



Fintech: Choosing a Cloud Services Provider

INSTRUCTOR'S MANUAL

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CASE SYNOPSIS

The CIO of Fintech – provider of a billing-and-payment processing service for alcohol distributors and retailers – wants to get experience using the cloud to host a new service for Fintech clients. The planned service will make a copy of transaction data selectively available to alcohol distributors and retailers (with security controls that ensure each client can only access their own transaction data, for their business analytics initiatives). The CIO is cautiously optimistic that this service will be both beneficial and secure. He believes it will be a useful first step for his company to take before moving other resources and services into the cloud. His staff briefs him on three cloud service providers: Amazon, Google, and Microsoft. Each provider offers services which fit Fintech's requirements, yet with important differences.

The case is framed at the moment when the CIO (Joe Kwo) feels he should choose a provider. Kwo recognizes that once he makes this decision, he also needs to consider how to minimize risks (including risks the provider brings, and other risks) that could jeopardize Fintech's relationship with its clients. Students have an opportunity to select a provider based on information provided in the case, and the instructor can exercise other options, such as:

- 1) After eliminating one vendor, and considering strengths and weaknesses of the vendor selection process, the instructor can ask students to recommend other steps Kwo should take before making a final decision.
- 2) Students can be asked to offer recommendations for mitigating risks associated with particular providers.

The Fintech case addresses the perspective of a company *purchasing* cloud computing services, as opposed to a vendor *selling* cloud computing services. It offers the added benefit of describing an important specialist intermediary in the highly regulated and complex US alcoholic beverages industry.

TARGET COURSES & LEARNING OBJECTIVES

This case is primarily designed for an MBA course on *Strategic IT Management*. It assumes students have introductory-level knowledge of relational database systems and cloud computing (e.g., student can define public, private, or hybrid cloud). Or, the case can be paired with suitable background readings on relational databases/ business analytics and/or cloud computing, or assigned after these topics are covered in the course.

This IM focuses on its use in the MBA *Strategic IT Management* course, but it can also work well in several other contexts. At the end of this instructor's manual we describe one author's experience teaching it in an undergraduate IS majors capstone course (*Managing Information Resources*) at an American public University, and a similar course at a private university in Peru. We also describe other instructors' experience with it in an executive DBA class and an MBA *Strategic IT Management* class.

After working this case, students should be able to:

- Consider technical, economic, operational and strategic factors when making mission-critical decisions involving new IT initiatives (such as, in this case, moving a customer-facing service to the cloud).
- Recognize that cloud services fall on a continuum, including end-user facing SaaS cloud applications (e.g., gmail, Dropbox) and those used by/delivered in cooperation with IT professionals (IaaS, PaaS)
- Evaluate a vendor selection process and offer suggestions for improvements.
- Consider contractual and relationship issues in working with a new software or hardware vendor on a development or implementation project (introduction to vendor management).

RESEARCH METHODS

One author is an IT consultant who has worked with Fintech on several projects, including advising on cloud computing. So, the research method is characterized as a case study with participant-observation. Three semi-structured interviews were conducted with CIO/EVP Joe Kwo. At his request interviews were not recorded; the interviewer took extensive notes. In follow-up e-mails, Kwo offered clarification and answered new questions. One author also participated in IT staff meetings. A Non-Disclosure Agreement (NDA) signed by the first author prevents the authors from disclosing some specific proprietary details observed during meetings and in e-mails.

THEORETICAL LINKAGES

CIO Joe Kwo believes it is time to choose a provider. Based on information provided in the case, students can consider strengths and weaknesses of Fintech's vendor selection process, and recommend other steps Kwo should take, both before selecting a provider and after a provider is chosen. The instructor can also guide students to begin to consider vendor management challenges, such as getting a relationship with a cloud services provider off to a good start and subsequently managing the relationship.

There is no "right" answer as to the provider choice; this case offers strong evidence favoring each of three providers under consideration. Some instructors may recall that in the Mainframe computing era of the 1960's and 1970's, a common refrain was "You'll never get fired for hiring IBM." IBM was not the lowest-cost vendor, but it had a great reputation and huge market share, so was viewed as a safe choice. Today, all three providers presented here can be seen in that light. As discussed more fully below, Amazon is an easy choice because of its placement in Gartner's Magic Quadrant *Leader* box. Microsoft has been selling software to business customers for many more years than Amazon, and is close behind Amazon in the *Leader* box. Google (now under the umbrella of Alphabet, Inc.), a company which dominates search, successfully launched many lines of business and is much admired. No cloud service provider is a slam-dunk winner and no company should be quickly eliminated from contention.

In addition to considering vendor selection issues, the case fills an important role by giving students an opportunity to consider cloud computing from four important perspectives:

- Continuous IT Evolution and the Double-Edged Sword of IT
- Cloud Computing Opportunities and Challenges
- External Opportunities and Threats Influence IT Adoption Decisions
- Introduction to Vendor Management

Continuous IT Evolution and the Double-Edged Sword of IT

Organizations continuously confront new technology-driven opportunities and risks as enabling hardware and software technologies continue to evolve. Any IT (whether new or ongoing) brings both benefits and challenges. Cloud computing is but one important example of business change enabled by rapidly-evolving technologies that CIOs closely monitor. Other rapidly changing technology contexts in 2016 include internet of things (IoT), social media, and learning systems (such as those powering IBM Watson and self-driving cars).

In the MBA *Strategic IT Management* course these are central challenges that students consider over several class sessions. They learn about Moore's Law and its implications (CPU performance doubles approximately every 18-24 months. Faster computational speed enables more complex software which in turn enables powerful and complex new software applications). Students learn about other fundamental advances, such as new software development technologies and methodologies (especially agile), new types of data capture, storage and analytics, advances in artificial intelligence, mobile applications, social media, IoT, and of course, cloud computing. For each new type of hardware, software, networking or database, students learn, the path to fulfillment is strewn with rocks. To use another metaphor, IT is a *double-edged sword* that brings the potential for both good outcomes from its use and unanticipated harmful outcomes (many of which can be avoided through planning and oversight).

If being a first mover was unequivocally the right thing to do, every company would move fast to adopt every IT innovation. However, new hardware and software technologies and applications do not always behave as predicted or hoped, and also companies' ability to exploit them for business value varies. Some first movers do attain a competitive advantage, while others find themselves on the "bleeding" edge when they hoped to be leading edge. Many things can go wrong when working with unfamiliar technologies, so it is wise to try to anticipate pitfalls before making large investments in them. For this reason, many large organizations establish separate organizational units devoted to experimentation with and evaluation of emerging technologies¹. To learn more about a technology before making a major commitment to it, some organizations conduct one or more pilot tests/studies to assess technical, operational, and economic challenges^{2 3}.

Through discussing the Fintech case MBA students should come to appreciate that a CIO needs to be aware of potentially-valuable new IT, and prepared to wrestle with new challenges that each new technology will bring. Exhibit IM-1 summarizes key points about Continual IT Evolution and the Double-Edged Sword of IT.

Cloud Computing Opportunities and Challenges

Cloud is an example of a rapidly-evolving set of technologies and applications, and moving to the cloud continues to be a major preoccupation for CIOs and CEOs. So, implementation of a new cloud service can be seen as an instance of a general theory of Continuous IT Evolution, with the dual opportunity/challenges of the Double-Edged Sword of IT. The cloud is a compelling opportunity based on two key factors: *pay-as-you-go* (transfer the capital expense of owning hardware and software to a lower and more predictable operating expense) and *elasticity* (much easier and less expensive to scale up or down in the cloud, in response to a surge or drop in demand for a service)⁴. Providers contend that since they specialize in cloud computing they have stronger expertise than most of their customers. Providers also have scale economies

¹ see Cash, Earl, Morison, Teaming up to crack innovation and enterprise integration, *Harvard Business Review* November 2008

² Gogan, Baxter, Garfield, Usoff. Pilot-testing an inter-organizational system to reveal relational feasibility issues. *Engineering Mgt Journal* 23(2): Fall 2011.

³ Gogan and Rao. When vendors participate in pilot test projects: Pitfalls and challenges. *Engineering Management Journal* 23(2): Fall 2011).

⁴ *What every CEO needs to know about the cloud*, Andrew McAfee, *Harvard Business Review*. Nov 2011, Vol. 89 Issue 11, p124, 9 p

that most companies could not imitate. The case mentions these characteristics. A 2017 Gartner report, “Magic Quadrant for Business Intelligence and Analytics Platforms⁵” states:

“For the past three years, interest in deploying BI and analytics platforms in the cloud had been hovering around 45% of customer reference survey respondents for this Magic Quadrant — with the greatest interest coming from lines of business. In this year's survey, active and planned cloud BI deployments jumped to more than 51%, with much of this shift in interest coming from IT respondents. Most BI and analytics platform vendors are now responding in a significant way: with a range of cloud deployment and subscription pricing model options, and different degrees of support for leveraging the on-premises investments that buyers have already made.”

External Opportunities and Threats Influence Adoption Decisions

In the MBA Strategic IT Management course, students are advised to look at all cases through the Resource-Based View (Strengths and Weaknesses portion of a SWOT analysis: identify each company's general and IT-related assets and capabilities that contribute to their profitability, and weaknesses that constrain it) and an environmental analysis (Opportunities and Threats portion of a SWOT analysis: identify positive and negative external political/regulatory, economic, social, and technical pressures). SWOT analysis provides a foundation that helps students understand strategic IT alignment (ideal – and temporary – state when all company IT assets and capabilities fully support the business strategy and operations and complement non-IT assets and capabilities).

The Fintech case provides some pertinent information for a partial SWOT analysis, but our focus in planting clues was primarily to provide sufficient context for students to recognize that the alcoholic beverages industry brings an interesting and unique set of competitive and regulatory pressures. Here, we briefly describe a few key aspects.

Fintech strengths: Strengths include their reliable EFTPS transaction processing system, which is the engine that drives the business, their versatile IT staff, and Kwo's ability to work effectively with external consultants.

Fintech weaknesses: Some students might criticize Fintech for not having moved earlier into the cloud. Other students might criticize Kwo for relying too heavily on published information in the vendor evaluation process (see Introduction to Vendor Selection and Management, below).

External Opportunities: The case implies that Fintech continues to have opportunities for growth, given that the US alcoholic beverages industry has grown from \$177B in 2006 to about \$220B in 2015. Fintech processes “more than \$20B in payments per year”. Students might bring up the topic of internet alcohol sales, but this topic is not covered in the case, given our focus on vendor selection rather than a full treatment of this company's competitive strategy (in fact, Fintech did not give us permission to discuss specific competitors or their initiatives).

External Threats: Data in the case allows students to recognize that Fintech does not dominate alcoholic beverages transaction processing (at best it has a 10% share, given numbers in case). So, although we were not permitted to discuss competitive issues students can assume competitive pressures. The case is more explicit about the complex regulatory environment, which works in Fintech's favor by creating entry barriers (a new entrant would, like Fintech, have to obtain permissions in each state where they would operate. Each state has a different set of applicable laws, regulations and procedures).

A full SWOT analysis would also include technical opportunities and threats. These are alluded to in the discussion of “Cloud Computing Opportunities and Challenges” (above), but again, this is not the focus of this case.

⁵ *Magic Quadrant for Business Intelligence and Analytics Platforms*. Sallam, Howson, Idoine, Oestreich, Richardson, Tapadinhas, 16 February 2017, ID: Gartner G00301340, page 3.

Introduction to Vendor Selection and Management

CIOs select and work with software and hardware vendors and external service providers. By considering the steps Kwo and his people took to compare three cloud service providers (Amazon, Google, Microsoft), students can consider technical, operational, and economic criteria that should influence the provider selection process (such as referring to industry reports, developing use cases, and contacting cloud services providers' happy and unhappy customers), and identify specific evaluation techniques that were used.

Students can also begin to consider how to work effectively with a chosen service provider. In a much-cited classic marketing article, Barbara Jackson (1985) explains that when business customers and vendors have different expectations, one or both parties will be disappointed. An owner of a small bakery might view white flour as an undifferentiated commodity which can be purchased from many different sources. She does not seek to “marry” a particular flour distributor in a long-term deep relationship. Instead, as long as quality requirements are met, the owner focuses on price. The flour supplier might offer incentives that induce the customer to buy a larger-than-needed quantity in exchange for a discount. Jackson refers to this as reciprocal “transaction” focus.

On the other hand, a technology-based company like Apple -- which produces complex products comprised of components sourced from multiple suppliers -- may establish a long-term “relationship” with some key material or components suppliers. A company might send some of its engineers or analysts to suppliers' premises, or invite supplier employees to visit its facilities, in order for the two companies to work together on initiatives to reduce costs, improve product quality, timeliness of delivery, or other aspects.

Thus, business customer expectation (transaction vs relationship) can be juxtaposed against vendor expectations. If both parties want a reciprocal transaction, they negotiate terms on a short-term basis. If both want to build a long-term relationship, the customer might accept higher unit prices and negotiate for contractual terms that specify how each party will coordinate with one another to co-create value and (hopefully) reduce total cost of ownership (despite a higher unit price). Similar principles apply with IT sourcing decisions. For this reason, several influential papers have proposed that managing long-term relationships is a “core capability” for the CIO.⁶

Having briefly described four perspectives that can inform the case discussion, we next offer a discussion per the Suggested Student Preparation Questions.

SUGGESTED READINGS TO ACCOMPANY THE CASE

1. McAfee, A. What Every CEO Needs to Know about the Cloud, *Harvard Business Review*, November, 2011. We continue to assign this in *Strategic IT Management*. When a more-recent similarly strong practitioner article is published, we recommend replacing this one.
2. The case quotes a January 2016 *CIO* article by Thor Olavsrud (Eleven Cloud Trends that will Dominate 2016”), which, paired with the McAfee article, helps students recognize current cloud opportunities and challenges. It does not provide a tutorial on advantages and challenges of cloud computing (which the McAfee article does).
<http://www.cio.com/article/3026527/cloud-computing/11-cloud-trends-that-will-dominate-2016.html>
3. Froehlich, A., “Eight Cloud Computing Predictions for 2016.” *InformationWeek* (12/23/2015). This short online annotated slide show, also noted in the case, can also be assigned:
http://www.informationweek.com/cloud/infrastructure-as-a-service/8-cloud-computing-predictions-for-2016/d/d-id/1323598?image_number=1

⁶ See for example: N. Levina and J. Ross. From the vendor's perspective: Exploring the value proposition in IT outsourcing. *MIS Quarterly* 27(3): 331-364, 2003; D. Feeny, M. Lacity and L. Willcocks, Taking the measure of outsourcing providers. *MIT Sloan Management Review* 46(31): 41-48, 2005; and D. Mani, A. Barua and A. Whinston. Successfully governing business process outsourcing relationships. *MIS Quarterly-Executive* 5(1): 15-29, March 2006)

DISCUSSION/PREPARATION QUESTIONS

1. Joe Kwo recognizes that the cloud offers both opportunities and risks.
 - a. How would a move to the cloud make it easier and/or more profitable for Fintech to provide large volumes of selected data to its clients?
 - b. What technical challenges does Fintech face in offering the new service?
 - c. What business challenges does Fintech face in offering the new service?
2. Assume Joe Kwo must choose a cloud services provider. Based only on information provided in the case, which provider should Kwo choose? Why? You will need to compare and contrast the three providers' offerings in detail, and prepare to discuss technical and business implications of their similarities and differences.
3. For each provider (Amazon, Google, Microsoft), identify specific risks, and prepare to offer specific suggestions for launching, running, and managing the proposed new service if that provider is chosen.
4. Evaluate strengths and weaknesses of the provider evaluation process described in the case. What useful steps were taken? Do you see any problems?

ANALYSIS & RESPONSES TO DISCUSSION QUESTIONS

1. **Joe Kwo recognizes the cloud offers both opportunities and risks.**
 - a. **How would a move to the cloud make it easier and/or more profitable for Fintech to provide large volumes of selected data to its clients?**
 - b. **What technical challenges does Fintech face in offering the new service?**
 - c. **What business challenges does Fintech face in offering the new service?**

This question addresses the issue of Continuous IT Evolution and the Double-Edged Sword of IT. As CIO/EVP, Joe Kwo needs to consider cloud computing as both a general manager and an IT manager, in the face of continuous business and technical change. By considering how Kwo approaches cloud computing, students begin to develop a sense for the challenge of technical change more broadly. The instructor can ask *Why is Kwo interested in offering a new cloud-based service to Fintech clients?* Students might respond that many companies are moving to the cloud. It is likely that some Fintech competitors are doing so and also that some clients are eager to have cloud-based access to their data so they can do a better job of analyzing their own operations.

By moving to the cloud, Fintech can offer this new service with less financial risk than going it alone. While there will be startup costs associated with carefully analyzing security requirements, conducting tests, and launching the new service, Fintech will avoid investing in hardware and most of the software that would otherwise be required if they did not use a cloud services provider. So, the company should be able to quickly reach break-even on this service, after which it will generate profits (unfortunately the company was unwilling to reveal their plans for pricing this service to its retail and wholesale clients, so we cannot provide break-even calculations here).

After recording a few student ideas, the instructor can push students to explain further: *What is it about the cloud that is attractive to so many companies?* Students will likely speak to issues (described above) of replacing the burdensome capital expense of owning hardware and software with a predictable (and more fully tax-deductible) monthly expense, as well as the elasticity of a rented solution (ability to easily and quickly scale up or down).

This can be a good moment to discuss Gartner's "Hype Cycle" methodology (Exhibit IM-2). To verify students' understanding, ask students to describe some indicators that Gartner would use to plot the position of an emerging technology on the basic Hype Cycle template. Case Exhibit 4 includes this descriptive template and its 2015 Cloud Computing Hype Cycle. This helps students recognize that cloud computing

is a bundle of related tools and applications, each adopted by organizations at a different pace, over time.

The instructor can help students understand the Hype Cycle's Peak of Inflated Expectations versus the "Trough of Disillusionment" – the point in time when news stories shift from glowing better-than-sliced-bread testimonials to darker stories about problematic implementations, unexpected problems and so on.

OPTIONAL SIDEBAR: *Hype Cycle and the Diffusion of Innovations Curve*

The instructor can compare the Hype Cycle with Everett Rogers' S-shaped Diffusion of Innovations curve Exhibit IM-3), which describes the path of an innovation's adoption by individual or organizational *innovators*, then *early adopters*, early and late *majority*, and *laggards*. This is an optional complementary topic to discuss (see a helpful Wikipedia tutorial: https://en.wikipedia.org/wiki/Diffusion_of_innovations).

The instructor can ask students to classify the firm (most will debate whether it is in the early or late majority; Fintech is definitely not an early cloud computing adopter).

Ask: *What are the risks of being either an innovator or in the late majority?*

Students should also mention issues related to the possibility that one or more competitors will gain experience in the cloud earlier than Fintech, and thus "steal" some Fintech clients (see sidebar: *Is the Cloud a Disruptive Technology?*). If students don't bring this up, the instructor can remind them that a choice to do nothing also has business ramifications. Should a Fintech competitor offer a cloud based data analytics solution before Fintech launches theirs, Fintech may fall behind in the race for new retail and wholesale clients, and some of their existing clients might leave Fintech. Exhibit IM-4 summarizes this phenomenon.

If Fintech does not gain extensive experience with cloud computing, perhaps a competitor will do so, and capture some of Fintech's existing or targeted customers by offering a similar cloud-based service earlier or executed better. The instructor can also help students see a counterpoint to this last statement: *An advantage of being a late adopter of a new technology is that a company may have a better opportunity to build on the experiences of early adopters who confronted various technical and business challenges.*

Regarding technical challenges: The Electronic Fund Transfer Payment System (EFTPS) "*processed about 1.5 million alcohol transactions per day ... more than \$20 billion in payments per year*". This translates into about 4 billion transactions per year (given 260-265 business days per year). Fintech was founded in 1991, weathered the Great Recession, and has been growing (we are not permitted to state recent rate of growth, but reader can assume growth has accelerated). Thus, a cloud services provider will need to be able to process a lot of Fintech data and be able to scale up as the company continues to grow.

OPTIONAL SIDEBAR: *Is the Cloud a Disruptive Technology?*

The challenge of IT evolution can be addressed by reference to Clay Christensen's Disruptive Innovation theory*, which proposes that an emerging technology underperforms a competing technology on familiar dimensions, yet also provides valuable new functionality. Over time, a disruptive technology overtakes the familiar technology on both traditional and new functionality. Organizations that successfully recognize the potential of a disruptive technology, and start experimenting with and learning about it earlier than others, may be able to achieve stronger profits than less nimble competitors.

The instructor can use the Fintech case to introduce the concept of disruptive technologies, or to reinforce students' understanding of this theory. Since a Strategic IT Management class would normally include several cases with disruptive technology implications, we label this sidebar "optional."

*Christensen, C.M. (1997), The Innovator's Dilemma: When New Technologies Cause Great Firms to Fail. Harvard Business School Press.

Another important technical challenge is security. Kwo and his team apparently have a very good track record for operating EFTPS with excellent security, but do not yet have a track record for providing a secure cloud-based service. The vague descriptions for each provider's security stance are red flags that should worry Kwo. Ask students: *We agree on why Joe Kwo wants to get into the cloud; what might he worry about in the cloud?* Students will mention security concerns (such as *Twelve Threats* mentioned in the case.⁷) Cloud services providers contend that because they specialize in cloud services, they offer the most secure solutions. Many experts agree with this point of view. However, the Cloud Security Alliance (mentioned in the case) is somewhat less sanguine.

In a one hour, 20 minute class there is not sufficient time for the instructor to walk students through all twelve cloud security threats. The instructor can, however, note that many items on this list have threatened organizations' information assets for quite some time. For example: greedy or disgruntled employees ("malicious insiders") have long been security threats. A famous malicious insider was Nicholas Leeson, whose fraudulent online trades led to the demise of his employer (Barings PLC). Another example: Denial of Service (DoS) attacks continue to occur on a regular basis, but the first Distributed Denial of Service attack (DDoS) was the Morris Worm, in 1988. Information security threats – perpetrated on proprietary networks or via the Internet, existed before the terms "cloud computing" and "cloud service provider" were coined.

The instructor could focus on Threat 12, which does not have a long history: Shared Technologies, Shared Dangers ("Cloud service providers share infrastructure, platforms, and applications, and if a vulnerability arises in any of these layers, it affects everyone."). This concern is backed up by studies of the problem of "correlated failures" (not defined in the *Twelve Threats* article, but important for the instructor to know): A company (including a cloud services provider) that adopts a standard hardware and/or software configuration, shares common vulnerabilities with other adopting organizations, leading to "correlated failures": attackers identify a weakness in one organization's standard implementation and then exploit it in others' systems, compromising an entire network.⁸

Scalability and security challenges arise from technical considerations, with business implications. If a system does not scale quickly and reliably, it can disappoint Fintech customers, whose appetite for data may grow rapidly as they see benefits from insights achieved in their new data analytics initiatives. If security issues arise, the consequences can be far-reaching in terms of lost customer trust and a damaged reputation. This represents a very sharp "blade edge" on the Double-Edged Sword of IT.

Other External Opportunities and Threats: We hint at economic opportunities and threats in the brief discussion above about likely competitor moves. The instructor can ask students to consider the socio-political and regulatory environment. US alcohol sales reporting is complex; this industry is governed state by state. The instructor can check students' understanding about state-by-state regulatory and reporting complexity by briefly referring to regulations imposed with the repeal of Prohibition, asking: *Why did the case mention the repeal of Prohibition?* US students should recall from high-school history classes that Prohibition began in 1920, thanks largely to the women's Temperance movement (at-home women frustrated that much of their husbands' paychecks went to drink, and concerned about the relationship between alcohol abuse and domestic violence) joining with the right-to-vote Suffragette movement (unfair that a drunk man could vote but a sober woman could not)⁹. During Prohibition organized crime moved in and bootlegging was widespread (the instructor can refer to TV mini-series depicting this era, such as *Boardwalk Empire* and *Z: The Beginning of Everything*). Exhibit IM-5 (which some instructors will find

⁷ FY Rashid. The dirty dozen: 12 cloud security threats. *InfoWorld* 3/11/2016.

<http://www.infoworld.com/article/3041078/security/the-dirty-dozen-12-cloud-security-threats.html>

⁸ P Chen, G Kataria, R Krishnan. Correlated failures, diversification, and information security risk management. *MIS Quarterly* 35(2): 397-422, 2011.

⁹ D Okrent. *Last Call: The Rise and Fall of Prohibition*. Scribner, 2010. Note: PBS aired a Ken Burns documentary on Prohibition, drawing on Okrent's history.

useful as a focusing tool) has images of historical documents from December 1932 when the Eighteenth Amendment of the Constitution was repealed (reversing Prohibition, effective January 1933). Caution: this is an interesting topic but not central to the case's focal issue of provider selection.

- 2. Assume Joe Kwo will choose a cloud services provider today. Based only on information provided in the case, which provider should he choose? Why? You will need to compare and contrast the three cloud services providers' offerings in detail, and be ready to discuss technical and business implications of those differences.**

Students recommending Amazon will likely mention that Gartner proclaimed AWS the Leader¹⁰. Amazon offers the best price. Students might mention "documented case studies" on Amazon's web site (Coinbase, FINRA, Nokia, NTT Docomo), but other students should counter-argue that these "cases" illustrate Amazon's marketing expertise but probably downplay challenges that these and other AWS customers faced. In 2017, students who follow the news might be less likely to jump on board with Amazon, because of a high-profile AWS outage in February 2017 (AWS shut down unexpectedly and remained down for five hours. Initial reports speculated that the outage was perpetrated by malicious attackers, but Amazon reported that human error was the cause)¹¹. Students with deeper technical backgrounds and/or those who choose to read the Gartner report might mention two use cases discussed in that report and relevant to Fintech -- batch computing and cloud-native applications. Gartner's "batch computing" use case describes "*data analytics and other one-time (but potentially recurring), short-term, large-scale, and scale-out workloads*". Gartner's "cloud-native applications" use case assumes "*that resilience must reside in the application and not in the infrastructure*" and "*that the application can run well in a variety of underlying infrastructure configurations*". Fintech does need to process its proprietary algorithm in the cloud.

Students recommending Google will note that their price is just slightly higher than Amazon, but Google offers the potential for very big cost savings based on volume discounts as the new Fintech service scales up. Seeing Google as an up-and-comer in this competitive space, some students might theorize that, hungry to grow this business, Google might provide more attentive support than others. Google dominates search and attracts high-quality talent. Many observers agree that if they want to dominate cloud services, they have a good chance of doing so.

Some students will notice that Google emphasizes proprietary technologies, whereas Fintech favors Microsoft or open-source tools. Others will note that Google's position in the "Visionary" cell of Gartner's Magic Quadrant (mentioned in case, and shown in Exhibit IM-6) indicates that its performance is somewhat uneven; therefore Fintech should not choose them for an application designed to build a stronger relationship with its customers. This is another opportunity for debate, since Google supporters might bring up the following: While Google is new to cloud computing as a PaaS or IaaS provider, it has managed its own distributed server farms for some time. Google employs top technical talent and is well known for technical innovation (case does not mention Google Glass or Google's work on self-driving car technologies, but since Google is one of a few top-choice employers for the current generation of college graduates, we are confident students already know about these and other initiatives).

Students recommending Microsoft will note that Fintech is already a Microsoft shop, and that Gartner places Microsoft in the Leader cell with Amazon. Other students will counter-argue that Case Exhibit 8 shows Microsoft is much more expensive (more than \$7000, compared with around \$1650 for Amazon and Google). Yet, David Nolte explains: "*Azure SQL database platform might be cheaper in terms of application re-development cost*". Since the case implies that Fintech is considering the possibility of

¹⁰ *Critical Capabilities for Public Cloud Infrastructure as a Service*: <https://www.gartner.com/doc/reprints?id=1-2QX6UM&ct=151027&st=sb>

¹¹ J. Cozza, Amazon web Services was taken down by a simple typo. *CIO Today* 4 Mar 2017 and R. McMillan. Amazon grapples with outage at AWA cloud service. *The Wall Street Journal* 1 Mar 2017.

migrating other applications to the cloud at a later time, this is an important consideration. The instructor can reflect on this part of the discussion:

The case described Kwo as “fairly conservative about costs,” yet he is also willing to commit additional resources when necessary. Is this one of those times when spending more is necessary?

Some students will note that only Microsoft Azure offers an in-memory database (IMDB¹²). For big-data analytics, an IMDB makes it possible to very rapidly run simultaneous calculations, translating into big performance improvements. The case mentions that Fintech would apply “*proprietary algorithms to the data as it was being processed in the cloud-based solution for analysis.*” An in-memory database *might* be helpful here (to be certain about this, a more robust test needs to be conducted). The case cites a helpful MSDN article and the case glossary defines IMDB. For the instructor’s benefit we also link to a good explanation in Wikipedia.¹³ We are not suggesting this be assigned for students to read, but the explanation is useful, as are the links at the end of it.

A comment in the case by David Nolte can help those MBA students with non-technical backgrounds recognize that in-memory databases are new and Fintech does not yet have experience with them:

“In-memory databases are a fairly new technology offered by Microsoft. After reading articles published by the Microsoft Developer Network, we’ve learned that in-memory databases optimize a data table representation stored in active memory, while storing another copy on the hard disk.”

When asking students to justify their choices, other considerations may also come out besides those mentioned above. For the instructor’s convenience we summarize provider similarities and differences in Exhibit IM-7.

The evaluation also revealed some open questions that demand further investigation.

Open Questions

- Security: Each cloud services provider describes their approach to security using different terminology, making it difficult to compare them. Students may criticize the team for failing to dig deeper on this dimension.
- Performance: Google Cloud Platform and AWS refer to Virtual CPUs, while Microsoft Azure refers to DTUs (Data Throughput Units, apparently reflecting Microsoft’s approach of using an in-memory database). Also, AWS scales up by increasing nodes while the other two options do not describe scalability in terms of nodes. The case does not reveal whether these differences are meaningful and if so, what are the implications (probably because Fintech’s IT staff did not know what to think of this either).

Some students will reasonably argue that until these questions about security and performance are resolved, Kwo should not select a provider. Others will counter-argue that Kwo could treat the first two or three projects to push a few clients’ data to the cloud as pilot tests. Fintech does not need to put all clients’ data in the cloud at once. If Amazon or Google do not work out well in the pilot tests, it won’t be too late to try Microsoft.

This can be a moment for the instructor to talk briefly about pilot testing -- a topic that relates both to the due diligence phase of learning about and comparing potential vendors, and how to mitigate risks (question 3, below).

¹² As of spring 2017, Amazon Web Services does offer support for an IMDB: <https://aws.amazon.com/elasticache/> but in June 2016 we think it did not.

¹³ https://en.wikipedia.org/wiki/Computer_data_storage#Primary_storage

A company that learns how to conduct well-designed pilot tests and how to learn from them (by treating each pilot as an experiment and measuring dependent variables with care), can afford to face some unknowns. In our view, Fintech is a company that could benefit from learning how to design and conduct pilot tests (see Sidebar).

OPTIONAL SIDEBAR: *Conducting Pilot Tests*

The plan to provide Fintech clients with access to their transaction data via the cloud could be treated as a pilot test of cloud computing before committing to move other Fintech IT applications or data to the cloud (Kwo states that this first initiative is a step into the cloud before committing other operations to the cloud).

Evaluation of the three providers -- based on predefined technical and other criteria and supported by a Use Case -- can also be thought of as a mini pilot-test that aimed to spot potential technical, operational, and/or economic challenges in each cloud service provider's offerings.

Since Kwo did not describe either approach using the lingo of pilot testing, we assume he did not view this as a pilot test and we recommend that the instructor not use the label "pilot" here, unless this concept has already been introduced earlier in the course, or unless Instructor is prepared to give a short lecture.

The idea of considering technical, operational and economic (TOE) feasibility via one or more pilot tests remains useful. Whether or not the instructor refers to "pilot testing," we recommend guiding students toward a basic understanding of these three forms of feasibility as outlined in Exhibit IM-8.

In our class, the "punch line" for this discussion is that often it is necessary to conduct more than one pilot test (and/or pilot test/s, combined with other method/s of evaluation (such as surveys, simulations or focus groups) in order to adequately judge technical, economic, and operational feasibility of a new IT application.

3. For each provider (Amazon, Google, Microsoft), identify specific risks and offer specific suggestions for launching, running, and managing the proposed new service if that provider is chosen.

If some key risks associated with each provider did not come out in discussing question 2 (above), the instructor can push students to identify additional technical and business risks that each contender brings. Regardless of when students identify risks, the instructor should record these on a separate section of the board.

Amazon, Google, and Microsoft are all large and prominent companies. Two important risks relate to their size:

- Having a large installed base of users makes each provider vulnerable to security issues; hackers, cyber-criminals and even foreign governments seem to be magnetically drawn to big companies like these. A student might argue that these companies have defended against hackers for a long time anyway; probably they have stronger defenses than most companies. Another student might bring up Amazon's winter 2017 outage¹⁴ -- although this was apparently caused by an employee error, not an attack.

¹⁴ J. Cozza, 2017, op cit. and McMillan, 2017, op cit.

- A second risk in selecting a very large provider: that provider might slip into complacency when dealing with smaller clients like Fintech (with just 80 employees), that represent a fraction of the big company's profits.

Looking separately at risks particular to each provider:

- **Amazon:** Biggest risk is possible complacency, leading to sloppy service (discussed above).
- **Google:** Gartner says Google's ability to execute is not strong. Some students may think Google spreads itself too thin; many exciting initiatives might reflect a bias for innovation at the expense of operational excellence.
- **Microsoft** is the only contender mentioned in the case that offers products and services across the IaaS-PaaS-SaaS spectrum. With Google and IBM hoping to move into the Leader box, can Microsoft successfully defend all three areas of focus, or will they abandon IaaS and PaaS in favor of SaaS, which complements their other strong product lines related to end-user computing (MS-Office)?

Microsoft is the only provider offering an in-memory database at the time of the case (IMDB, discussed above). The instructor might want to show students a 2016 Gartner Hype Cycle report which placed in-memory data analytics in the Trough of Disillusionment¹⁵. Is the in-memory cup half empty or half full? Some experts are optimistic that this technology will soon climb out of the Trough and up to the Plateau of Productivity, while others read the current position in the Trough as a bright red flag of risk.

Risk Mitigation Strategies

- Kwo could direct his team to run end-to-end testing on a large sample dataset, comparing providers to measure processing throughput, verify that data accuracy and completeness are preserved, etc.
- Once a provider is selected, Kwo could appoint a relationship manager – preferably someone with a high tolerance for detail. This manager will closely monitor service levels and keep provider's "feet to the fire."
- To mitigate "provider complacency" Kwo could launch a pilot test of a second cloud computing initiative – perhaps one that is not client-facing—using Google, Microsoft, or a niche cloud provider -- just to keep the primary provider "on their toes".
- A move to the cloud can intensify existing information security issues and give rise to new ones. So, very soon Kwo should hire an InfoSec auditor to evaluate Fintech's current systems and advise him on specific steps to take to prevent security incidents, rapidly detect incidents that will nevertheless occur, and rapidly and effectively respond to each incident in ways that minimize disruption to Fintech clients and employees.

Recalling Jackson's continuum (described above): While a "transaction" focus is theorized to be at one end of Jackson's continuum and a "relationship" focus is at the other end, in practice a customer and provider may not lie cleanly at one end of this continuum. Amazon, Google and Microsoft all offer "pay as you go" pricing and service level agreements that contractually guarantee 99% uptime, with the provider paying a penalty when the specified level is not hit (transaction focus). These providers also advertise various means of support – via partner networks and customer service mechanisms (implying a longer-term relationship

¹⁵ F. Biscotti and M. Pezzini, Hype cycle for in-memory computing. Gartner report no. G00290714, 26 July 2016. <https://www.gartner.com/doc/3388338/hype-cycle-inmemory-computing-technology>

focus). So, the possibility exists that Fintech (and especially CIO Joe Kwo) will occasionally experience some dissonance: expecting relationship-level care from the chosen provider, who at times will be more focused on metrics specified in the SLA and less focused on support services. Articulating this hypothetical transactional-relational imbalance gives the instructor an opportunity to guide students through a discussion of the merits and shortcomings of relying on clearly specified contracts to ensure good service provider behavior.

4. Evaluate strengths and weaknesses of Fintech's provider evaluation process. What useful steps were taken? Do you see any problems?

The key steps that Kwo's IT staff took were:

1. Nolte hired a consultant to advise him on cloud service providers. The case indicates that the consultant relied on industry reports from credible sources such as Gartner and Forrester – a good first step, but not as thorough an investigation as textbooks advise.
2. A high-level Use Case was developed to describe how (for a particular Fintech retailer or wholesaler) transaction data (which would already have moved from Fintech's transaction processing databases into its local data warehouse) would be extracted from the local data warehouse, transformed back into a format compatible with the retailer's or wholesaler's database, placed into a secure "zone" of a cloud-based data warehouse, and made available to that client only. This is the repeatable process that Fintech will perform on a daily basis, for each participating client. Exhibit IM-9 summarizes this process.
3. Kwo articulated technical, operational, and economic criteria. Case Exhibit 6 ("Basic" comparison) lists important *operational* criteria such as training, customer support, and SLA (Service Level Agreement) and one *economic* criterion (pricing). Case Exhibit 7 summarizes important *technical* criteria, such as programming languages and databases supported and tools for system administration and security. Case Exhibit 8 offers a rudimentary *economic* analysis (evaluating expected initial cost based on applying each provider's pricing information to a basic Use Case).

It is certainly helpful to hire a consultant when moving into unfamiliar territory. In discussions with undergraduate and graduate students thus far, no student challenged the decision to use a consultant. Some students raised issues that a consultant could have perhaps raised with Joe Kwo. For example, a student might wonder why Fintech did not issue a Request for Proposal to prospective providers. Students who work for large government contractors may have seen RFPs, and might believe they are quite helpful. An RFP from Fintech would describe Fintech's customers and operations, provide an overview and rationale for the planned new service, describe one or more Use Case/s, include a detailed requirements specifications list, and indicate various constraints (such as project timing, how the new system should integrate with legacy technologies, etc.). Done well, a good RFP provides a strong foundation for an IT project. Done not so well, it can go on and on for many pages and dissuade vendors from bidding on a project.

Students who work for small companies may never have seen an RFP – for good reason. Developing an RFP is itself a project that requires resources. Fintech claims to be a leader in its field (and it processes large data sets every day), yet it is only an 80-person company. Amazon, Google and Microsoft might discourage smaller companies like Fintech from issuing RFPs, by failing to respond to them. If a big vendor expends resources to respond thoroughly to an RFP, they will want to be compensated for that effort. The prices Amazon and Google charge (around \$20,000 initially) would not be high enough to cover the cost of responding to an RFP.

The instructor can ask: *What has Fintech lost by not issuing an RFP?* A student is likely to answer that Fintech did not produce a detailed requirements specification document (should have been the next step after producing the Use Case, and necessary for creating an RFP). Without it, it is difficult to evaluate

whether some providers' features – such as an IMDB, or support for mobile devices, or foreign currency translation -- would be relevant and helpful.

The Use Case was specified at a level appropriate for analyzing each provider's pricing calculations based on it, but it was not sufficient to support a full analysis of Fintech's likely total operating costs with each provider. This insight might emerge when some students argue that the Use Case was necessary, but not *sufficient*, because it did not help clarify why Microsoft is much more expensive than the other two options. Ideally, one would need to know every material cost associated with using each service (that is, total operating cost – this analysis was not done).

Other students may argue that Fintech should create separate use cases for wholesalers versus retailers (these two types of entities probably have different analytics requirements), and also for large versus small wholesalers or retailers. If Fintech relies too heavily on Case Exhibits 6, 7 and 8, Kwo runs a risk of choosing a provider that meets the needs of his IT staff, yet does not adequately meet the needs of some Fintech clients.

Moving on, the instructor can ask students what else they would do to evaluate cloud services providers. One aspect should come out: There is no indication as to whether Kwo, Nolte or other manager visited or talked with clients of Amazon, Google, or Microsoft. If you work for a large company and are dealing with a small provider, you can require the provider to give you (under non-disclosure) their entire client list. This gives you a chance to interview both happy and unhappy clients of that provider. If a provider refuses this request but does give you a partial list of clients, assume these are the happy ones. You can still learn quite a bit from these clients, via meetings or phone calls, but you would also want to seek out further information to get a more complete view. Nowadays, a Google search helps answer that challenge (and many others). For example, a March 2017 Google search on “criticism [provider name]” quickly produced helpful articles on the first screen.¹⁶ One can also search on various users' forums and other sources (*The Wall Street Journal*, *InformationWeek*, *CIO*). Kwo or his consultant could put a question out to contacts on LinkedIn – some of whom may have had direct experience with one or all of these cloud providers.

By this point in the discussion, students should see that price comparisons for IT products often appear simple, yet complexity becomes evident as managers peel away layers of the “onion” in search of unambiguous, verifiable information about initial cost and likely total operating cost or total cost of ownership. Students should recognize that technical, operational, and economic criteria are all helpful lenses to guide the evaluation process.

¹⁶ Here are a few such items that the instructor could share with students in 2016:

B. Darrow. Amazon's cloud is not enterprise-ready, says Oracle Exec. *Fortune*, Jan 20, 2016.
<http://fortune.com/2016/01/20/oracle-exec-says-aws-not-enterprise-ready/>. On the other hand, see: R Hof.
Ten years later, Amazon Web Services defies skeptics. *Forbes* 22 Mar 2016.

B. Butler. Why Google hasn't taken off in the cloud yet. *Network World*, 13 Jan 2016.
<http://www.networkworld.com/article/3022242/cloud-computing/why-google-hasnt-taken-off-in-the-cloud-yet.html>

B. Darrow. It's Google's time to shine in the enterprise. *Fortune*, 11 July 2016.
<http://fortune.com/2016/07/11/its-googles-time-to-shine-in-big-business/>

B. Darrow. Microsoft Cloud stumbles but company sees light ahead. *Fortune* 21 April 2016.
<http://fortune.com/2016/04/21/microsoft-cloud-stumbles/>

TEACHING SUGGESTIONS AND OTHER USEFUL INSTRUCTOR RESOURCES

We suggest instructors poll students before class or at start of class (see Prep Check sidebar) and then proceed with the class as follows.

Which Provider? (20 minutes)

See discussion of Student Preparation Question 2. Capture arguments favoring each provider on board, leaving sufficient board space for arguments against/risks of each provider.

Arguments against each Provider (15 – 20 minutes)

See discussion above of Suggested Case Preparation Question 3. As an optional activity, ask the class *Based on discussion so far, has anyone changed his/her mind about a provider to choose?* If no one changes their mind, force a new vote by announcing that the lowest vote-getter has been eliminated; a runoff “election” is needed (do this quickly, with a show of hands).

Advice, Given Provider Choice (20 minutes)

Ask how to move forward with a particular provider, given its strengths and weaknesses. The twist is this: *“You are David Nolte, who will manage the launch. Kwo has made his decision, and he did NOT choose your first-choice provider. How to effectively manage the launch and the ongoing relationship with this provider, given what you know about them?”* Use students’ original choices to assign them, in teams, to articulate a plan for a provider they did NOT choose (i.e. students who chose Amazon now consider Google; those who chose Google now consider Microsoft, those who chose Microsoft now consider Amazon). This part of the discussion could be structured as a team breakout-and-report-back.

The above approach mirrors reality (we sometimes must execute a strategy that we would not have chosen). It also helps students appreciate an important aspect of the no-one-right-answer philosophy of case method: *What matters is whether you as a manager can capitalize on positive aspects of a situation and overcome negative or risky aspects by choosing appropriate managerial tactics.*

Evaluate Fintech’s Vendor Evaluation Process using a Strengths-to-Weaknesses Toss-Up (15 minutes)

First student discuss a strength of the evaluation process (e.g., hired consultant, referred to Gartner reports, created a Use Case and ran a test of it based on each provider’s calculator).

Next student discuss a weakness (e.g., no customer-centered Use Case, unclear specifications, not calling happy and unhappy clients of each provider, not thoroughly searching for information about each provider in news and trade publications, not inviting sales reps from each provider to make a presentation, not adopting the second-pilot tactic described above -- hire a different cloud services provider for a different initiative).

Back to a student mentioning one strength, then another mentioning one weakness, etc. until no more strengths or weaknesses are identified (or until time runs out).

Case Wrap-up (5 minutes)

Emphasize the following points during the wrap-up.

- 1) Since the CIO needs to take into consideration technical, operational, and economic factors in sourcing decisions, the evaluation process should include affected stakeholders— particularly

when a proposed IT initiative involves customers or business partners.

- 2) A strong vendor evaluation process devotes as much attention to understanding each vendor's risks and weaknesses as to the vendor's strengths.
- 3) Change is a constant: IT vendor selection often involves technologies that are not yet fully understood. It is important to rely on current, credible information. Reports by research organizations (Forrester, Gartner, major accounting firms) can help a CIO recognize and anticipate some of the challenges ahead.
- 4) Pilot testing is a helpful way to gauge whether an IT provider will meet an organization's needs before making a long-term commitment. Note: In a long night class, this is where an instructor could go into a mini-lecture on this important topic, drawing on resources described above. Or, the instructor can alert students to other cases to be discussed in the course that will explore this topic further.
- 5) When it comes to choosing an IT provider, there is rarely one right answer. Although there are many ways to fail, there are also often several paths to victory. A thorough evaluation process will take more time than a quick decision, but can help a CIO spot viable options to pursue.
- 6) Instructor can mention the classic HBR article by Barbara Jackson (1985, described above). Business buyers and sellers sometimes do not realize that their expectations are not in synch regarding a short-term transaction (seek low price, do not commit to a long-term relationship) versus an ongoing relationship (seek manageable total cost of ownership, commit to a long-term, collaborative relationship aimed at co-creation of value).

OPTIONAL SIDEBAR: Start-of-Class "Prep Check"

Use a mobile polling technology or paper-and-pencil; give students less than 5 minutes to answer:

- Which provider? (circle one): Amazon Google Microsoft
- Explain your choice, using no more than 2 sentences to indicate important information that led you to choose this provider.

If paper-and-pencil, have a student at the end of each row collect and sort colleagues' answers into three groups (Amazon, Google, Microsoft). Assign each of three other students to collect and count each provider's "votes." (This technique gives the instructor a back-to-the office record of each students' level of preparation and will reveal some misunderstanding about key technical concepts.)

Display a summary on the screen (if polling system) or have three stacks of paper votes. If the latter, cold-call by randomly pulling answers from each pile to ask students for their choice and rationale.

Experiences Teaching this Case

The case was tested four times in 2017, with MBAs, undergraduates (one American and one Peruvian class), and Executive DBA students. All discussions were lively and all instructors stated it contributed to student learning. This suggests that the case may be applicable for business students of all levels.

In an MBA required *Strategic IT Management* class it was taught in a 45-minute block in an instructor-centered lecture/ discussion style. 13 students chose Amazon, 6 each chose Google and Microsoft.

In an undergraduate capstone *Managing Information Resources* class for IS majors in their final semester of study, students were required to submit written answers to three questions:

- 1) *What is the key issue?*
- 2) *Given this issue, what do you recommend the protagonist do?*
- 3) *Support your recommendation with facts from the case.*

After the case discussion students are also required to submit written answers to two additional questions:

- 4) *What are the three most important things you learned from this case?*
- 5) *How did the case discussion change your view of the case?*

One student chose Microsoft; most chose Amazon or Google. Some students said Fintech should move ALL its data into the cloud; others said this would quite risky. Many post-discussion written answers discussed risks moving all data into the cloud and many noted that technical, human and business factors affect technology adoption.

In an Intro to MIS class in Peru, students emphasized cost and security more heavily than American undergraduates. Distinguishing between initial price and total cost-of-ownership, these students were more open to Microsoft. And, sensitive to security issues, some students suggested Fintech should not move too quickly into the cloud; test at least two and possibly all three cloud services providers before betting the company on any one provider.

In an Executive DBA class (students have 12 + years' significant managerial experience). A case-method instructor reported that DBA students were less interested in choosing a vendor and more interested in probing whether Kwo had carefully weighed potential benefits of cloud computing versus various risks.

Other Useful Resources for the Instructor

Articles in IT Publications

- E. Knorr, "2016: The year we see the real cloud leaders emerge." *InfoWorld* 1/4/2016. IBM expected to out-execute Google in the short term. In 2015 AWS sales were about \$7B, Microsoft \$5B, IBM \$4.5B. Google, less than \$1B in cloud sales, was expected to rise sharply in 2016. See <http://www.infoworld.com/article/3018046/cloud-computing/2016-the-year-we-see-the-real-cloud-leaders-emerge.html>
- D. Mytton, "Global location wars: Amazon vs. Microsoft vs. Google," *InfoWorld Tech Watch*, 12/1/2015. Discusses provider's geographic strategy (NOT touched on in Fintech case). Instructor can mention geography when students discuss whether Kwo thoroughly evaluated cloud providers. He did not ask about redundancy and fast failover in data center locations around the world (Fintech clients are U.S.-based companies). See <http://www.infoworld.com/article/3008617/cloud-computing/global-location-wars-amazon-vs-microsoft-vs-google.html>

Consultancy Reports

Gartner's Magic Quadrant characterizes software and hardware vendors according to "ability to execute" and "completeness of vision" (low/high on both dimensions), yielding four categories of players in an IT segment:

- *Leaders* both execute well and are well positioned for tomorrow.
- *Visionaries* have a strong strategic direction but are not yet executing well.
- *Niche Players* target small market segments and execute well in those segments.
- *Challengers* hold strong current market positions, but lack a viable strategic plan

Two 2016 Gartner reports placed Amazon and Microsoft in the Leader quadrant and Google in Visionary.

- L. Leong, G. Petri, B. Gill, M. Dorosh. *Magic Quadrant for Cloud Infrastructure as a Service, Worldwide*, Gartner, August 3, 2016, ID: G0 0278620
- J. Tsidulko, "Here's who made Gartner's 2016 cloud IaaS Magic Quadrant," Aug 10, 2016. <http://www.crn.com/slide-shows/cloud/300081664/heres-who-made-gartners-2016-cloud-iaas-magic-quadrant.htm>

Based on this Gartner research, in 2016 Amazon was the top IaaS provider and Microsoft was the only significant player that offered a full range of services across the IaaS-PaaS-SaaS spectrum. These two vendors stood alone in the Leader quadrant, while Google was the sole Visionary (Exhibit IM-1). Note: we did not include Ex IM-6 in the case, because it is from an August 2016 Gartner report (case anchor date is June 2016).

The instructor can also refer to Forrester Research reports on cloud services providers.

Vendor White Papers

- M. Kralj, P. Kazmi, A. Ruth, *Amazon Web Services - An Overview of the AWS Cloud Adoption Framework*, Oct. 2016. https://d0.awsstatic.com/whitepapers/aws_cloud_adoption_framework.pdf. The report's Abstract states: *For your organization to benefit fully from adopting AWS Cloud, your staff needs to acquire new skills and the organization needs to implement new business processes, or modify existing ones, that make work practices more efficient and agile. We have created guidance ...*
- Google Cloud Platform Documentation: *Overview*, Retrieved June 11, 2016 from <https://cloud.google.com/docs/overview/>. The introduction states: *This overview is designed to help you understand the overall landscape of Google Cloud Platform ... commonly used features and get pointers to documentation that can help you go deeper. ... You'll also get pointers to some tutorials that you can use to try out Cloud Platform in various scenarios.*
- Microsoft Azure Documentation: *Introducing Microsoft Azure*, Retrieved June 11, 2016. Explains components and services in a typical cloud-based platform. <http://www.windowsazure.com/en-us/develop/net/other-resources/white-papers/>.

In Appendix IM-1 we list cases about software vendors shifting to offer software-as-a-service via the cloud. Any of these could be taught in tandem with this case, to help students recognize varied issues of SaaS versus IaaS or PaaS.

EPILOGUE

Shortly after Kwo discussed the cloud providers with Nolte and his staff (as discussed in the case) he made his decision: Amazon Web Services (AWS). Price was one factor, and a few other reasons were key, which we discuss.

No matter which provider was chosen, multiple vendor products, with various levels of incompatibility, would need to be integrated. Kwo came to see this first cloud test as an extension of Fintech's local data warehouse – but in the Cloud.

A third-party tool was identified for moving data from Fintech's local Oracle Data Warehouse to the cloud. The tool was compatible with Microsoft SQL Server Integration Services (SSIS), Oracle (Data Warehouse), and Amazon (Redshift Data Warehouse). This solution created a “bridge” to address the multiple-vendors problem.

Recall the case mentioned that Nolte had “a good relationship” with the consultant, who had “*a strong background in projects working with the cloud.*” In fact, the consultant had used this third-party tool to migrate data in an Oracle data warehouse to Redshift (we left this out of the case, concerned it would lead students to too-quickly home in soon on Amazon). This heavily influenced Kwo in his decision to choose AWS.

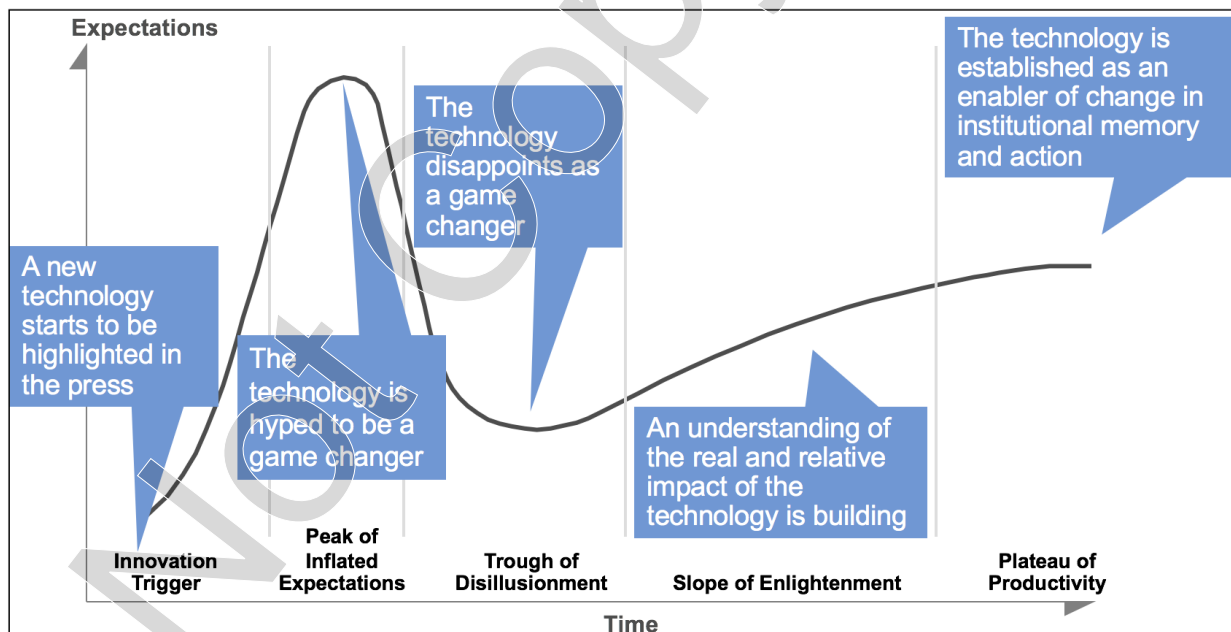
Fintech started with a few customers and after testing it with them for about 6 to 8 weeks, began to roll it out to all clients. The third part tool was tightly integrated with existing data extractions and was successfully implemented. Fintech now delivers its analytical data to its customers in the cloud, via AWS (Amazon Redshift Data Warehouse).

Exhibit IM-1 Since IT is a Double-Edged Sword ...

<p>Since IT is a double-edged sword ...</p> <p>questions to consider:</p> <p>How can a new IT application <i>reduce</i> risks?</p> <ul style="list-style-type: none"> • And: How might it <i>increase</i> risks? <p>What impact could it have on our:</p> <ul style="list-style-type: none"> • strategy? • business processes? • other applications? • overall IT architecture (data, apps, network)? 	<p>Evaluate Emerging Technologies</p> <ul style="list-style-type: none"> • Who should monitor emerging technologies? <ul style="list-style-type: none"> – Big companies: "ET" groups or DIGs. – Or, use consultants to monitor IT trends. • Some questions to ask about a specific ET: <ul style="list-style-type: none"> – What is this technology used for now? – How could we use it? – Is this a disruptive technology?
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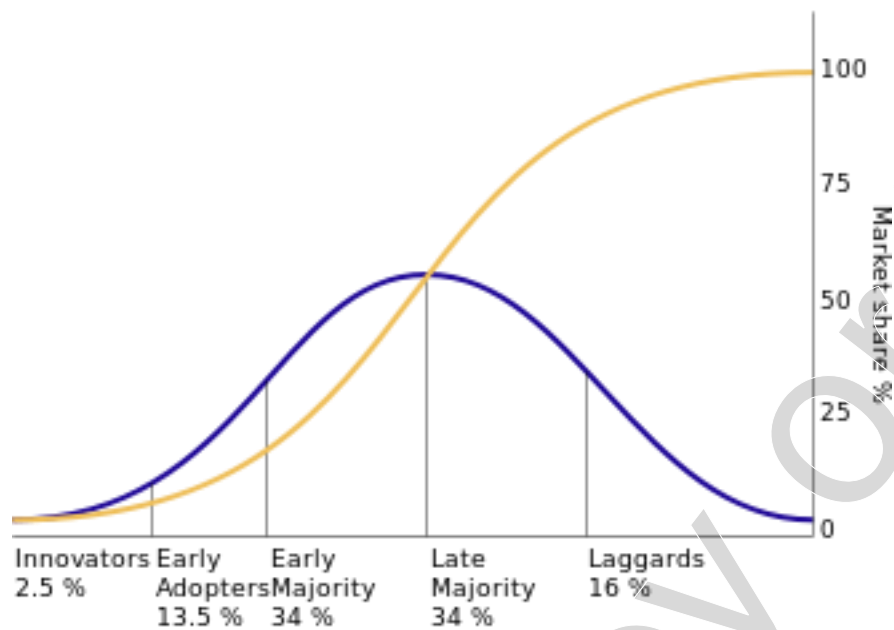
Source: Case Authors

Exhibit IM-2 Gartner's Generic Hype Cycle



Source: Gartner Research, used with permission.

Exhibit IM-3 Diffusion of Innovations Curves



Source: Everett Rogers, (August 2003). *Diffusion of Innovations, 5th Edition*. Simon and Schuster. ISBN 978-0-7432-5823-4.

Exhibit IM-4 The Challenge of Disruptive Technologies

The traditional technology is clearly superior *at first!*

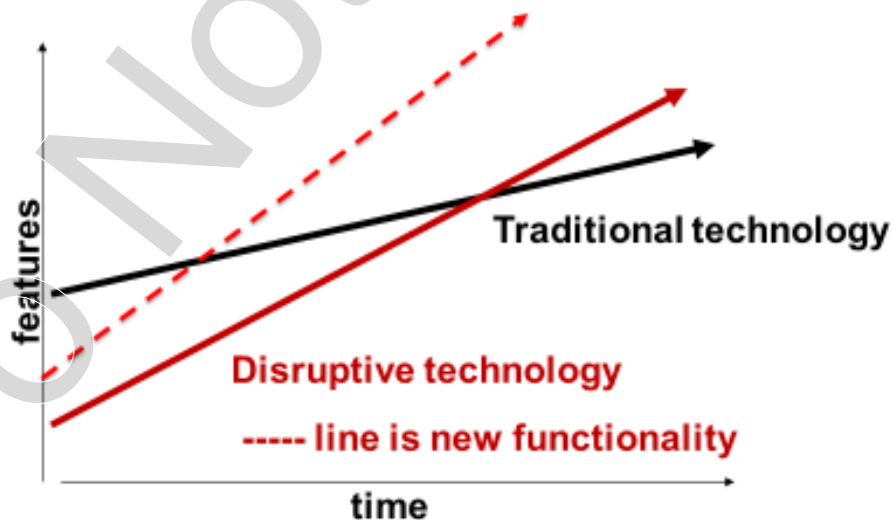
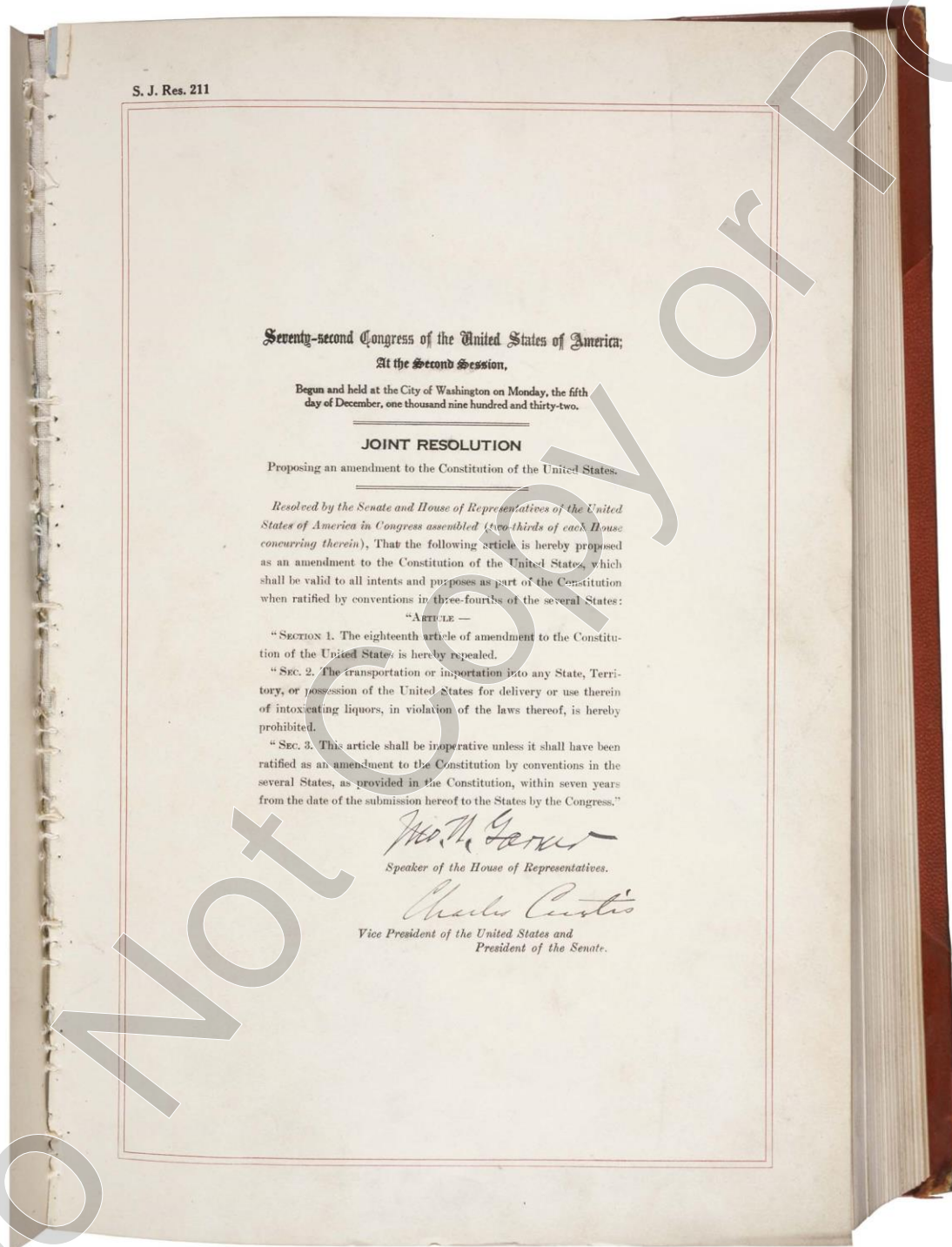


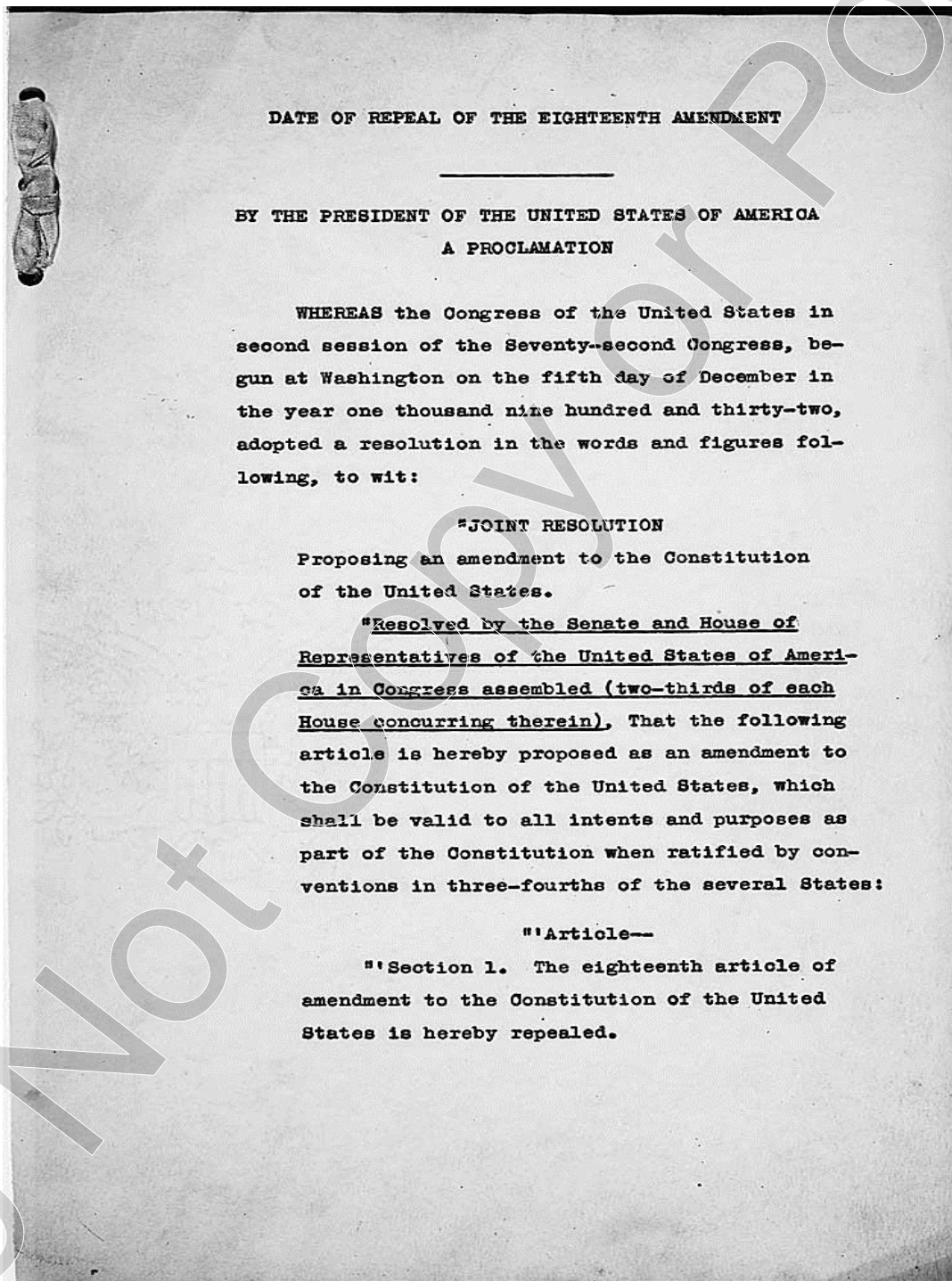
Exhibit IM-5 Proposed 21st Amendment to the United States of America Constitution



Source: National Archives, Retrieved November 1, 2016, from https://www.archives.gov/files/founding-docs/downloads/21st_Amendment_Pg1of1_AC.jpg

Exhibit IM-5, cont'd Presidential Proclamation 2065 of December 5, 1933,

in which President Franklin D. Roosevelt announces the Repeal of Prohibition.



Source: National Archives, Retrieved May 16, 2016, from <http://www.archives.gov/historical-docs/todays-doc/index.html?dod-date=1205>

Exhibit IM-6 Gartner Magic Quadrant for Cloud IaaS, Worldwide



Source: *Magic Quadrant for Cloud Infrastructure as a Service, Worldwide*, by Lydia Leong, Gregor Petri, Bob Gill, Mike Dorosh, Gartner, August 3, 2016, ID: G00278620, Retrieved November 1, 2016, from <https://www.gartner.com/doc/reprints?id=1-2G2O5FC&ct=150519>

Exhibit IM-7 Summary of Similarities and Differences: Amazon, Google, Microsoft

Similarities across Providers (See case exhibit 5)

All three providers offer:

- pay-as-you go approach supported by a high-availability promise in their SLA.
- access to consultants who can train or guide Fintech on each provider's platform.
- better than 99% availability, and a service-level contract specifying compensatory credits
- various resources (training, local provider staff, user forums)

Differences among Providers (see case exhibits 6 and 7)

- *Customer Support*: Amazon offers more support channels and a lower per-month support cost than the other two providers (but this might reflect more use of automated/non-human forms of customer support).
- *Mobile Support*: Microsoft offers the broadest mobile app support: Android, iOS, Windows. Google only supports Android. Amazon supports Android and iOS. For consumer-facing applications, mobile support is very important nowadays. However, it might not be important for this data analytics application, since business clients would likely want to do that work using devices with large screens and robust support for graphics.
- *Currency Support*: Amazon's ability to accept payments in multiple currencies might be a plus for non-US customers, but is unlikely to be a compelling benefit for Fintech given its current US-focused strategy.
- *Data Warehouse*: Amazon and Microsoft Azure offer Data Warehouses; Google does not. This means that if Fintech chooses Google, Fintech will need to also choose a cloud-based data warehouse product.
- *IDE toolkits*: Fintech is already using both Visual Studio and Eclipse. Amazon and Microsoft support Visual Studio; Google does not. Amazon and Google support Eclipse; Microsoft does not. So, if both Eclipse and Visual Studio are important, Amazon wins on this dimension.
- *IMDB*: Only Microsoft Azure used an in-memory database (IMDB). For big-data analytics, an IMDB makes it possible to very rapidly run simultaneous calculations, which can dramatically improve performance.
- *Price*: According to Exhibit 7 Microsoft is much more expensive (about \$7000/month), although the higher price might be justifiable due to Microsoft's in-memory database. Also, a total-cost-of-ownership (TCO) argument might favor Microsoft. Amazon and Google have similar per-month prices (Google at \$1684, AWS at \$1638), but Google's usage-based pricing might quickly reduce the monthly cost.

Exhibit IM-8 Assessing a New IT Application in One or More Pilot Studies:
Technical, Operational, and Economic Feasibility

Technical Feasibility

- Does it work?
- Is it compatible?
- Do we understand how it works?
- When it breaks, do we know how to fix it?
- Does it scale?
- (etc.)

Operational Feasibility

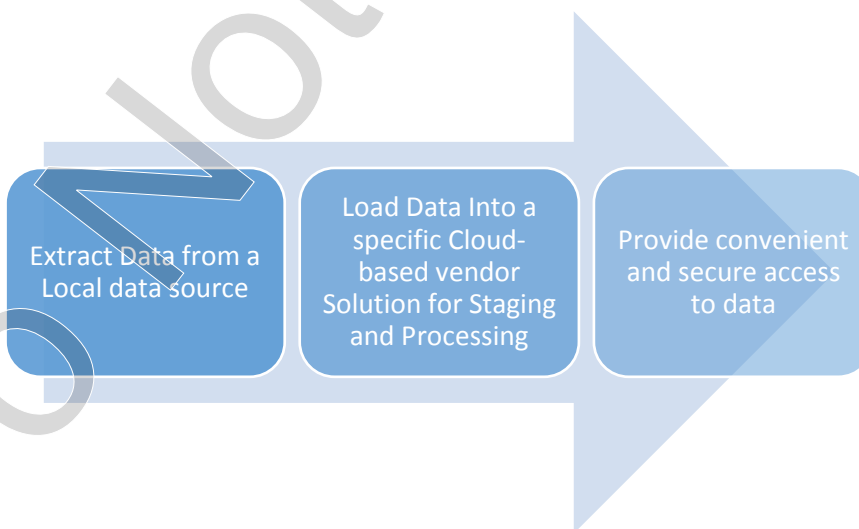
- How would it fit in?
- Can we streamline business processes?
- Will our employees accept this?
 - How much must they change?
- What about our business partners?
- (etc.)

Economic Feasibility

- Is it worth it?
- How expensive is this to buy? To install? To operate? To maintain? To upgrade?
- Total Cost of Ownership (TCO)
- Will it lead to reduced costs?
- Will it lead to new customers?
- Increased sales? Better customer retention?
- (etc)

Source: Adapted from UJ Gelinas, RB Duil, PR Wheeler. *Accounting Information Systems* (10th Edition). Cengage, 2012. ISBN-13: 978-1133935940

Exhibit IM-9 Fintech Cloud Test Use Case



Source: Case Author

IM Appendix 1

Review of Other Cloud Computing Cases, Addressing Vendors' Perspectives

The Fintech case addresses the perspective of a company purchasing cloud services from a vendor. The instructor may find it useful to review cases that address the perspectives of major software vendors as they confronted new technical and business opportunities and challenges in the cloud. We offer this information here, because in some universities instructors are teaching courses that focus entirely on cloud computing opportunities and risks (such a course would be an appropriate elective in an MS-IT program, for example).

Cases we previously used in an MBA *Strategic IT Management* class include:

CA Technologies: Bringing the Cloud to Earth? HBS 611-047, 6/27/2011

CA Technologies (CAT), a \$3.5 billion firm with 13,500 employees, sold software and services to banks and other large companies. At the time of the case, CAT's best customers were not yet ready for a move to the cloud, yet CAT leaders recognized that they needed to acquire cloud capabilities in order to fend off challenges by more nimble competitors. CAT had spent about \$1B acquiring cloud providers in 2009 and 2010. Reviewing the evolution of IT management (pages 3-6), the CA case reminds the reader that, thanks to Moore's Law, hardware has improved dramatically over the years. This phenomenon, along with important developments in database management, software, and networking gave rise to cloud computing. Yet, some 70% of the world's transaction data still resided on mainframe computers as of mid-2011. A map of the cloud computing landscape in this case also provides a helpful overview.

SAP 2014: Reaching for the Cloud. (HBS 614-052, 3/14/2014)

Headquartered in Germany, SAP is the global leader in enterprise resource planning (ERP) software. The SAP case provides helpful background on enterprise software in general, and specifically why enterprise software and services are shifting to the cloud. Students consider how SAP can capitalize on several recent major acquisitions (including \$5.4B for Sybas, \$3.4B for Success Factors and \$4.3B for Ariba), and to identify opportunities and risks in SAP's plans to move to the cloud.

Amazon in 2015 (HBS 514 025, 4/29/2015)

This case reviews Amazon's history from an online bookseller to a global ecommerce leader. Students are asked to consider whether one of its newer product lines -- Amazon Web Services -- is a distraction or a vital contributor to the company's future profitability?

Other available cases that take a cloud vendor's perspective (which we have not taught) include:

- Amazon (2008: 609 048; 2015: MH031)
- BlazeCian (W14671)
- IBM (2010: MH0008; 2015: MH036)
- Microsoft (W11166)
- SAP (2012: SM 214)
- UFIDA (2012: TU0037)
- Zuora (SM182)