

# The World of Enterprise Applications is Changing – Is It Time to Reroute Your ERP Roadmap?

by Pat Phelan

Pressure to move to the cloud is forcing IT leaders to rethink their application strategies. Yet, “enterprises are moving to the cloud” is not the same thing as “enterprises are moving all their ERP applications to SaaS.” Your ERP roadmap probably needs to be rerouted, but the new route depends on your ultimate destination.

## What You Should Know

- Cloud technologies are changing the ERP landscape creating opportunities for innovation and a risk of underestimating the total costs. Make ERP roadmap decisions based on business goals like business transformation, modernization, or cost cutting, not on vendor ultimatums or ease of acquiring and installing cloud technologies.
- Moving some applications to the cloud probably makes sense, but for most enterprises the full ERP application suite shouldn't (or can't) move to the cloud, at least for now. Start your cloud journey with IaaS - getting your ERP out of the data center is the most cost effective, least disruptive move to the cloud you can make. Identify high-impact opportunities for SaaS applications that engage customers, employees or partners.
- Preserve existing application licenses and custom code investments while you wait for the SaaS ERP market to mature. In the meantime, continue to innovate with other cloud options that extend core ERP.
- Regardless of the route your enterprise applications / ERP roadmap takes, examine topics such as funding, risks, and support roles/responsibilities to understand tradeoffs of the route change.

## Table of Contents

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<b>Summary</b>	<b>3</b>
What You Should Know	3
<b>The World of Enterprise Applications is Changing</b>	<b>4</b>
<b>IT Leaders Are Under Pressure to “Move to the Cloud,” But What Does Moving to the Cloud Mean?</b>	<b>7</b>
<b>The Route Your ERP Roadmap Takes Depends on Your Ultimate Goal</b>	<b>10</b>
<b>A Roadmap Reroute Needs to Consider Tradeoffs</b>	<b>14</b>
<b>Notes</b>	<b>16</b>

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## Summary

Pressure to move to the cloud is forcing IT leaders to rethink their application strategies. Yet, “enterprises are moving to the cloud” is not the same thing as “enterprises are moving their ERP applications to the cloud.” Your ERP roadmap probably needs to be rerouted, but the new route depends on your ultimate goal.

### What You Should Know

- Cloud technologies are changing the ERP landscape, creating opportunities for innovation and a risk of underestimating the total costs.
  - “Cloud” is just another name for “outsourcing.” It works for some scenarios but not for others.
  - Your digital journey should, at a minimum, include assessing how three evolving cloud technologies at the forefront of the digital movement – machine learning, blockchain and the internet of things (IOT) – could enable your digital business model and what effect employing them would have on your ERP strategies.
  - Make ERP roadmap decisions based on business goals such as business transformation, modernization, or cost cutting, not on vendor ultimatums or ease of acquiring and installing cloud technologies.
- IT leaders are under pressure to “move to the cloud,” but have different viewpoints on what moving to the cloud means.
  - ERP vendors are putting the squeeze on customers to move to the cloud, creating panic to make a decision or else risk loss of support.
  - Moving some applications to the cloud probably makes sense, but for most enterprises the full ERP application suite shouldn’t (or can’t) move to the cloud, at least for now.
  - It may be many years before there is functional parity between your incumbent ERP solution and what you can get via Software as a Service (SaaS).
  - Start your cloud journey with Infrastructure as a Service (IaaS). Getting your ERP out of the data center is the most cost-effective, least-disruptive move to the cloud you can make.
  - Target specific sets of requirements best suited for moving to the cloud.

- Preserve existing application licenses and custom code investments while you wait for the SaaS ERP market to mature.
- In the meantime, continue to innovate with other cloud options that extend core ERP.
- The cost of avoiding innovation far outweighs the tradeoffs that must be considered.
  - Reduce ERP operations costs in order to unlock money for innovation.
  - Regardless of the route your enterprise applications/ERP roadmap takes, examine topics such as funding, risks and support roles/responsibilities to weigh the tradeoffs of the route change.

## The World of Enterprise Applications is Changing

Monolithic ERP suites prevailed over the last 30 years when the goal was standardization and integration. Today, instead of efficiency, business agility and innovating how work gets done have become top of mind for business and IT leaders who are trying to figure out how to transform the business to compete in a digital world.

Regardless of how you feel about it, we now live in the cloud era. Cloud technologies are changing the way we live and work. The cloud has become an enabler of new business models that lead to business transformation. As R. “Ray” Wang, principal analyst, founder and chairman of Constellation Research says<sup>1</sup>, “Everything from a technology point of view in digital transformation starts with the cloud.”

Yet at the heart of it all, “cloud” is just a new form of “outsourcing.” It works for some scenarios but not for others. Back-office enterprise applications (such as ERP) that serve as the transaction-based systems of record for the business are not transformational by nature. As a result, businesses gain little from moving them to the cloud. ERP must interact with cloud technologies that enable transformation while still serving as the sturdy, steady, foundational systems of record for the enterprise.

The cloud makes it possible for business drivers such as geography-specific requirements or functionally focused solutions to change the enterprise applications landscape. We are seeing the monolithic suite of enterprise applications shifting to an ecosystem. At the core, you have the enterprise system of record and highly transactional applications. The satellite solutions surrounding and extending them are where it makes sense to use the cloud for systems of engagement.

<sup>1</sup> “A Dynamics365 Conversation with R. ‘Ray’ Wang,” Microsoft eBook, 2018, <https://info.microsoft.com/rs/157-GQE-382/images/EN-US-CNTNT-ebook-Ray-Wang.pdf>

An example of a functionally focused system of engagement ecosystem is Salesforce serving as the core, with numerous connected applications. Each enterprise's Salesforce ecosystem is individually tailored using common building block applications. A similar example, but for a system of record, is an ERP suite serving as a tightly integrated core that is loosely connected to applications such as asset management, online ordering or project accounting.

The age of a few mega ERP vendors dominating the market is being displaced by an increasing number of new best-in-class vendors that offer cloud-native or cloud-delivered ERP solutions. ERP customers don't have to wait for their incumbent software vendors to develop cloud extensions.

Many of the point-specific cloud solutions don't yet have functional parity with the mega ERP vendors' flagship products. Neither do the current versions of the mega vendors' cloud offerings have that functional parity. For example, SAP and Oracle's logistics related modules represent millions of lines of code. No one has successfully rewritten these modules in recent decades. If these mega vendors aim for "lowest common denominator" cloud solution functionality in order to achieve one-to-many scalability, they must exclude unique capabilities such as logistics or industry-specific functionality.

The mega ERP vendors aren't as organizationally nimble as solution-specific software vendors, which makes them behind in terms of maturing their cloud products. The solution-specific vendors are giving mega ERP vendors a run for their money, and the mega ERP vendors are responding by stepping up rhetoric aimed at locking in customers.

Most enterprises will end up with a hybrid ERP environment featuring a mix of internally deployed applications and cloud-delivered services. By spreading functionality over best-fit solutions, the cloud provides more flexibility, which improves enterprise agility and increases the ability to enact change quickly.

An enterprise can digitally transform the business using a variety of technologies without replacing its ERP solution. Examples include adding mobile applications, using smart sensors to monitor livestock and using self-learning algorithms to improve the student enrollment process. In many ways, cloud technologies will impact your ERP strategy only peripherally. However, you should watch the evolution of three technologies at the forefront of digital transformation closely for their potential impact on ERP: machine learning (ML), blockchain and IOT.

- [Machine learning](#) is becoming a foundation for new business models. Although ML is being incorporated into the mega ERP vendors' cloud solutions, it is offered as an add-on rather than being embedded in their existing ERP solutions. Some data needed for ML to happen resides in the existing ERP applications, but it's not necessarily the broad-reaching data (big data) needed for ML to synthesize new insights. Integration is needed to marry the ERP data with other ML components.

- [The internet of things](#) is introducing a level of connectivity and accessibility that was unheard of just a few years ago. The big impact of the IOT on ERP is in interfaces, data, security and support strategies.
- [Interest in blockchain](#) is increasing, and the market potential for it is enormous, but the technology and the transformational opportunities it offers are not yet well understood by business leaders. Blockchain capability will likely sit outside the core ERP solution but, as with ML and IOT, will affect ERP integration, data, security and support.

These forces add up to a chaotic time for IT leaders. On a positive note, there have never been more opportunities for businesses to reinvent themselves. Although enterprises are under extreme pressure to innovate how work gets done and to take advantage of these new technologies, the desire to change doesn't necessarily mean that the enterprise is willing and able to change. If you feel that it's a struggle to innovate in IT, you are not alone. In a 2018 study by Vanson Bourne, "The State of Innovation"<sup>2</sup>, IT and finance decision makers were surveyed on priorities and challenges faced when it comes to funding and investing in innovation. The study identified several barriers that keep ERP leaders from innovating (figure 1).

### You Are Not Alone: Roadblocks to Innovation

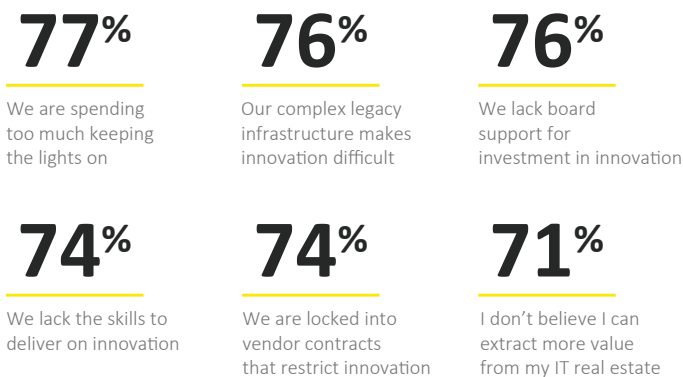


Figure 1. Roadblocks to Innovation

Source: Vanson Bourne, June, 2018

Business innovation is happening at a much faster pace than most enterprise ERP solutions can adopt changes to support it, so the question becomes "What will happen to ERP?" Rest assured that no matter how work gets done on the front end, every enterprise must still conduct the basic block-and-tackling functions of buying, selling, receiving, paying, etc. on the back end. These tightly integrated, complex functions still need to happen — i.e., in your ERP solution.

<sup>2</sup> "The State of Innovation," Vanson Bourne, June, 2018 <https://www.riministreet.com/the-state-of-it-innovation-priorities-and-challenges>

Implementing new technologies is not cheap, especially when integration is required, or the ERP solution must be modernized to accommodate the new technology. Funding for innovation is hard to get, especially for enterprises with flat IT budgets. Gartner’s 2018 IT metrics survey<sup>3</sup> showed that 90percent of IT funds are locked up in ongoing operations and enhancements, leaving only 10 percent of the budget for business transformation initiatives. For most enterprises, ERP represents the lion’s share of the applications portfolio, meaning the bulk of the 90 percent is spent on ERP. Enterprises must look for ways to reduce their ERP maintenance spend in order to unlock money for innovation.

## IT Leaders Are Under Pressure to “Move to the Cloud,” But What Does Moving to the Cloud Mean?

“Enterprises are moving to the cloud” is not the same thing as “enterprises are moving their ERP applications to the cloud.” The cloud is not one-size-fits-all, and “cloud” means different things to different people. In the Vanson Bourne innovation study, nearly two thirds (63 percent) of the respondents said they felt locked into their enterprise’s existing software vendor relationship. Over half (54 percent) indicated that they felt pressured to adopt their incumbent vendor’s cloud strategy. As ERP leaders make directional changes to their ERP roadmap, they must separate the cloud reality from what ERP vendors say in their marketing messages (hype).

In general, the cloud market includes IaaS for operations, Platform as a Service (PaaS) for custom development, and SaaS for packaged applications. It also includes the cloud management services necessary for activities such as integration, ensuring data security, and managing the cloud portfolio (figure 2).

### The Difference Is Ownership

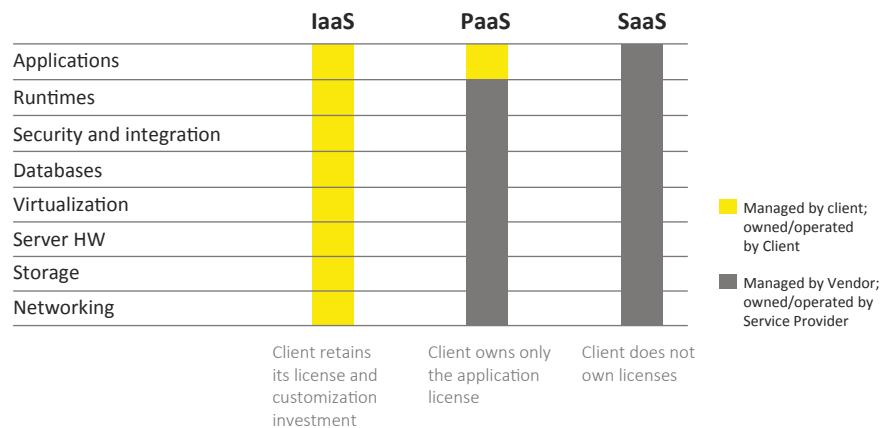


Figure 2. The Cloud Market

Source: Rimini Street, July 2018

<sup>3</sup> “IT Key Metrics Data 2018: Executive Summary,” Gartner Inc., December 11, 2017

Many enterprises are starting their move to the cloud at the infrastructure level (IaaS). Taking this route on your ERP roadmap involves moving the ERP applications, customizations, and interfaces to a hosted service (e.g., Amazon Web Services or Microsoft Azure). It can even include moving to database as a service. It preserves existing application licenses and custom code investments, giving the same functional fit but at a lower price point by keeping the application portfolio intact and simply hosting it on a third party's server instead of the enterprise's.

Using IaaS to eliminate your data center is the most cost-effective, least-disruptive cloud move for ERP.

PaaS is gaining traction with enterprises that want to custom build applications using software and tools available over the internet. PaaS can be used as a means to modernize, while leaving the core ERP solution intact (for example, building or buying a web-based advanced analytics application that provides real-time, or near-real-time integration with data in the internally deployed ERP solution).

With PaaS, the route your ERP roadmap takes is using the cloud for innovative solutions that sit outside the core ERP, providing a modern wrapper that extends the value of the existing ERP solution. This use of PaaS creates a hybrid ERP environment. Integration, data sensitivities and security are issues that require special attention but because the PaaS solution is outside the core ERP solution, PaaS also preserves existing ERP investments and functionality.

The mega ERP vendors offer proprietary versions of IaaS and PaaS. However, be wary of getting locked into the ERP vendor's IaaS offering, particularly if you are not committed to the vendor's broader cloud roadmap. IaaS and PaaS specialty vendors typically offer more robust service at a lower cost and continue to invest more heavily in infrastructure and platform technologies.

SaaS ERP is being pushed heavily by ERP vendors and is overhyped in the media for large enterprises with complex business requirements. To date, a very low percentage of Oracle ERP and SAP Business Suite customers are truly migrating to SaaS ERP. For most large enterprises with complex requirements, SaaS ERP is still too immature and is not yet a credible option for anything more than a pilot project. Some may try a pilot project with a small division for the sake of giving their stakeholders a taste of how SaaS ERP might be used, but for most enterprises there is no viable SaaS ERP product to implement yet. However, many enterprises aren't seeing the business case for a wholesale replacement of their ERP solution because back-office functions enabled by ERP don't differentiate the enterprise or make it more competitive.

Instead of considering a wholesale move to the cloud for ERP, the strategy that many IT leaders are taking is a targeted approach, focusing on areas that drive competitive advantage, and it pays to be at the leading edge. Look at using cloud components where your ERP vendor doesn't have the best-in-class solution for requirements that are important for your business. The most likely candidates are systems of engagement that support interactions with suppliers and customers.



No matter what technical migration tools the vendor offers, there is no easy way to implement SaaS ERP. Moving from one ERP product to another solution is a “rip-and-replace” endeavor, with the typical risks, costs and organizational change and disruption that accompany enterprise-level projects. Vendor hype that tries to make moving to SaaS ERP sound easy focuses mostly on technical installation activities, glossing over a wide range of challenges. Examples of these include:

- **The need to standardize business processes, configurations and data in order to fit into the SaaS product:** A foundational principle for SaaS is that the vendor’s standard solution can be used by many customers. For this to work, enterprises that have global standard processes must be able to further standardize on the vendor’s standard rather than on an enterprise-driven standard. Enterprises that have custom processes should ask whether there is value in moving to standard processes if they spent the last several years customizing them to best suit the business needs.
- **Addressing integration requirements to glue loosely coupled solutions together:** SaaS ERP products don’t contain the unique capabilities that are available in existing ERP solutions. Alternate solutions must be built or bought to satisfy the extra requirements, creating a need to integrate the portfolio. Integration and data management experts will be needed to ensure data integrity across the solution portfolio.
- **Rationalizing (and then replacing or retooling) customizations that are necessary but not delivered with the SaaS solution:** The effort to identify, understand and assess the need for existing customizations is directly proportional to the number of customizations owned. For some enterprises, this won’t be an issue but for highly customized ERP deployments, this activity alone can make a move to SaaS ERP prohibitive. Similar to the standard process question, assess the value (or harm) of eliminating customizations that are needed to meet business requirements. Of course, customizations that are outdated or don’t provide business value should be eliminated regardless of roadmap direction.

All of this can translate to years of project work and associated financial burden which aren’t feasible, particularly when there is little perceived business improvement for the disruption involved. At the end of the journey, assuming you successfully make the move to SaaS ERP, being able to post journal entries or record an employee transfer in the cloud versus doing so in the existing ERP solution doesn’t make the business more productive. Unsuccessful SaaS ERP deployments or making a decision to stop a SaaS ERP migration mid-project will be problematic for enterprises that forfeit their licenses in a “license-to-subscription” swap deal.

# The Route Your ERP Roadmap Takes Depends on Your Ultimate Goal

The Vanson Bourne innovation study looked at the priorities driving businesses to change<sup>4</sup>. The top three motivators were digital transformation, business improvements and cost savings (figure 3).

## Your Ultimate Goals Should Drive Your ERP Roadmap

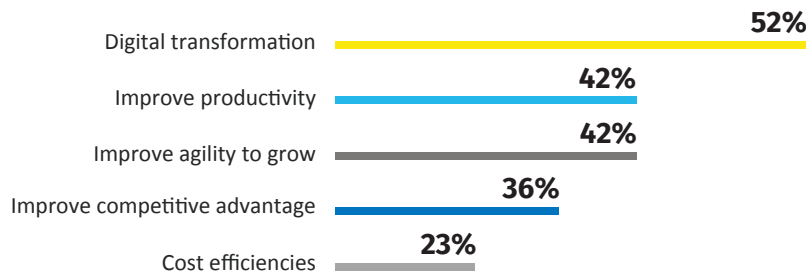


Figure 3. Goals Should Drive Your ERP Roadmap

Source: Vanson Bourne, June, 2018

**If moving to the cloud is geared to business improvements (such as improving productivity, growth or customer loyalty):** SaaS ERP can make sense in a limited range of scenarios, but for most large enterprises considering SaaS ERP is premature for now. Many Oracle and SAP customers with complex business requirements can't reroute their ERP roadmaps to include a move to SaaS ERP immediately. For these customers, a decision to move to SaaS ERP would be a rip-and-replace effort, including stripping out unique requirements and customizations and sourcing these in alternate ways, driving up the total cost of moving to SaaS.

One of the selling points of SaaS is a low cost of entry. However, many SaaS ERP solutions are functionally immature. Trying to force-fit complex requirements into a SaaS product can be cost-prohibitive. Worse still, it can compromise the integrity of the total solution, making it unacceptably risky. Some SAP and Oracle customers' "must have" functionality (such as industry-specific features) found in the established ERP solutions is not available in the vendors' SaaS ERP offerings. Certain functionality may never be available in their SaaS offerings. To make matters worse, there is less opportunity to customize a SaaS solution.

<sup>4</sup> "The State of Innovation," Vanson Bourne, June, 2018 <https://www.riministreet.com/the-state-of-it-innovation-priorities-and-challenges>

For enterprises that can operate within the functional scope and standardization constraints of the SaaS model, the ERP roadmap may include completely replacing the existing ERP solution. Most enterprises have a significant investment in their existing ERP solutions. Software licenses are an asset that is forfeited when moving to a subscription model. Also, unlike owned licenses, when you stop paying your subscription, you lose access to the system. Be sure to include off-boarding protections in your SaaS subscription agreement.

Although moving from a CAPEX to an OPEX model can be a good business move, it will require up-front funding and the existing ERP deployment will need to be maintained during the transition. The technology shift will not necessarily result in measurable business operations improvements.

**If moving to the cloud supports digital transformation:** Enterprises engaged in transformation want to adopt new technologies and new ways of working, and they want these things quickly. If your goal is transformation to achieve business goals, rethink your definition of ERP and the route you want it to take.

For many enterprises, the definition of ERP is that it's a one-stop shop for all back-office functionality. Their ERP solutions have been customized to meet the business needs and are not able to change quickly. There is very little vendor-delivered functionality that supports transformation or innovation in deployed ERP solutions. Attempting to enable transformation via the ERP solution puts a burden on IT to further customize ERP. When faced with this added burden, the business is unwilling to wait for IT to deploy new capabilities.

Just as important, further customizing the existing ERP solution is not the right way to deliver new capabilities such as mobility or business intelligence. Even where ERP vendors provide some functionality for innovative capabilities, these are often limited in scope and won't be the best fit.

Counter these issues by adopting a corporate-wide technology strategy that preserves your custom-fit ERP solution with its embedded integration and slow-to-change profile and at the same time harnesses the willingness of the business to innovate around the edges of ERP (figure 4).

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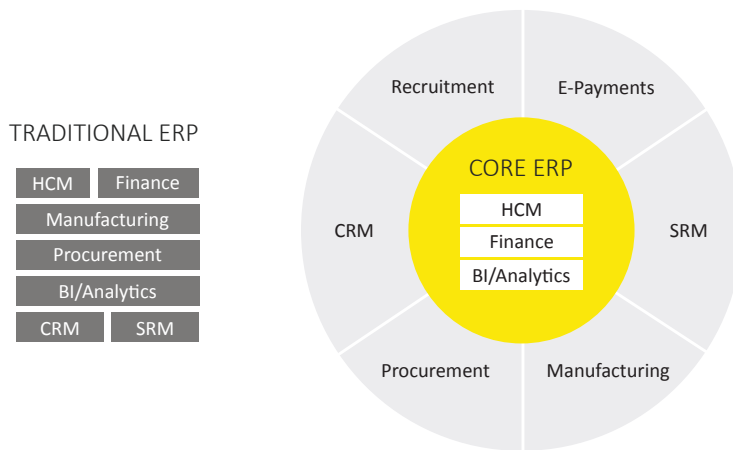


Figure 4. Digital Transformation May Redefine ERP

Source: Rimini Street July, 2018

Use PaaS integration tools to glue the static ERP and dynamic edge solutions together. The goal is to balance the cost of integration against the business flexibility gained by having differentiation and innovation happen outside ERP. This is not a return to the old best-of-breed days, because ERP is still a tightly integrated single solution. Rather, it is a right-sizing that allows ERP to perform as originally designed and allows IT to better support transformation.

While you wait for the ERP cloud market to mature, you still have opportunities to adopt a cloud strategy. You can take the IaaS route described earlier or use SaaS for systems of engagement rather than for ERP, which is a system of record. Each of these options results in a hybrid ERP environment that allows you to keep the ERP solution in place. On this route, you may save money on infrastructure and get more life out of your ERP investment. You can modernize ERP over time to enable integration with cloud technologies that have touchpoints with ERP — for example, making data available to real-time analytics.

**If the business’s critical priority is lowering ERP costs:** SaaS ERP may be able to reduce risks associated with frequent change but that won’t necessarily result in lower total cost of ownership (TCO). SaaS ERP implementations can be as costly as internal deployments, particularly where integration is needed for a hybrid environment or customization is needed to achieve full functional fit.

Over five to seven years, SaaS TCO can exceed ongoing license and maintenance fees. Costs for some vendors can be far more than for others. A recent Piper Jaffray & Co. company research note stated that for Oracle Cloud, “recent checks suggested that the cost of implementation can be 2x-3x a competitor deployment on the HCM side.”<sup>5</sup> Oracle CEO Mark Hurd has repeatedly justified his company’s cloud moves to investors by explaining that Oracle stands to triple<sup>6</sup> its annual recurring revenue from customers who move to the cloud. Be prepared for SaaS ERP vendor negotiations to be more difficult than licensed software at renewal time because you can’t easily switch from one SaaS ERP vendor to another.

For SAP and Oracle customers, moving from the licensed products to their cloud offerings creates a new type of vendor lock-in risk. Oracle Cloud Services (OCS) and SAP Hana Enterprise Cloud (HEC) represent a maintenance lock-in that isn’t present with licensed software. In the case of SAP, HANA also creates a technology lock-in. SAP and Oracle are also targeting customers who have hardware refresh needs. They push an alternative that avoids hardware costs — but in return demands an indefinite commitment to their cloud services.

A move to SaaS for specific best-in-class functionality provides an opportunity to deleverage your lock-in exposure with these vendors. However, the resulting hybrid ERP environment can be more costly to support. Although a SaaS vendor takes on some technical services, new support requirements are created for the internal team. Integration support and service management are other examples of where costs can increase.

Instead of looking at SaaS ERP, get off the vendor-driven upgrade path and maximize the ERP asset that you own. Upgrades and reimplementations are expensive. Even though Oracle and SAP have announced extensions to end dates of their premier support policies, they are providing minimal functional improvement to their license-based products. The bulk of their R&D dollars is going into their cloud solutions. If you decide to stop doing upgrades, the question becomes whether ongoing payments to the ERP vendor are driving sufficient value.

Managed services is another cost-saving option if you manage your ERP software internally. Use a third party to operate the system. This frees up internal resources for innovation efforts and avoids the disruption of switching ERP solutions.

<sup>5</sup> Piper Jaffrey & Co. company research note dated February 14, 2018

<sup>6</sup> “Bold Claims In Oracle’s FY18 Q2 Earnings,” UpperEdge, Jan. 24, 2108 <https://upperedge.com/oracle/bold-claims-in-oracles-fy18-q2-earnings/>

## A Roadmap Reroute Needs to Consider Tradeoffs

Regardless of the route your enterprise applications/ERP roadmap takes, examine topics such as funding, risks, and support roles/responsibilities to understand tradeoffs of the route change.

- Include factors such as ROI and maturity of the cloud products and services when making decisions about what to move to the cloud and when to move it.
  - Decision-makers must weigh the pressure to move to the cloud now against waiting for cloud products to mature and provide a better fit. For SaaS specifically, are the cloud solutions mature enough to support your business? Is it likely that the products will mature if you defer the move? Also, look at the value of going to the cloud now given potential costs to fill functional gaps that may be resolved in future product releases.
  - Will moving infrastructure to IaaS and perhaps using PaaS satisfy a “move to cloud” mandate?
- Moving ERP capability to the cloud/SaaS increases agility but is it worth the increased complexity? As the number of vendors increases, there are more moving parts, each of which has its own change cycle.
  - You will need a maestro to compose the full applications architecture, middleware and infrastructure solution, and manage it as it evolves. Expand the solution architect role in order to address the broad range of technologies and services involved.
  - Orchestrated integration will increase in priority as more solutions comprise the portfolio. This includes data, process and device integration. Automated integration tools and enterprise-wide integration standards and processes will be necessary. Mulesoft is an example of a vendor that supports these activities. You might also need to stand up an integration competence center.
- IT leaders with flat IT budgets must choose between spending scarce funds on ERP operations versus shifting funds to investments in innovation.
  - If business transformation initiatives are on the back burner due to a lack of funding, ERP cost optimization (reducing vendor maintenance fees) can free up funds for transformation.
  - Assess whether losing license investments is worth converting licenses into subscriptions. Low up-front costs for moving to the cloud can seem attractive but must be weighed against total ownership costs (TCO) for the benefits gained. Particularly for SaaS, additional costs such as integration, customization and organizational change should be factored into cloud TCO calculations.

- Innovation requires human resources. IT leaders with headcount constraints must make a tradeoff between staffing ERP operations versus staffing innovation projects.
  - ERP cost optimization can be a means to free up internal staff to work on new initiatives and gain new skills.
- When roadmap changes result in a hybrid ERP environment, the merits of supporting the components individually must be weighed against using a unified approach to support.
  - Support will likely need to be bimodal — mode 1 for the core ERP solution that must change in a structured rigorous manner, and mode 2 for innovative solutions that follow an agile development model. Each mode has its own methodology, governance and required skills.
  - Managed services must occur in harmony with each other and with supporting internally deployed solutions. Once established, unified support provides a more holistic, synchronized outcome across vendors and service providers.

For most, the cloud is a non-optional force that is going to impact the business and IT. The cost of doing nothing about it far outweighs the tradeoffs that must be considered. Look closely at each area where the cloud might serve a purpose — assess whether an alternate route should be taken in the short- or near term while the market matures.

# NOTES

## **Note 1: Machine Learning (ML)**

This technology uses algorithms to parse data, learn from it and then make a determination or prediction from it. For example, Uber and Lyft use ML to determine the price of your ride.

## **Note 2: Internet of Things (IOT)**

Per Gartner<sup>7</sup>, the IOT is the network of physical objects that contain embedded technology to communicate and sense or interact with their internal states or the external environment. Dunkin' Donuts is a digital transformation example where the IOT was leveraged to transform its cardboard menu boards into digital signage for real-time delivery of marketing content tailored to individual stores, geographies and customers.

## **Note 3: Blockchain**

Blockchain is a digital ledger technology for storing and recording transactions in a way that can't be hacked or otherwise compromised. An example is a blockchain-based system that allows a patient's electronic health records (EHR) to be securely available across participating healthcare providers. The commercial value of blockchain will lag behind ML for most enterprises until they understand the concept and test how to translate its value into business improvement opportunities.

<sup>7</sup> <https://www.gartner.com/it-glossary/internet-of-things>



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