Replace, Maintain or Modernize: Improve ROI with a Legacy System Assessment
Executive Summary

Many CIOs today deal with rising costs of maintenance of legacy systems, yet are unsure of where to start with their judgment of the business value of the system, including the rising costs and competitive vulnerabilities they pose. As digital innovation and disruption begins to take hold across industries, leaders decide between continuing to invest in maintenance, completing a full replacement or pursuing modernization. The foundation for this decision lies in a comprehensive and thorough assessment of the current system and its ability to meet current and anticipated future needs.

Key Takeaways

• Black-box modernization, through a redesign or mobilization, can preserve the business logic and value without requiring the time and resource constraints of full replacement, or engendering the increased risk of maintenance.

• Maintenance costs will rise over time, but may be the only option for companies without the resources for replacement or modernization.

• Full replacements provide significant functionality benefits. Their development and deployment need to be handled very carefully in order for those benefits to be fully realized.

• CIOs need to examine the entire context—support software, external environment, internal support, and business model stability—of their legacy system in order to come to an objective answer.
Introduction

Thousands of companies today face a crisis—and not the PR, budget, privacy and other crises that grab headlines. As digital disruptors pioneer new digital business models and products to threaten established companies’ market share and competitive position, this crisis holds them back from pursuing the same initiatives that are driving serious financial returns for the disruptors, including new markets, unprecedented engagement with consumers, shortened go-to-market for new products and serious operational efficiencies.

The problem at the heart of the crisis is the legacy systems, or the “systems which are resistant to change.”[1]

Companies maintain more than 240 billion lines of code in these systems, which require maintenance that eats up 90 percent of the total cost of the software over its lifecycle. [2] The “patch it fast” method over years and years has buried companies under technical debt and also weakened the code into “spaghetti code” that is too fragile to adapt without significant resources and time. With digital disruptors quickening the pace and pressure for innovation, this legacy crisis causes vulnerabilities that competitors can quickly and relatively easily exploit to gain market share.

Legacy systems cause four main problems that significantly harm a company’s ability to respond to this threat:

1. **Problematic APIs.** Companies implemented their legacy systems before the powerful RESTful API model, which debuted in late 2000. [3] Legacy system APIs are notoriously difficult to work with when completing upgrades and connections to other systems. This process often causes significant delays for projects.

2. **“Dead” languages.** Despite their widespread use in business, the languages of legacy code are not required education for programmers. A recent survey found that the COBOL language is relegated to a non-required elective class, and even then, at only one in four computer science programs.[4] When the U.S. graduates 40,000 computer science bachelor's degree earners each year to fill four million job vacancies [5], adding in additional skill requirements significantly raises the cost of hiring in this field.

3. **Efficiency losses.** Older languages are more “wordy” and require more resources from the IT department than their newer counterparts. Siphoning off IT resources takes away from the digital innovation investments that are

“Legacy” has little to do with the age or features of the system; it has more to do with the ability of that system to adapt to changing business needs.
so pivotal to companies’ futures. More time and resources are also crucial for developing “IT agility,” or the ability to respond quickly to competitive threats to digital products’ business models.

4. **Workers’ needs.** Today’s workforce has different needs that legacy systems cannot meet. The field worker needs robust mobile apps with real-time information and data to make more informed decisions. Companies need to be able to employ BYOD policies so employees can use the device most intuitive to their needs. These needs become cost-prohibitive with legacy systems.

And yet, for some companies, continuing to invest in the maintenance of legacy systems is the most prudent choice for their business right now. The business logic embedded in the code holds real business value and competitive advantage that even the most diligent extraction process cannot fully capture. Most IT departments have a track record with large software development projects to consider: 25 percent of software development projects fail outright and 60 percent produce substandard or ineffective products. [6]

Factor in weak or shortchanged IT resources and many CIOs see a path to disaster.

**The Big Question: Replace, Maintain or Modernize**

The key is to conduct a thorough assessment of the business value of the legacy system and the needs of the business to determine the appropriate path for the business.

Businesses choose to undergo periods of maintenance and modernization to upgrade the system to meet the business’ needs. When a significant gap opens up between the functionality of the legacy system and the business’ needs, companies pursue replacement with a new system. Determining how large their gap is (and projecting how large it will quickly become) is a major challenge for CIOs.

**Option 1: Replace**

Full replacement of the system represents the most arduous and resource-intensive option, and one that companies are often forced into or feel extremely pressured to pursue. These business drivers include new regulations that require new system capabilities; technology no longer receiving support from the supplier; or mergers and acquisitions creating the need for a consolidated platform.

**Making significant changes to a system so intertwined with crucial functions of a business will always carry some risk.**
Investing in a full replacement—a massive undertaking—generates serious business impact. The functionality of modern systems causes significant productivity gains and more powerful business intelligence reporting. The extraction process that replacement projects require can also have ramifications beyond the system; by dusting off and exposing the processes and business logic, new opportunities for efficiency and innovation can reveal themselves.

That payoff represents the best case for replacement, but for some companies, the costs and risk may overcome the benefits. The arduous process of moving everything over is extremely resource-intensive. Firms who are not able to pursue a “big bang” implementation where everything is switched over at once also need to develop APIs for the legacy and replacement systems to work side-by-side. Even downtime for a few hours can add significantly to the bottom line of these projects. The technical side is only half the battle. As companies try to realize some of the value in productivity and efficiency gains, CIOs need to develop a robust plan for addressing the cultural changes and providing the training employees need as their workflows adjust.

CIOs also lose out on ROI when they rely on traditional software vendors, for replacements, such as SAP and Oracle for ERP systems, whose interfaces limit the possibilities for interaction design and user experience.
User adoption issues are a key factor in why many software development projects fail, because users will make mistakes, develop workarounds, or abandon the system completely.

Option 2: Maintain
If it’s not broken, why fix it? IT leaders can project the resources and time needed for maintaining these systems, and are also comfortable with their supplier for continuing updates. Without an injection of funds to the IT budget, maintenance appears as the only option.

Continuing to invest in the maintenance of these systems is the safe short-term and risky long-term choice. Maintenance costs will only increase as the competitive advantage evaporates. As the market undergoes major changes with digital and mobile innovations, the impact and applicability of the competitive advantage of the business logic comes into question. The unseen costs of maintaining a legacy system come through when a competitor emerges who places more demand and urgency on IT resources. With so much tied up in maintaining the legacy system, is the business still able to respond?

Option 3: Modernize
Modernization of a legacy system is often presented as a middle road between replacement and maintenance, but it all depends on the modernization path pursued. Modernization efforts typically fall into two categories: white-box and black-box.

- **White-box modernization** involves reverse-engineering the internal operations of the system and developing an abstract model of the system in order to restructure it into a more modern architecture.

- **Black-box modernization** heavily focuses on “wrapping,” and therefore is only concerned with the inputs and outputs. Generally, companies pursuing this effort will have an end goal of developing another layer of software to conceal the old system through a modern interface.

  White-box modernization, because of the difficult abstraction and reverse engineering approach, requires a significant amount of time and effort. Black-box efforts are not without their own resource costs, but pale in comparison to the white-box route, which is the only option for dealing with the issues in the underlying code.[7]

As the workforce demands more mobile technology, especially for 24/7 operations, delivering key data points of business intelligence or making it easier to log data from a mobile device saves employees’ time and frees them up to pursue more analytical or creative tasks.
Modernized legacy systems allow for new possibilities with data, logic and usability without the arduous process of replacement. Their systems also grant more latitude to the IT department to pursue other ventures.

**Assessing Your Legacy System**

Completing an unbiased and rigorous assessment of the legacy system provides the answer. This is not making a business case or reaching out to vendors for the options; the assessment needs to happen before either of those. CIOs need to first create a foundation for their decision-making process and develop a picture of what additional research into their own system and supported business lines is required.

The goal is to identify which quadrant fits the current situation. Modernization is the ideal outcome for many companies: the ability to capitalize on the functionality of new technologies without the resource and time requirements of a new replacement. Replacement with commercial packages should only be pursued with low quality and low value systems; replacement projects typically fail to deliver on desired results and require extensive user testing.

**Understand the value the legacy system provides.** It’s crucial to first decide if a legacy system is worth the resources it is currently requiring. If the system failed tomorrow, what operations would be affected? If the system were never implemented, what would have happened? Is the system a background or foreground player in products’ (or the company’s) value proposition? If the system gained an additional 10 percent of performance, what would happen? If any of these answers reveal the slightest hint that the system is not necessary for the business, the CIO needs to immediately look into whether this system is actually necessary at all, rather than its functionality.

**Understand your users’ needs.** Successful software development projects begin with ethnographic research into user needs. Researchers spend time out in the field with users, performing contextual inquiries, process flows, task analyses and user interviews, to create ‘personas’ for each user. This stage often yields considerable surprises for companies. It’s also necessary to understand the mobility and contextual needs of users in this stage to see if legacy systems need to integrate with those. User conditions that may require mobile applications of the system include: 24/7 operations, need for efficient communication, location changes, need for specific data points.
Discovering users’ needs through contextual inquiry and addressing how the software can meet them is crucial to any legacy systems project.
Assess the external environment and support software of the legacy system. These essential contexts, in which the legacy system operates, factor into the ability to meet the business’ future needs. How is the vendor or supplier? How likely are they to continue operations? On a scale of 1 to 4, how would you rate the ability of the external environment and support software to fulfill desired functions? How often are patches issued? What is the quality of support personnel? What are the license costs for the support software? It’s also necessary to identify the internal support factors in your assessment. Are current staff members able to patch the code quickly? How easily are issues addressed? Is the current staff able to manage cultural implementations of the changes?

Assess the application itself. How well does the system work as a whole and on a component level? Are there features that are unutilized but still paid for? How does the application perform its overall functions? [8]

Assess the competitive position and business model stability. If the business model is about to undergo significant change, is it wise to invest in the legacy system supporting it now?

How competitive is the product or business line? For example, the recent rise of “on-demand” delivery of consumer products, such as Amazon Prime NOW and Minibar, put pressure on the business model of supply chain managers supporting traditional commerce sites. Can the SCM’s existing business model support consumers’ needs for real-time tracking and instantaneous delivery?

There are many different ways to address competitive positioning. Porter’s Five Forces for Competitive Position Analysis is the dominant choice for most businesses. [9]

Conclusion

No industry can hide from digital disruption, yet few have the IT systems resources they need to compete. From outdated languages affecting the ability to hire to new regulations requiring significant changes, many CIOs are at a crossroads with their legacy system, examining the costs and benefits of modernizing, maintaining or replacing the system.

After working with numerous large enterprises and developing our own projections, it’s apparent that the advances in middleware, service-oriented architecture and APIs, have made modernization the most cost-effective strategy. A redesigned interface, mobilization of key functions, or virtualization of data will meet both business’ and users’ needs—without the short-term costs of replacement and long-term vulnerabilities of maintenance.
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References


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