focus group proceedings, coordinating introductions and timing of the event; one researcher coordinated the questioning and two researchers took notes and handled the recording equipment.

A briefing paper outlining the agenda and background details of the research project was sent to all attendees a week prior to the focus group. The question schedule was developed by the research team and included a range of types of questions. Opening, introductory and transition questions were used to introduce and scope the focus group and to emphasise the fact that we are seeking to understand two main areas of industry participants’ experiences and perceptions; e-business software projects and e-business software project risk. Key questions and probe questions were developed to investigate the two main areas of focus and follow up questions were used to summarise. The questioning style was open-ended and
reflective, allowing the focus group participants to develop themes related to the two broad areas of questioning.

All participants agreed to the recording of the meeting on the proviso that no direct attribution of statements would be made and any documents identifying them (or their organization) would be cleared with them first. The clarity of the recording permitted easy discrimination between participants and the verbatim transcription of the dialogue (expressive sounds such as “ums and ahs” were omitted). The completed transcription was reviewed for spelling errors and checked word for word against the recording.

Most of the participants either knew, or knew of each other; this familiarity, and the competitive nature of the industry sector could have the effect of stifling discussion or limiting the range of perspectives, however this proved not to be the case. The range of perspectives evident throughout the meeting served to identify key research questions for the next phase of the project and will prove a useful starting point for research looking at these issues in other industry sectors.

A content analysis of the focus group transcript was undertaken. The analysis was performed manually and involved multiple passes through the transcript by two independent coders. Initial codes were derived by each coder, compared and crosschecked with margin notes and field notes for relevance and authenticity. The transcript was re-analysed, this iterative approach was repeated several times until the entire transcript was coded and crosschecked. Interpretive coding and check-coding methods similar to those described by Miles and Huberman (1994) were used\(^1\). The resulting coding schedule was then analysed and a report outlining the analysis findings was circulated to all focus group participants for comment. The results of the analysis are set out in the sections below.

### Research findings

This section discusses the results of the round table focus group and their implications.

#### E-business project differences

*Research Proposition 1 (RP1):* e-business related development projects are no different from any other software development projects.

Analysis of the focus group findings indicates that there were initial differences between e-business development and other IT development projects. Some CIOs reported that separate arrangements were made for developing e-business projects such as the creation and funding of separate e-business project groups to enable the organization to quickly enter this new area of business activity. These early e-business development efforts are seen to have suffered from vague sponsorship and less rigorous project initiation processes and are now being reabsorbed into the main IT function within the organization and are subject to the same project management and governance methods as any other IT project. Furthermore they are now expected to demonstrate their contribution to organisational value.

"*most people … are a little bit more questioning in terms of how much revenue they are going to create … the return to sobriety .. better investment and governance around these*

\(^1\) The resulting coding schedule is available from the authors on request
Focus group participants indicated that whilst these differences had now largely disappeared, a number of key differences have persisted. These differences relate to project reach and scope and stakeholder involvement and are discussed below.

**Project Scope and Reach**

IT systems arising from e-business development projects have a greater reach and scope than traditional IT development projects. These can be summarised in terms of two main themes, organisational context and project development requirements.

**Organisational context**

E-business development projects were seen to be more outward facing, have a wider span of use and impact a wider range of users. The time frames for developing e-business applications and the lifespan of the resulting product/service are generally shorter.

“... ten or fifteen years ago projects were major projects with multiyear delivery times where the scope wasn’t moving, nowadays ... you must be very reactive to your client demands” (focus group participant)

Brand and reputation are also more prominent as e-business projects tended to be highly visible to people outside the organization. There is greater emphasis on delivering functionality and performance and a requirement for “24/7” availability of e-business systems and services.

“there is a lot more pressure nowadays on delivering a lot of functionality, technology is being used more and more for daily processes, so people expect a lot more at a quicker rate of knots” (focus group participant)

The highly competitive marketplace has created higher requirements volatility. Focus group participants discussed this factor in tandem with external user expectations.

**Project development**

There are also differences in the approach to the development of e-business projects. Participants identified projects to be shorter, more modular and component driven, with less reliance on traditional systems development methods and more on iterative prototyping methods.

“it is becoming more component driven in the technology environment and that’s being driven by needing to be more flexible and manoeuvrable in business” (focus group participant)

Another difference was the increased need to co-develop e-business systems and applications and to partner with a wider range of external organizations. Identifying emerging market standards and selecting appropriate technologies from the extensive range of technology options facing the IT manager presents a new challenge.

Focus group participants noted that the desired skill set for project managers and systems developers had changed. Developers are expected to have up to date technical skills and to understand the business context within which they are operating. Project managers are
similarly required to have a range of business and technology skills, but most importantly to be able to communicate effectively with business managers.

“One thing that has changed is that we are looking for more mature project managers with a greater breadth of skills [who] can actually talk to the business” (focus group participant)

Stakeholder involvement

Stakeholder involvement also emerged as an area where differences between e-business development projects and other IT development projects were identified. Stakeholders can be divided into two groups: project sponsors and systems users.

Users

Focus group participants identified greater diversity in the range of user groups as a fundamental difference between traditional IT projects and e-business projects. User groups now include internal users from a wider range of business units and external users such as customers, suppliers and business partners. These users range in expertise from novices to IT professionals with a similar range of expectations in regard to systems functionality and support.

“[with e-commerce applications]… you typically have an unknown number of users using an unknown product in an unknown way. Whereas with more traditional products you’ve got a known group of users using a known product in a relatively known way” (focus group participant)

Sponsors

Sponsors were also seen as being more diverse, with projects having multiple groups of sponsors, with a corresponding increase in conflict between sponsors. Understanding sponsor requirements was seen as problematic and was exacerbated by sponsors’ sometimes unrealistic perceptions of the capability of technology to provide the desired level of functionality.

“typically the sponsor of these projects is quite vague and it tends to come often from a very broad base within the organization where as the more traditional project would typically have a clear sponsor from within one business area. What I’ve found is the e-commerce projects have a sort of vague level of sponsor ship, it always seems that the requirements are relatively unclear” (focus group participant)

E-business project differences conclusions

The proposition that e-business related development projects are no different from any other software development projects is broadly confirmed. However, two major areas of difference were noted, project reach and scope and stakeholder involvement. These differences raise a number of important organisational and project management challenges:

- dealing with multiple stakeholder groups
- understanding stakeholders and stakeholder requirements
- meeting/managing stakeholders expectations of systems functionality and availability
• finding systems developers and project managers with appropriate skill sets
• maintaining current awareness of technology options and emergent industry standards
• managing a wider range of external partners in the co-development of e-business systems

E-business project risks

Research Proposition 2 (RP2): e-business development projects carry the same risk profile any other software development projects.

Analysis of the focus group findings indicate that participants felt that the risks associated with e-business project development did not differ significantly from traditional projects, although the e-business environment exacerbated them. Projects were seen to suffer from the usual increases in project risk found in the early stages of adoption of any new technology, such as those associated with availability of skills. As the technology has matured, these risks receded. Three key exceptions were noted:

• risks relating the integration of e-business components
• risks relating to the management and coordination of the multiple parties now involved in the development of e-business systems
• risks relating to branding and reputation.

Integration risks

The disaggregation of e-business projects into small, quickly developed components was seen to create an additional level of complexity within the project. Participants identified risk associated with the integration of these multiple components that related to both integration between the e-business system components and between new components and legacy systems.

Project management risks

Participants identified the coordination of multiple stakeholder groups to ensure a smooth development process as now being more difficult and consequently higher risk. Increased numbers of stakeholders makes conflict more likely and its resolution more difficult, and this has implications for a number of key processes within the development cycle, such as requirements determination.

Branding and reputation

The risks to branding and reputation concern the “damage” that can be done to the good name of the businesses products (Branding) and the good name of the business itself (Reputation). Participants identified a number of key concerns regarding branding and reputation risk. As it is generally considered a business risk, branding and reputation risk was not previously considered a software project risk. E-business has led to changes in the relationship between the user and the organization, allowing customers and external users to interact directly with the businesses systems. This disintermediation of business processes means that systems developers now need to manage the risks associated with customers interacting directly with
the system as opposed to the businesses employees and agents using the system, a risk that was formerly carried by the business units responsible for interacting with customers.

“If you are going to look [at] the risks, the big difference between traditional technology and e-commerce is its reach. When you normally develop applications for 5 to 50 odd people, now you want to be able to access about 50,000 people so its more a branding risk as [...] this is your shop front” (focus group participant)

The participants’ perceived branding and reputation risk as an amalgam of the risks associated with not meeting customers’ expectations (in terms of functionality) and risks associated with compromised or diminished operation.

“I think one of the things which is a bigger risk is actually not [providing] what our customers want in terms of functionality and that means that the projects we are doing now have two separate risks, an internal risk and also a customer based risk” (focus group participant)

“one key difference is reputational risk, you know particularly 12 months ago everybody was announcing, we are going to have this site out, [...] you’re laying yourself open [...] there are major reputational risks, if you do get it there and its unreliable, [...] what are you going to do about non-repudiation and failure of transactions? You know, all these things that previously you could keep relatively well contained” (focus group participant)

E-business risk conclusions

The proposition that e-business development projects carry the same risk profile as other software development projects (RP2), was generally supported as the participants considered that the risks in e-business developments were not significantly different from those of other projects. Some risks were not of major concern as they were either temporary variations (and part of the usual adoption cycle that follows from the introduction of new technology) or were permanent changes not considered overly “risky” by being well within the bounds of conventional risk management practices. Three key exceptions were identified being risks relating to branding and reputation, integration of systems components and the project management risks relating to increased stakeholder groups.

Two of these exceptions, integration risks and project management risk have already been recognised within software project risk management (Sumner 2000, Keil et a, 1998). These risks are amplified and complicated in the context of e-business projects. Branding and reputation risks are rarely considered a software project risk as they are usually considered a business risk (or software risk) and hence within the domain of the business management.

Discussion

The differences in e-business development projects and the risk associated with those projects raise a number of implications for organizations that use e-business, both in terms of the ways in which these risks need to be addressed and the ways in which the organizations operate. In addition to these implications, the environment in which these systems are used and developed is not static. A key theme to emerge from the round-table was the current trend to rationalize and reconsider the organizations e-business applications and offerings.

This section discusses the implications of branding and reputation risk and stakeholder diversity and places these issues in the context of the trend to rationalise.
The implications for the branding and reputation of an organization and its products arise from the disintermediation of the traditional business processes by an e-business process. A number of issues arise because of this disintermediation.

Disintermediation of business processes changes the responsibility for the risk associated with diminished software operation from the business manager to both the systems development manager and the business unit manager. A traditional business process would involve a staff member as intermediary between the customer and the system, allowing them to mitigate, to some extent, any systems problems that might arise. In the e-business process, the customer interacts directly with the system, and any diminished or compromised operation of the system is visible to the customer. The risks of diminished operation in a traditional system are considered a risk to the business unit that arises from the using of the software (a software risk), and the business unit is responsible for any contingency plans to accommodate compromised operation of the system. The systems development process would only address these business risks indirectly by seeking to reduce the likelihood of system problems in general through, for instance, testing. Impacts on branding and reputation would be considered remote and down stream from the development process and as such are unlikely to be explicitly considered.

In pushing this risk upstream a number of issues arise. IT project managers need to recognise that they now share responsibility for the risk with the business managers. Given that much of the software project risk literature suggests that risk in projects is poorly addressed, the prospect of an additional risk being adequately considered would seem low. Even if the project managers recognise their new responsibilities, they may well be ill-equipped, in terms of business unit expertise or methodology, to appropriately assess and manage the risk. The business unit responsible may also be unaware of the change in ownership of the risk. If the business unit is aware of the change, their understanding of the risk exposure may be poor due a poor understanding of the technology involved. The previous points suggest inherent difficulties in the communication and co-ordination between the business unit and the developers that the proper management of a shared risk would seem to be required. These difficulties are of course magnified where multiple business units are involved.

The disintermediation of business processes also means that the e-business system now represents the “face” of the organization. The layout, design, ‘look and feel’ and other elements involved in the interaction with the customer replace the interaction once undertaken with the staff of the organization. In the same way that poor interaction between staff and customer may damage the reputation of the organization or its products, poor quality interaction with e-business system may cause similar damage. The implications of this aspect of disintermediation include the need for a greater emphasis on graphic design and systems usability in order to create systems that can accommodate a broad range of usage patterns and customer skill levels (Fowell 2001). Round table participants made this point repeatedly. Addressing these issues may include far more emphasis on customer support mechanisms and a need to capture a very broad set of requirements from a disparate set of external users, which are themselves already noted as increased areas of risk within e-business projects.

The diversity of stakeholders becomes a prominent issue in this regard, but unlike branding and reputation risk, stakeholder diversity is well known in software project risk. Schmidt et al. (2001) identifies “Failure to identify all stakeholders” as risk that affects requirements definition, implementation etc, thus providing project management with some familiar ground on which to begin. In regard to e-business however, the diversity of the stakeholders takes on a new level of difficulty as the stakeholders now include external user groups, where
the identification is seen as very difficult. By implication this creates very real difficulties in determining and managing requirements.

The diversity of the stakeholder group may also imply that no one solution is applicable, and that appropriate risk mitigation techniques may involve the development of multiple versions of a system, each with a different target user group in mind. The ongoing evolution of e-business within the organization and the changing perceptions and skills of the external user base add yet another layer of complexity to an already complex development environment.

In regard to the evolution of e-business, development appears to be currently going through a phase of rationalisation. The realisation that e-business development is not significantly different from other forms of development and hence the same rules do and should apply has caused a rationalisation in both the e-business systems to be retained by organizations and the way new systems are developed.

A number of participants discussed the ongoing problems associated with “killing off” systems that could no longer be justified, and on bringing the development of e-business systems into line with other developments. That is, to move away from the treatment of e-business as a special case, outside the normal requirements for resource allocation and cost/benefit justification.

In terms of systems development, a number of round table participants indicated the importance of refining tools and techniques.

It would seem from the tenor of the round table discussion that this return to normality is in its final phase and has achieved some maturity. The organizations represented appear to have discarded the fanciful notions of e-business that were prevalent some years ago and now see e-business systems in the same way as any other system.

The implications of these issues suggest that a reassessment of the project risk assessment and management methods within the organization may be necessary to adequately understand the new demarcations and associations in regard to effective management of e-business software project risk. The co-ordination and involvement of the stakeholders in this process is important, however the diversity and ‘unknown’ nature of the external user groups create considerable difficulty in this regard and will require imaginative and novel approaches to resolve it.

**Conclusions & Further Research**

E-business projects do not seem to vary in a significant way from other projects in the way they are managed or the risks they present. They do, however, have a much broader stakeholder constituency, which is more exacting and more diverse than that associated with other systems. Many of the issues raised during the round table relate to understanding the requirements of this extended stakeholder constituency and the demands of the external users (clients) was seen to be driving the risks associated with the development of e-business projects.

It was the general consensus of the round table participants that the risks associated with these types of projects are not significantly different from those of other types of projects. One major exception was reputation and brand risk. These business risks now appear to need addressing during the systems development, rather than the systems use phases, due largely to the disintermediation of the business processes by the e-business system. Again this
difference is directly related to the change in stakeholder groups, and round table participants thought they were reasonably well managed through the selection of methods and techniques used in the development of the systems themselves.

It would seem that e-business has lost much of its hyperbole and businesses now see the e-business systems as simply part of their systems portfolio. The current phase of an evolving understanding of e-business systems is particularly focused on understanding how best to address the impact and concerns associated with the external user groups.

This study sought to gain a general understanding of the risks associated with e-business projects. These risks proved to be more subtle and elusive than anticipated. A better understanding of these risks and their mitigation techniques could be generated by a more in-depth and detailed study of the actual projects. In particular a better understanding is needed in regard to:

- the role of external stakeholders and the implications of the extended stakeholder group for project risk
- the disintermediation of business processes and the impact on the locus of responsibility for branding and reputation risk management
- risk management practices, their evolution and incorporation into the standard methods and practices of the development process, especially in regard to the rapidly changing technology and application requirements of e-business.

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