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## MISQE Insight on Information Systems Due Diligence

*Information systems due diligence is an essential investigative process that companies should perform before making critical business decisions. Given the importance of information systems to business performance, IS due diligence is critical for determining and mitigating risks to ensure a successful business acquisition, merger, divestment, new market entry or ongoing operations. We explain the IS due diligence process and highlight the role of a firm's senior information system executive.*

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### Introductory Comments

*In 2010, U.S. airlines United and Continental legally completed their merger. Nearly five years later, executives were still struggling to integrate two sets of disparate information systems.<sup>1</sup> United Continental Holdings attracted ongoing adverse publicity because of poor operational performance and customer service. Managing the merger diverted attention from addressing intense competition from other major U.S. carriers. Merging information systems can take immensely more time and effort than merging balance sheets. As the Romans might have warned, "Caveat Emptor Systemata."<sup>2</sup>*

Though the integration of United and Continental's information systems was not the only hurdle to overcome for a successful merger, it was a huge one. However, it exemplifies the challenges many firms face, as ever more complex information systems are the central nervous system of their operations. Mergers and acquisitions are also increasingly critical components of business strategy. In Europe and North America, mergers and acquisitions doubled between 2002 and 2022.<sup>3</sup>

Because information systems are so often critical to the success of a merger, the CIO of the merged entity must be an active participant in the due diligence process because he or she will be responsible for integrating systems. When the merger is between equals, both parties' CIOs should participate in due diligence because they might have executive roles in the merged



<sup>1</sup> "The making of United Airlines' summer from hell," Financial Review, July 19, 2015, available at <https://www.afr.com/companies/transport/the-making-of-united-airlines-summer-from-hell-20150719-gifi0m>.

<sup>2</sup> Buyer beware of systems.

<sup>3</sup> *M&A Statistics*, Institute for Mergers, Acquisitions and Alliances, available at <https://imaa-institute.org/mergers-and-acquisitions-statistics/>.

entity. This article provides CIOs with a guide to IS due diligence during a merger or acquisition, which can also be useful for an ongoing operation.

## The Need for Information Systems Due Diligence

A market economy comprises competitive enterprises that can be bought and sold. Two prerequisites are necessary to support the twin requirements of competitiveness and marketability: 1) enterprises need to regularly assess their readiness to meet emerging customer needs; and 2) there must be an efficient market for buying and selling enterprises. Such a market requires information richness and transparency to reduce uncertainty.<sup>4</sup> An information systems due diligence assessment can serve both needs because it evaluates whether an enterprise's information systems and associated infrastructure can securely meet current and future needs.

An organization's balance sheet, a common measure of its "health," only provides a snapshot of the current collection of capital. Moreover, the balance sheet usually only includes economic capital, which is about 30% of the value of a public company<sup>5</sup> and often even less for a high-tech business. Viewing a firm as a collection of systems that create capital is more useful in a digital world.<sup>6</sup> For instance, a system of engagement creates customers (social capital) and a system of production produces goods and services (economic capital). Systems are the engines for creating value. As a consequence, in this article we focus on critically assessing current business systems and their capacity to meet future needs.

In general, due diligence is a comprehensive and systematic investigation undertaken by individuals or organizations before entering into significant agreements or transactions.<sup>7</sup> It is primarily a methodology for reducing risk when trading firms. The primary goal is to

analyze an organization's commercial, technical, financial and operational exposures. By gathering pertinent information and assessing potential threats, due diligence is pivotal in minimizing uncertainties and mitigating risks associated with a critical business transaction.<sup>8</sup> Both parties in a merger or acquisition expect to receive concise and actionable recommendations to inform managerial decisions. More specifically, IS due diligence is concerned with assessing the quality of a firm's digital assets, their management, and the delivery of information services internally and externally.

## Initiating an IS Due Diligence Assessment

IS due diligence can be initiated by three parties: the seller, the buyer or the leadership team of a business. The three parties have differing objectives.

For the *seller*, an IS due diligence assessment should identify any issues that might reduce the market value of its business. The due diligence report should provide an actionable roadmap for rectifying value-diminishing issues, which is typically shared with the buyer in the interests of transparency. Specifically, the report will indicate shortcomings in systems operations, software quality and development, and security.

For the *buyer*, due diligence takes place prior to a merger or acquisition and evaluates the target company's financial health, legal standing and operational efficiency. It helps investors assess the potential risks and opportunities. Due diligence is vital in legal matters, ensuring compliance with regulations and mitigating legal risks. The intention is to identify significant risks associated with the purchase of a business and subsequent action needed to mitigate identified risks. IS due diligence for the buyer covers the same issues as for the seller. In addition, if the buyer intends to merge the acquisition with another business, the assessment must identify significant systems integration risks.

Usually, when the *leadership team* initiates a due diligence assessment it is associated with a planned merger or acquisition activity, but

4 Roth, A. E. "What Have We Learned from Market Design?" *The Economic Journal* (118:527), March 2008, pp. 285-310.

5 "What it takes to be a CEO in the 2020s," *The Economist*, February 6, 2020, available at <https://www.economist.com/leaders/2020/02/06/what-it-takes-to-be-a-ceo-in-the-2020s>.

6 Watson, R. T. *Capital, Systems and Objects: The Foundation and Future of Organizations*, Springer, 2020.

7 Bruner, R. F. (author) and Perella, J. R. (foreword) *Applied Mergers and Acquisitions*, Wiley, 2004.

8 Kirkulak Uludag, B. "Due Diligence," in Idowu, S. O., Capaldi N., Zu, L. and Gupta A. D. (Eds.), *Encyclopedia of Corporate Social Responsibility*, Springer Berlin, 2013, pp. 839-846.

it can be a routine evaluation of an ongoing enterprise. For example, an organization's board or top management team might commission an external review of a critical information system or a comprehensive review of all systems to ensure compliance with the board's stewardship duties. There's value in engaging external third parties to look at how you operate to gain a different perspective. The external reviewer's report will typically include advice on improving business systems' security, reliability and performance.

## The CIO's Role in IS Due Diligence

To avoid the lengthy and costly journey of United Continental Holdings, the CIO (or CIOs) must be involved in IS due diligence to assess the barriers to systems integration and the cost of their remediation. Indeed, in-depth IS due diligence might show that the expected financial gains are unachievable because of significant incompatibilities across multiple parallel systems (e.g., ERPs from different vendors or incompatible seat reservation systems).

When there is no plan for a merger, such as when a company is acquired to augment a portfolio of independent entities, the buyer's CIO will provide input to the due diligence assessment. For due diligence carried out by a seller or for an internal IS due diligence, the CIO will have the same relatively passive role. However, internal due diligence will require the CIO to react to adverse comments and actively prepare for such future assessments.

## Two Types of IS Due Diligence

An IS due diligence exercise can assess the overall state of a business or focus on its business systems.

A *business evaluation* assesses all information systems and the entire information and communications technology (ICT) infrastructure. This type of IS due diligence involves a comprehensive review of cybersecurity to examine general and specific practices. However, it does not dig deeply into any particular system unless serious issues are identified. General software development and code maintenance procedures are examined to ensure

they are effective for fixing bugs and making enhancements.

Notably, the evaluation will assess how a company's systems support its vision and strategy, complementing a competitive intelligence review. The enterprise's information management practices<sup>9</sup> will typically be reviewed because decision-making quality depends on high-quality information.

A *systems evaluation* can assess an information system, software product or information service. It requires a more ICT-centric analysis focusing on systems development and maintenance, cybersecurity and the supporting ICT architecture. The skills and capabilities of the software development team will be assessed as they are critical to a system's ongoing performance. A detailed assessment of code development and maintenance will be made. The goal is to identify system flaws and estimate the cost of their remediation or impact.

For companies considering the launch of a software product or information service, a due diligence assessment can identify the systems and technical risks associated with the launch, assess market readiness and determine any technical debt in the existing product suite.

In a systems evaluation, the executive management team might limit assessment to the systems most critical to business continuity. This will be less expensive than evaluating all major systems and is consistent with the 80-20 rule, whereby much of the company's success often depends on a few systems.

An example of a systems due diligence evaluation is provided by a private equity company that was considering acquiring a software supplier and asked a third party to conduct a due diligence assessment of the supplier. The private equity company's value calculation was based on the software company's claim that its primary application was being redeveloped using modern software languages and architectural patterns, specifically a micro-services-based architecture. When the due diligence team interviewed the software company's development team, it became evident

9 Kettinger, W. J., Ryoo, S. Y. and Marchand, D. A. "We're engaged! Following the path to a successful information management capability," *The Journal of Strategic Information Systems* (30:3), September 2021, 101681.

that there was a lack of alignment between the CEO's expectations and the developers' actions. Though the application was being redeveloped with more modern programming languages, its overall structure was similar to the original architecture. The due diligence team reported this misalignment to the private equity company because post-acquisition development costs would be significantly higher than anticipated. The redevelopment project would need to be restarted with a more appropriate architecture and appropriately skilled team members.

## The Four-Stage IS Due Diligence Process

An IS due diligence team should comprise professionals with decades of experience in systems development and operations and specialized ICT knowledge. IS due diligence typically follows a four-stage process.

### 1. Data Collection

Due diligence starts with reviewing information on a company's business systems, including software roadmaps, backlogs, release plans, evidence of systems requirements, architecture diagrams, technical designs, key vendor arrangements, cybersecurity and data privacy. The due diligence team will also gather indicators, such as product quality metrics, defect lists, problem statistics, test reports, and team and skills profiles.

### 2. Review

A series of in-depth interviews with key stakeholders is conducted to build an understanding of the business systems management approaches and architecture. These interviews are the foundation for qualitatively assessing the software development team's practices and the company's maturity.

### 3. Risk Analysis and Recommendations

Key opportunities and risks are identified based on the information collected in the prior stages. The opportunities for improvement are evaluated, and a comprehensive set of recommendations, often in the form of a roadmap, is identified.

### 4. Reporting and Client Review

An IS due diligence review is an iterative process. The evaluation team reports key findings to the client as the assessment proceeds. Continuous information sharing through interim due diligence reports, most of which are prepared within a compressed time frame, is essential for ensuring that the client's executives are fully appraised and prepared when they receive the final report. The client might intensify the review based on some concerns the due diligence team highlights during its assessment. Based on the final report, the client decides on actions and priorities. The report makes extensive use of infographics that rapidly communicate critical findings to executives. During the final presentation, key stakeholders will typically comment and question the substance of the findings.

## Frameworks for IS Due Diligence

IS due diligence assessors typically rely on a set of reference models to assess a client's current status and future needs. These frameworks generally cover practices in four areas:

1. Information systems management
2. Information systems development
3. Cybersecurity
4. Information management.

Other reference models can be applied when the client and circumstances dictate.

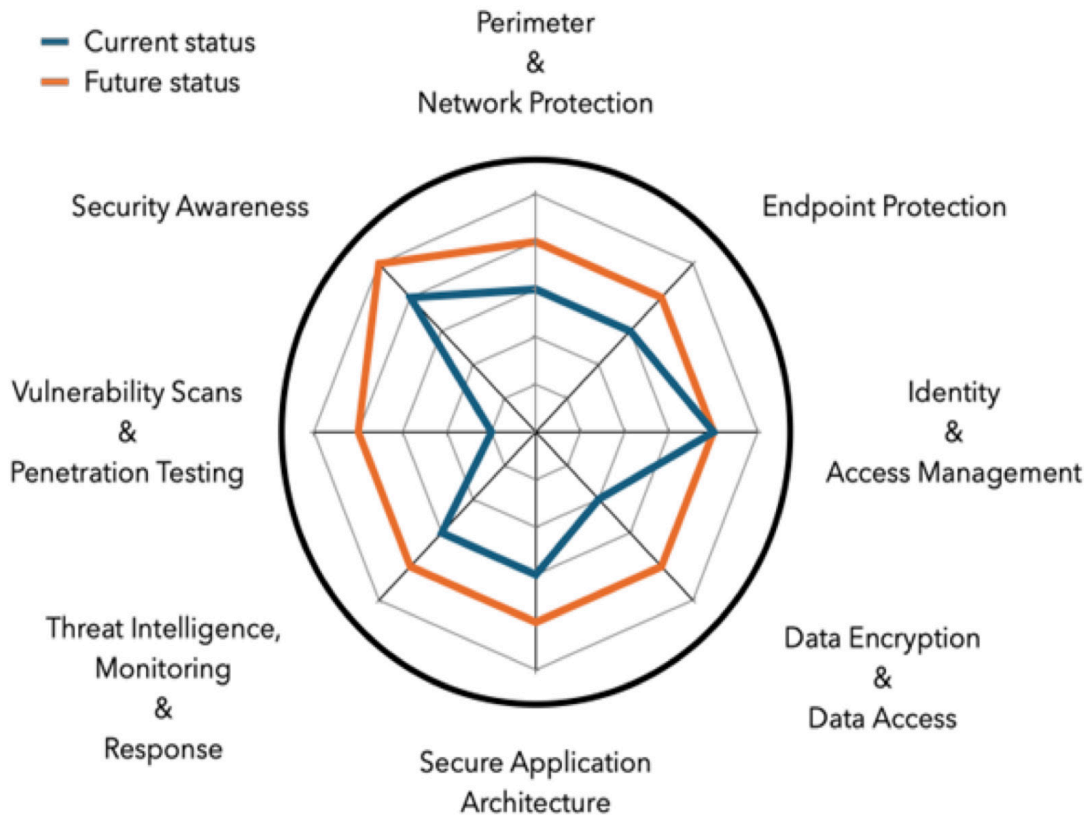
To make the findings of IS due diligence readily understandable by the client, assessors often report their results in the form of a radar chart (see Figure 1 for an example).

The report should also include commentary on the findings and results of discussions with organizational personnel. It might highlight the positives with a preceding green bullet and suggestions for improvement with a red bullet. For example:

- The AWS production environment running the customer applications is secured, with good, layered segregation between the applications and database. There is a no-trust model between the internal corporate network and production.



**Figure 1: Example Radar Chart for a Cybersecurity Assessment**



- Non-cloud devices allow users to have full admin access with no policy guidance on disk encryption.

## Skills Needed for IS Due Diligence

IS due diligence assessors need deep knowledge of business software and communication technology. They require expertise in software development and implementation, often gained from several years of managing software development or consulting. Systems thinking skills are valuable when a comprehensive examination of an organization's systems is commissioned. Because interviews are a key form of data collection, assessors should be adept at building rapport.

An IS due diligence team usually has three members: the team lead, a cybersecurity expert

and a systems expert. Additional specialists might be required depending on the requirements of the project. For example, a product development expert might be included in a product launch review.

The team typically completes six to eight rounds of interviews with specialists from the different departments to get an overview of a company's current situation. However, the process is adaptable, with variations in detail and access depending on the assessed organization. The final report is typically around 40 to 50 pages.

## Value of IS Due Diligence

For a merger or acquisition, a detailed IS due diligence assessment allows the buyer and seller to take appropriate steps to ensure a successful outcome. The report should reveal risks that are

controllable if specific actions are taken by either party. It helps the buyer and seller to determine the price for the exchange of ownership.

IS due diligence involving a comprehensive review of an enterprise's critical systems will reveal matters that need attention for continued operation as a competitive, productive organization. For example, the due diligence team might highlight systems not effectively serving the enterprise's mission and pinpoint the opportunities for higher levels of integration across systems.

## IS Due Diligence Challenges

One challenge is that an IS due diligence team may lack expertise in the business area under examination, which can result in an inconsistent and incomplete review. Domain knowledge of the industry, and of the systems and software platform deployed, should be augmented if a gap exists.

Another challenge is that time and cost constraints may mean that the IS due diligence team has limited access to information essential for carrying out an accurate assessment. A hasty review might miss key risk factors, and thus diminish the value of IS due diligence.

## Concluding Comments

A comprehensive IS due diligence assessment by an expert, external and independent source can reveal significant risks and opportunities to the various parties of a business acquisition or merger.

For senior business leaders, an impartial IS due diligence assessment can be essential to meeting their stewardship obligations. It can reveal business continuity threats and identify performance improvement opportunities.

## About the Authors

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