DXC TECHNOLOGY

Leveraging the hyperscalers

Constructing cloud-native business capabilities

If you think cloud is only about IT infrastructure, you seriously need to think again.

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Leveraging the hyperscalers

This series explores ways to realize the potential of cloud as a business-shaping strategy, which requires focusing on delivering outcomes, creating new capabilities in new ways and ensuring that cloud is used appropriately.

Constructing cloud-native business capabilities (this paper)

Defining a cloud journey to deliver business outcomes

Transforming to a data-centric enterprise through cloud

Introduction

To help enterprises realize the potential of cloud, DXC Technology is producing a series of papers on leveraging the hyperscalers. This paper, the first, explores how enterprises can build business capabilities in a new way by assembling components from the cloud. The second paper in the series explains how business leaders — CEOs, COOs, CFOs and business unit heads — can ensure that their journey to cloud is focused from the start on delivery of business outcomes. The third paper discusses how cloud has a key role in transforming to a data-centric enterprise.

Today, cloud is not just an IT strategy — it's a business-shaping strategy, much more about delivering business capabilities. A hybrid platform, as enabled by the Cloud Right™ approach, can help organizations achieve their business goals.

The major hyperscalers, Amazon, Google and Microsoft, have moved far outside their initial niche of standard IT infrastructure services. In addition to providing services for developers to reduce time to market, they have built specialist services targeted at the major technology trends such as blockchain, 5G, machine learning, artificial intelligence and digital identity. Moreover, they are adding many industry-focused solutions.

Their vast revenues give them huge scope for continued investment, opening up opportunities for enterprises to rapidly combine IT and business components, thereby acquiring business capabilities that in a traditional model would have been unaffordable. So, the critical question for an enterprise is: How can we capitalize on this unparalleled investment?

Assembly vs. build, and the industrialization of IT. The progressive industrialization of cloud has brought tools for developers to build systems in the cloud — called *cloud-native applications*. The more recent addition of components with business functionality, many targeted at the latest industry and technology trends, enables enterprises to construct *cloud-native business capabilities*, which from Day 1 are conceived and designed on the basis of sourcing components from the cloud. Through this evolution, enterprises can turn from being *builders of IT systems* to *assemblers of business capabilities*.

The flexibility and the options created by assembling components from the cloud give enterprises new freedoms: to experiment, scale and create distinct products and services. Moreover, IT teams can invest their time in configuring cloud components to meet the needs of their target customers, instead of stitching together the plumbing. The result is solutions that are both more differentiated and more valuable.

You can capitalize on the hyperscalers' huge investment by intercepting their development path, gaining momentum in the market by exploiting the newest cloud services and avoiding investment in custom-building capabilities that will soon be available as a utility.

Strategic vision and execution through digital transformation. Today's catalog of public cloud solutions can make a direct contribution to new products and services, but fundamentally what they offer is a basket of much more sophisticated components. These components must still be assembled and configured to reflect the specific needs of an individual enterprise and its customers. Processes have to be redesigned, staff trained in new skills, culture aligned, new KPIs put in place and new organization structures set up.

With so much capability available on a utility basis from the cloud, competitive advantage will come from the vision to see how and where components can be assembled to make differentiated customer propositions. Moreover, since the components are the same for everyone, the workforce's skills in assembly inevitably become of pivotal importance.

The model of *assembly*, as opposed to *build*, represents such a new paradigm that an enterprise's operating model and governance must be overhauled to accommodate it. In addition, the architecture grows in importance: Architecture describes components and how they are combined, while individual architects challenge project teams to adopt assembly and experimentation, rather than traditional build based on assumptions about customer needs.

The transformation from build to assembly is of such a wide-ranging and fundamental nature that the active intervention of CEOs, COOs, CFOs and other business leaders is essential.

Develop your strategy with a practical tool: a Wardley map. You can capitalize on the hyperscalers' huge investment by intercepting their development path, gaining momentum in the market by exploiting the newest cloud services and avoiding investment in custom-building capabilities that will soon be available as a utility. At a higher level, you will want to understand which components with rich business value will be soon forthcoming so that you can shortcut the traditional product development cycle and afterwards ride a wave of future upgrades and enhancements.

As a practical tool, you can develop a Wardley map to chart the trajectories of the different hyperscalers as they build out IT and business components. Next, you can use a Wardley map to plot your own strategy to rapidly assemble IT and business components into cloud-native business capabilities that will make a difference to your customers.

This paper uses the banking industry as an example to show how you can create a Wardley map that exploits the hyperscalers' investments to construct your own differentiated strategy.

We are seeing history repeat itself

A peculiar discovery of Clayton Christensen, the pioneer of innovation theory, was that disruptive technologies "introduce a very different package of attributes from the one mainstream customers historically value, and they often perform far worse along one or two dimensions that are particularly important to those customers."[1] For instance, the picture quality of early digital cameras was poor, although they made up for this by dispensing with film. Likewise, the sound fidelity of Sony's first transistor radios was sacrificed for a different package of attributes — small size, light weight and portability. Photography and hi-fi buffs did not see the point of this and dismissed the innovations.

The same pattern occurred with public cloud. When AWS first commercialized public cloud services, the offering was confined to infrastructure as a service (IaaS). Developers were delighted. They saw that they could spin up infrastructure really fast without waiting for procurement, delivery and installation of physical kit. IT infrastructure managers, however, who made most of the buying decisions, with their "operations goggles" on, could only see the deficiencies of cloud — such as the risks of moving data outside a data center, reliance on secure internet access and dependence on distant third parties to troubleshoot. Measured as they were on run metrics such as unit costs and outages, they failed to grasp that the source of competitive advantage was shifting from cost and system performance to innovation. It was all about speed of change. The features that they wanted applied to run, not change.

This failure to see cloud for what it is and what it offers is being repeated, although now it is because cloud computing itself has evolved. First, many of the features that (to some) were lacking in IT infrastructure services have been added (for example, on-premises and in-region compute to address concerns about the location of data processing). Next, services have been provided for developers to build systems designed to exploit the flexibility of cloud — so-called cloud-native applications. Perhaps more significantly, a vast range of business value-adding components are now being added, making possible a further step: the construction of cloud-native business capabilities, where from Day 1 a new business capability is conceived and designed on the basis of exploiting components from the cloud. This has the potential to make a strategy for cloud much more than an IT strategy — it can be a business-shaping strategy.

Why a strategy for cloud is a business-shaping strategy, not just an IT strategy

Originally, cloud offered a better way to build IT systems, but cloud itself did not transform the business. Fundamentally, infrastructure as a service, as its name suggests, represented a new service model. IaaS brought a radical change in the commercial model for IT (rent vs. buy) and in the time taken to provision IT (instant

[1] Disruptive technologies; *Catching the Wave*

self-service vs. the months of a standard procurement cycle), but ultimately the same system was still operating in a data center somewhere. “Lifting and shifting” systems to the cloud delivered no discernible value for customers. Cloud at best enabled enterprises to provide value indirectly through the ability to develop capabilities faster, for example, by reengineering and migrating systems to cloud to harness its flexibility and speed.

Cloud today is as much about delivering business capabilities as it is about IT.

This is absolutely not the case now. Cloud today is as much about delivering business capabilities as it is about IT. The hyperscalers are rapidly building out the range and number of services that they offer. For instance, at the end of 2017 AWS offered around 90 services; today the number is 225.

Although the hyperscalers continue to extend their infrastructure and developer portfolio, the crucial departure from around 2017 onwards has been the addition of value-adding business components. In particular, the hyperscalers are building specialist services targeted at the major technology trends — for example: blockchain, internet of things, edge computing, immersive real-time experiences through 5G, and streaming and visualization. These trends also include machine learning machine learning and artificial intelligence, unstructured data extraction and analysis, digital identity management, and marketing analytics and automation.

The hyperscalers are also adding industry-focused solutions — for instance in banking: fraud APIs, payment services, financial data services and solutions optimized for specific core banking systems. Yet for many, this mental transition has not yet been made, with people continuing to think that cloud is all about infrastructure as a service; however, today it is as much about business components, and, in the future, this will be even more so (as we will show later).

In order to understand how far wide off the mark this limited view of cloud is, we can use a technique called *Wardley mapping*. A Wardley map shows the structure of a business or service, mapping the components needed to serve the customer or user on two axes. The vertical axis reflects the degree to which a capability adds value to end customers (say, in commercial industries through new products and services, or to patient outcomes in the health sector); the horizontal shows the evolution of technology as it passes through stages from *genesis* to *custom-built, product and commodity/utility*. As a result, a Wardley map is a valuable aid in developing a strategy that makes optimal use of external capabilities and focuses your own scarce resources on the areas that will deliver the greatest return. The various relevant ways in which a Wardley map can be used are set out in the appendix of the report *The Renaissance of the IT Organization*.

In the Wardley map shown in **Figure 1**, we have taken the banking industry and picked out just a fraction of the public cloud services now available to illustrate how these can directly transform customer products and services or provide capabilities for internal customers (developers, data scientists, UX designers, analysts, etc.) to create transformed products and services. Banking is just one example; for other industries the picture is just as compelling.

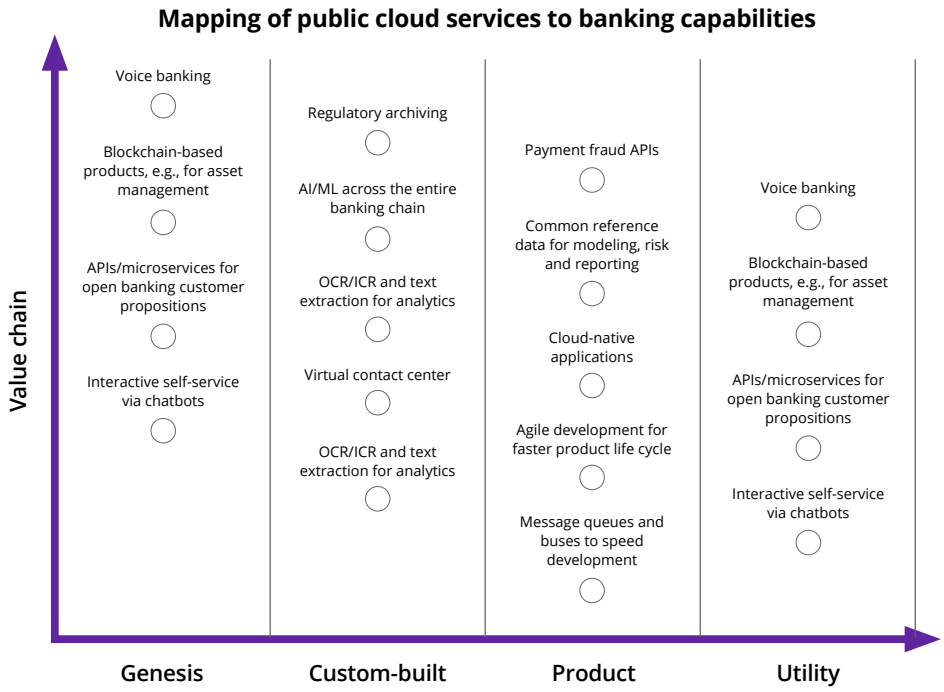

Figure1. Wardley map showing cloud components that support banking innovation (see Appendix for an explanation of these terms)

Capabilities that are new to the market (such as voice banking and blockchain-enabled asset management) feature in the "genesis" stage of the map. Under the "custom-built" stage come capabilities that are more mature but still highly unique to an individual enterprise, such as development of models and analytics on unstructured data. In the "product" column, capabilities are very similar from one bank to another, with a less direct yet still significant scope to impact end-customer services — for example, through faster product iteration. In the fourth/final stage, capabilities are identical and sourced as "utility" functions.

From an organizational perspective, these four stages would be the domain of different departments: genesis — innovation/experimentation; custom-built — in-house development; product — internal project team plus vendor; and, utility — procurement from outsourcer or utility operator.

Assembly vs. build and the industrialization of IT

This map of banking capabilities demonstrates the progressive industrialization of IT. Following IaaS, the first key change in the market for cloud services was the addition of tools for developers to build systems in the cloud — called cloud-native applications. In terms of industrialization, this amounted to machine-tooling for enterprises to manufacture their own parts and construct their own assembly lines. The second major step in industrialization has been the increasing business

functionality of components. If we use airplane manufacturing as an analogy, we have moved from screws and bare steel to parts (fan blades) and now to modules (complete engines). To extend the analogy, with SaaS (e.g., Salesforce, Workday and MS Dynamics), there is the option to source entire Airbus-style business capabilities (wings, fuselage, etc.)

The greater business functionality of components is a predictable stage in the trajectory of the technology maturity cycle. Indeed, if we look beyond the hyperscalers, we see a whole range of specialist firms that now provide componentized business services via the cloud — for example, in banking: know your customer, anti-money laundering, payments and clearing. Through this evolution of technology, enterprises have the potential to turn from being builders of IT systems to assemblers of business capabilities.

An example of how you can assemble cloud services to provide a valuable cloud-native business capability in a fundamentally new way is provided by the Fundamental Review of the Trading Book (FRTB), a banking regulation (see box).

Fundamental Review of the Trading Book: An example of how cloud services can be assembled to deliver cloud-native business capabilities

The Fundamental Review of the Trading Book (FRTB) is a set of rules, introduced under Basel III, to standardize the treatment of market risk and impose stricter capital requirements. In order to comply with FRTB, the main steps that banks need to take are: develop enhanced risk models; populate models with bank positions and market data, such as prices and credit ratings; and run the models.

Banks can assemble capabilities from the cloud to meet FRTB faster and more effectively than is possible using traditional solutions.

- *Faster model development cycles allow "strats" to tune their models progressively to reduce the amount of capital that the bank needs to hold.*
- *Common real-time reference data removes the need for the disparate reference data and interfaces found in most banks. The result is reduced cost, less complexity and standardization between different parts of the bank.*
- *Since FRTB requires an increase in the number of models and their complexity, greater compute capacity is necessary (some experts project a 20-fold increase). Since risk models are run only on an occasional basis to provide regulatory reports, the burst capacity of cloud compute is a natural fit for running FRTB models. In contrast, traditional infrastructure would be sized for the peak, with substantial capacity remaining idle for most of the time.*

By adopting a cloud delivery model to address FRTB, banks not only minimize their upfront investment and speed implementation, but going forward have greater flexibility, with the ability to scale to meet new demands and capitalize on future investment by the cloud providers in model development and data services.

This trend toward assembly, rather than build, is spurred by an additional factor. The job of assembly is simplified because solutions from cloud providers and their ecosystems are built with interoperation in mind, with APIs the ubiquitous glue. Additional components can be consumed from the same cloud provider with confidence that they will interoperate seamlessly. (Just think how this shortens procurement and due diligence cycles!) This transformation from builder to assembler reflects the broader evolution of traditional enterprises towards becoming platform businesses, as illustrated in the report, *The Science of Digital Platforms*.

Cloud-native components, glued together by APIs, are shifting the economics of make vs. buy. Using IT and business components from the cloud makes it easier and cheaper to construct capabilities in-house, albeit now through assembly rather than custom-build. Some of the hard engineering problems, especially around the "-ilities" — including usability, maintainability, scalability, extensibility, flexibility and availability — are removed. Moreover, IT and business teams can invest their time in configuring cloud components to reflect the needs of target customers, instead of putting together the plumbing. This makes the software more valuable and more differentiating than is possible through buying a COTS (commercial off-the-shelf) software product.

An added significance of the assembly model lies in the power to experiment. Once business capabilities can be assembled from cloud components, the time to market for new products and services is radically reduced. In addition, when costs move from large upfront CAPEX to much lower OPEX, organizations are free to launch and test products with customers more quickly and cheaply than with traditional approaches. Following feedback, products can be reconfigured or abandoned altogether. (Surely better to learn these lessons as soon as possible.)

Alternatively, if a new product or service proves successful, the enterprise will be in a position to scale rapidly, which of course plays to cloud's strengths. This ability to experiment is often cited in relation to building new IT systems using agile development techniques, but the value is all the greater when applied to new business products and services. In essence, cloud creates flexibility and options — and in today's fast-changing world, flexibility and options have a value in and of themselves. The COVID-19 pandemic has highlighted this value, as cloud-based solutions have enabled so many enterprises to respond rapidly to a wide variety of challenges, such as changing business volumes and remote working.

Strategic vision and execution through digital transformation

Within this picture, the earlier comparison to Airbus falls down in one crucial respect: Where Airbus components are assembled to meet a common design, components from the cloud can be assembled to produce any shape of business. Competitive advantage will come from the vision to see how and where

components can be sourced and assembled to make differentiated customer propositions. This is not to say that in some instances custom-build will not be the right option, but you need to be sure that this will add significant customer value (the vertical axis) and you will be sufficiently ahead of the curve (the horizontal axis) to maintain your differentiation. Following the vision, competitive advantage will come from the ability to execute the vision at pace through technical skills and digital transformation of your business. Of course, if you don't understand what you can source from the cloud and how to assemble its components into business capabilities, then the vision and its execution will be (perhaps fatally) weakened.

All this potential to exploit cloud for new products and services comes with a colossal proviso. Today's catalog of public cloud solutions can make a direct contribution to new products and services, but fundamentally what they offer is a basket of much *more sophisticated components*. These components still have to be assembled and configured. The raw components are — by definition — utilities provided by the hyperscalers, but their assembly requires transformation that is specific to an individual enterprise. Business capabilities have to be built: processes redesigned, staff trained in new skills, culture aligned, new KPIs put in place, new organization structures set up. Of course, for anyone with experience in business transformation this is no surprise.

"The IT function will be a technology capability embedded in the business, sitting directly with business groups and helping them achieve their needs."

There are some further implications of the move to assembly of utility components. First, if most of the components available are the same for everyone, then inevitably the skills and capabilities of the workforce become of pivotal importance. As with any emerging technology, there is a scarcity of people with the right experience, so the primary challenge lies in attraction. Here remuneration is only part of the picture. Just as important will be an enterprise's ambition and vision, as well as having a working environment and organizational structures that foster, rather than inhibit, the creation of cloud-native applications and cloud-native business capabilities. With expertise so scarce, finding partners who can bring supplementary vision, skills and relationships will also be critical.

The second implication of the move from build to assembly is that an enterprise's operating model and governance — to return to our earlier analogy, the factory layout and flow of material through the factory — need to be overhauled to reflect the new model of assembly, rather than the build. When new capabilities are acquired through a lengthy build process, it makes sense for this to be the domain of a distinct IT function. However, the speed and ease of assembly call for a closer, more integrated model between the business and IT, one based far more on experimentation than on prescriptive plans. As noted in *The Renaissance of the IT Organization*, increasingly, "The IT function will be a technology capability embedded in the business, sitting directly with business groups and helping them achieve their needs."

Moreover, the balance between change and run must shift. Traditional organizational structures are designed to optimize run rather than change. The assembly model, however, increases the pace of change and lowers its cost. Taken together with what appears to be a "permanently unsettled" political and social environment, this creates an imperative for enterprises to rethink their organizational models, placing equal, and in some instances more, value on change than on run.

The third major implication is for the strategy process itself. The accepted wisdom is that business strategy drives IT strategy. Clearly, in many respects this remains true; however, the pace and depth of technology innovation, coupled with the incredible variety of IT and business components available from the cloud, means that there needs to be more of a two-way flow of ideas. In order to be effective, business strategy needs to be much better informed about the options that are available — about the art of the possible. Cloud is radically changing the speed and cost with which new opportunities can be explored, as well as actually creating new opportunities. How can these possibilities not be factored into and shape business strategy?

The architecture function also grows in importance and takes on a new guise: Architecture describes components and how they are combined, while architects move out of their ivory towers into the trenches, challenging project teams to construct new capabilities through agile assembly of components and experimentation, rather than lengthy build based on assumptions about the market and customer needs. Architects also have a key role in educating project teams about the business and IT components that can be sourced from the cloud and other external parties.[2]

At this point it is clear that the transformation from build to assembly is of such a wide-ranging and fundamental nature that the active intervention of CEOs, COOs, CFOs and other business leaders is essential.

Intercepting the hyperscalers' trajectory to capitalize on unprecedented investment

Recent financial results of the cloud providers are staggering: In the first quarter of 2021, AWS generated cloud computing and hosting revenues of approximately $14.8 billion. In the fourth quarter of fiscal year 2021, Microsoft generated approximately $17 billion in revenue from intelligent cloud services. In the second quarter of 2021, Google Cloud brought in $4.6 billion in revenue, up 54 percent year over year.

Regardless of what assumptions you make, the levels of investment are utterly unprecedented and dwarf all other investment across the industry. Unlike most traditional investment that is made for an individual company to utilize on a proprietary basis (say, a new manufacturing plant), investment by the cloud players is going into components whose very purpose is to be consumed as widely as possible. The hyperscalers will of course add capacity to exploit economies of scale. But with such a broad range of IT components already available, the growth will continue to be in business components because this is where the cloud players will themselves seek differentiation from each other. In particular, they will continue to invest in solutions that harness the next major waves of technology such as blockchain, IoT, 5G and machine learning/artificial intelligence.

Jeff Bezos followed in the footsteps of Ross Perot

One of history's ironies is this: The outsourcing industry being supplanted by the hyperscalers — such as Amazon, founded by Jeff Bezos — itself began in a similar way.

Ross Perot, an IBM salesman, noticed that because mainframes came in a few standard sizes, many customers had excess capacity. He wanted to sell this capacity to other customers, but his superiors at IBM, not surprisingly, had other views. So, Ross Perot went his own way and founded Electronic Data Systems. Thus, the outsourcing industry was born.

[2] *Architecture awakens: Deloitte's Tech Trends 2020 report*

These investments are game changing. Without these investments, under a traditional build-it-yourself-model, many strategic plays based on emerging technologies would simply not be affordable, especially for enterprises that are not at hyperscale themselves. In a sense, we are seeing a democratization of technology. This is similar to the Second Industrial Revolution at the beginning of the 20th century. Initially, only large firms could afford their own generator. However, the availability of a "just-plug-it-in" network made electricity available to all on demand, opening up a period of unprecedented manufacturing growth. So, the critical question for an enterprise is: How can we capitalize on this huge investment?

Through plotting the trajectory of the hyperscalers and understanding not just where they are today but where they are going to be tomorrow, you can intercept their development path. This will enable you to gain the greatest momentum in the market by exploiting the newest cloud services. At the very least, you do not want to make the mistake of investing in custom-building capabilities that will soon be available as a utility (many enterprises have in fact done this — for instance, in customized solutions for container management). At a higher level, you will want to understand which components with high business value will be soon forthcoming, so that you can shortcut the traditional product development cycle and then ride a wave of future upgrades and enhancements.

You can chart the trajectory of hyperscaler Amazon in the map in **Figure 2**.

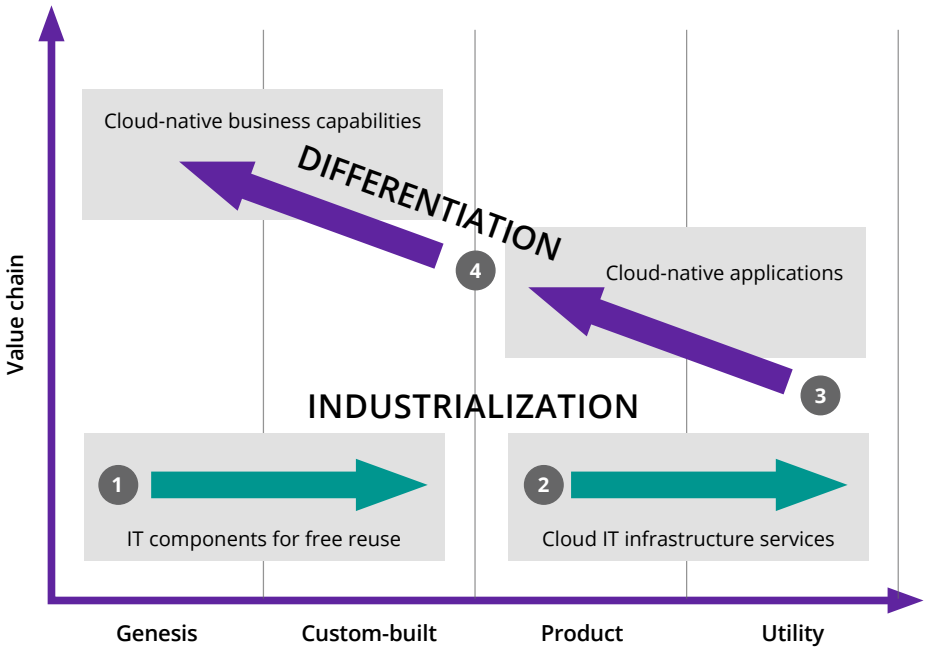

Figure 2. Trajectory of public cloud across the technology maturity cycle

1 and 2: Industrialization. Referring to the numbers in **Figure 2**: In the genesis stage, Amazon developed its in-house IT in the form of components that could be combined and individually scaled. In 2002 (1) came productization, when Amazon made some of its components available as free services for external developers to incorporate in their sites. Next (2), in 2006 AWS built an entirely new business based on a utility model that enabled industrialization. The horizontal scaling so essential for the growth of Amazon's online retailing business made it an ideal model for a scalable utility that from early on was conceived as a standalone business and not, as the myth would have it, as a means to commercialize excess capacity needed to handle peaks in its online business.[3]

This phase of industrialization has parallels with the Second Industrial Revolution. As William Janeway presciently observes, "The digital revolution is barely half-done. Once again, it has taken fifty years to deploy its transformational fixed and mobile broadband networks, just as it took roughly the same time to construct the railways and electricity grids of previous technology-driven new economies. And the layers of abstraction required to insulate users from the complexity of the network infrastructure are just now becoming demonstrably available by way of the increasingly thick and rich 'cloud.'"[4] This higher level of abstraction is finally realizing the potential of standardized components that has been trumpeted for the last 30-plus years.

3 and 4: Differentiation. The components provided by the cloud players are by definition utilities, available over the internet on demand to anyone with a credit card. Nevertheless, a fundamental shift toward differentiation is taking place in two regards: first, by the cloud players and second, by their customers.

Infrastructure services (such as compute and storage) inherently offer little basis for differentiation, either for the cloud players or their customers. However, as the cloud players have built out their catalog of infrastructure services, the market has inevitably commoditized.

Revenue growth has continued from increasing capacity and global reach, but in order to secure future returns, the hyperscalers have had to seek differentiation by building specialized infrastructure (e.g., for SAP and analytics) and, more significantly, by adding components that more directly add business value. Again, referrring to the numbers in **Figure 2**: First (3), they grew by extending services for developers to build cloud-native applications — for example, through containerization, microservices, DevOps and agile. More recently (4), the hyperscalers have added components with greater business functionality, such as IoT, edge computing, voice recognition, blockchain workbenches and machine learning tools. The cloud players' yearning for growth dictates that they will continue to channel investment into business components.

[3] *The myth about how Amazon web services started just won't die*

[4] William H. Janeway, *Doing Capitalism in the Innovation Economy*, Cambridge University Press, second edition, 2018, p. xxvi

Of critical importance, the cloud players' differentiation in turn enables their customers to differentiate. Initially (3), this differentiation came indirectly: Cloud-native approaches enable enterprises to launch products and services more quickly and thereby to differentiate.[5] But the addition of components with more business functionality (4) creates much further scope to differentiate. Although components are still technically utilities (available on demand to all), they require enterprises to configure and assemble them. And here lies the opportunity for enterprises to differentiate.

For example, although the hyperscalers offer voice recognition — e.g., via Alexa, Cortana and Google Assistant — a bank must still dedicate substantial effort to train these systems for voice banking, and design and build the right customer experience. In the example of FRTB cited earlier, banks can harness the model-building capabilities of cloud to build, test and iterate models more quickly, but their data scientists still need to develop distinctive models that will reduce risk for that particular bank. What differs here from the traditional software model is that these components are pay-per-use, scalable and designed for interoperability with countless other components. This flexibility and the options created give enterprises freedom: to experiment, to scale, and to configure and create distinct products and services.

Lock-in: Just get over it? Or a vital strategic decision?

Given the ever-widening range of services that can be consumed from a very small number of providers, an important factor to consider in assessing your cloud strategy is lock-in. If you source so much from the cloud, especially from one or two providers, are you locked in? And is this potential lock-in different from other forms of lock-in — say, with a large outsourcing partner or a software vendor?

Essentially, there are two schools of thought here. The first holds that good procurement practice dictates that you should have two or more cloud providers in order to maintain leverage. Likewise, architects (and some regulators) might call for systems to be designed so that they are portable between cloud providers. Alternatively, a second school believes that a degree of lock-in is unavoidable and indeed is already a prominent feature of today's technology landscape. (How many manufacturing companies are really in a position to change their ERP system?) In fretting about the inevitable, organizations risk bending themselves out of shape, constructing excessive complexity to manage multiple clouds and building in needless decision points that only act as a brake on change.[6] In other words, what enterprises should really focus on is speed, and anything that reduces speed is a bad idea.

A complicating factor here is that hyperscalers are investing in solutions to manage the entirety of the IT estate, both cloud and traditional infrastructure (for example Google's Anthos and Microsoft's Arc). These solutions simultaneously increase the benefits from a close alliance with cloud vendors while raising the risk of lock-in. The more suppliers you select, the greater the leverage, but also the greater complexity. So, is the right answer one, two or three vendors?

[5] They will of course also invest in adding capacity and in more specialized infrastructure (e.g., for SAP).

[6] *Don't get locked up into avoiding lock-in*

The question of lock-in is one where each enterprise will need to feel comfortable with its own choice. The key is for the CEO, COO, CIO and other parties such as the Chief Risk Officer to understand all the considerations and make a clear call that is communicated to the rest of the enterprise.

Your strategy will need to factor in the role of ecosystems and other IT firms

The next piece of the puzzle is the role of other IT firms. When so much capability is available in effect as a utility, differentiation comes through vision and execution. Other IT firms, whether service providers or software companies, become critical when they can either support faster execution or add capabilities that will differentiate the customer proposition. In the case of IT service providers (such as systems integrators), some enterprises will decide that they do not require an intermediary and want to be their own assemblers; others will decide that the change is of such complexity, risk and importance that they need all the help they can get. Meanwhile, scope to offer differentiated customer products will come from adding into the mix capabilities from niche industry software companies, the major software and hardware vendors (e.g., SAP, Oracle, HPE and Dell/VMware) and, finally, open source software communities.

In evaluating the potential of the cloud providers and other IT players, it's not just a matter of the capabilities that they bring, but of the ecosystems built around them.

In evaluating the potential of the cloud providers and other IT players, it's not just a matter of the capabilities that they bring, but of the ecosystems built around them. Increasingly in today's world, when choosing a vendor, you are choosing an ecosystem — essentially marrying a family as much as an individual. At this point, with a web of alliances and a few large players exerting huge influence, the art of strategy starts to resemble the dynastic court politics of 17th and 18th century Europe as much as traditional business strategy.

Changed roles

Success in driving a cloud business strategy (as opposed to a cloud IT strategy) entails major changes in the roles of business and IT leaders.

CEOs, COOs and boards

- **Cloud business strategy.** Once a cloud strategy has the potential to become a business-shaping strategy rather than an IT strategy, responsibility clearly needs to sit at the top of the enterprise. Here, vision and imagination in how and where to combine components that bring differentiation will be vital. Of equal importance will be championing this new perspective on how business capabilities can be built and challenging where traditional custom-build approaches are being applied without sound reasoning.
- **Vendor strategy.** As the richness of capabilities and the ease of integration between them increases, so does vendor dependence. This greatly raises the

Some of the biggest barriers to strategy execution will be your existing operating model and culture. Both will require transformation in order to harness the potential to assemble business components from the cloud.

importance of vendor strategy. When you needed a vendor strategy for each level of the stack or each significant component, this responsibility sat in IT and procurement. If you are buying the entire stack and non-interchangeable modules with rich business capability — potentially across huge spans of your business — then these vendor strategies and relationships will sit at the CEO or board level.

- **Operating model and culture.** Some of the biggest barriers to strategy execution will be your existing operating model and culture. Both will require transformation in order to harness the potential to assemble business components from the cloud, rather than build systems and capabilities in-house using traditional tools and processes. Without drive from the top to change culture and operating models, any cloud strategy will remain stillborn.

Business unit leaders and their IT partners

- **Market insight.** A critical role of business leaders and their IT partners is to understand where genuine differentiation can be gained in the market and how the current and future products of the cloud vendors can be assembled to enable this differentiation; or, alternatively, where custom-build and niche industry capabilities are the answer. In this process, it will be essential to understand your organization's wider cloud strategy so that you can see what capabilities have been or will be adopted elsewhere. This will drive reuse and simplification, which in turn bring lower costs and greater speed. Finally, business unit leaders and their IT partners will need close relationships with niche industry software companies and other IT firms to see where they can bring unique capabilities or act as partners in developing new solutions.

IT leaders and their teams

- **Advice.** With cloud strategy becoming a business issue, CIOs and their teams will play a vital role in educating and advising their colleagues about cloud capabilities and individual cloud vendors. The industrialization of IT through assembling rather than building components is a far cry from traditional models, so the extent of education and explanation required should not be underestimated.
- **Orchestration.** As the focus moves from build to assembly, the CIO and their team will become orchestrators of change. This is both in a literal sense, by laying the technical foundations to assist assembly and interoperability of cloud across the enterprise, and in a figurative sense, through shaping and combining strategies from across the enterprise to ensure standards and reuse that are essential to low costs and flexibility. In fulfilling this role, defining the business and technical architectures will be essential, as these architectures will describe components and how they are combined.
- **Vanguard of change.** CIOs and their teams will play an essential role in galvanizing the organization and acting as the vanguard for change. They will need to be cheerleaders for the changes in operating model and culture that are key to transformation. In addition, CIOs will on occasion need to recognize when traditional IT functions (such as build and control) are a hindrance and they need to step aside to let business units take the lead.

Some practical steps to build your strategy

So, what is your public cloud strategy? Can you fill out the map? Here are some key questions you will need to answer:

- What new products and services will add the most value to our internal and external customers?
- Which components are available from the cloud to support new products and services?
- How does the map look for each hyperscaler — as they each have very different strengths and strategies — and which will be the best fit for our business?
- How many cloud providers will we use? Will we go deep with one, to drive fast and transformational change? Or will we partner with several, to tap into different streams of innovation and maintain leverage in negotiations?
- In which areas will we want to devote our own resources to custom-build differentiating capabilities that cannot be sourced from elsewhere?
- Where will we use partners to assemble and manage cloud components because they bring distinct experience and skills, and/or the capabilities in question do not deliver meaningful difference in our customers' eyes?
- What changes are required in the enterprise's operating model to take advantage of potential to build cloud-native applications and assemble (rather than build) cloud-native business capabilities?
- What does our composite map look like?
- And of course, where do we begin?

It is not too early to start drawing your map: **Figure 3** is a blank canvas for your use.

Contact us if you have any questions or need assistance.

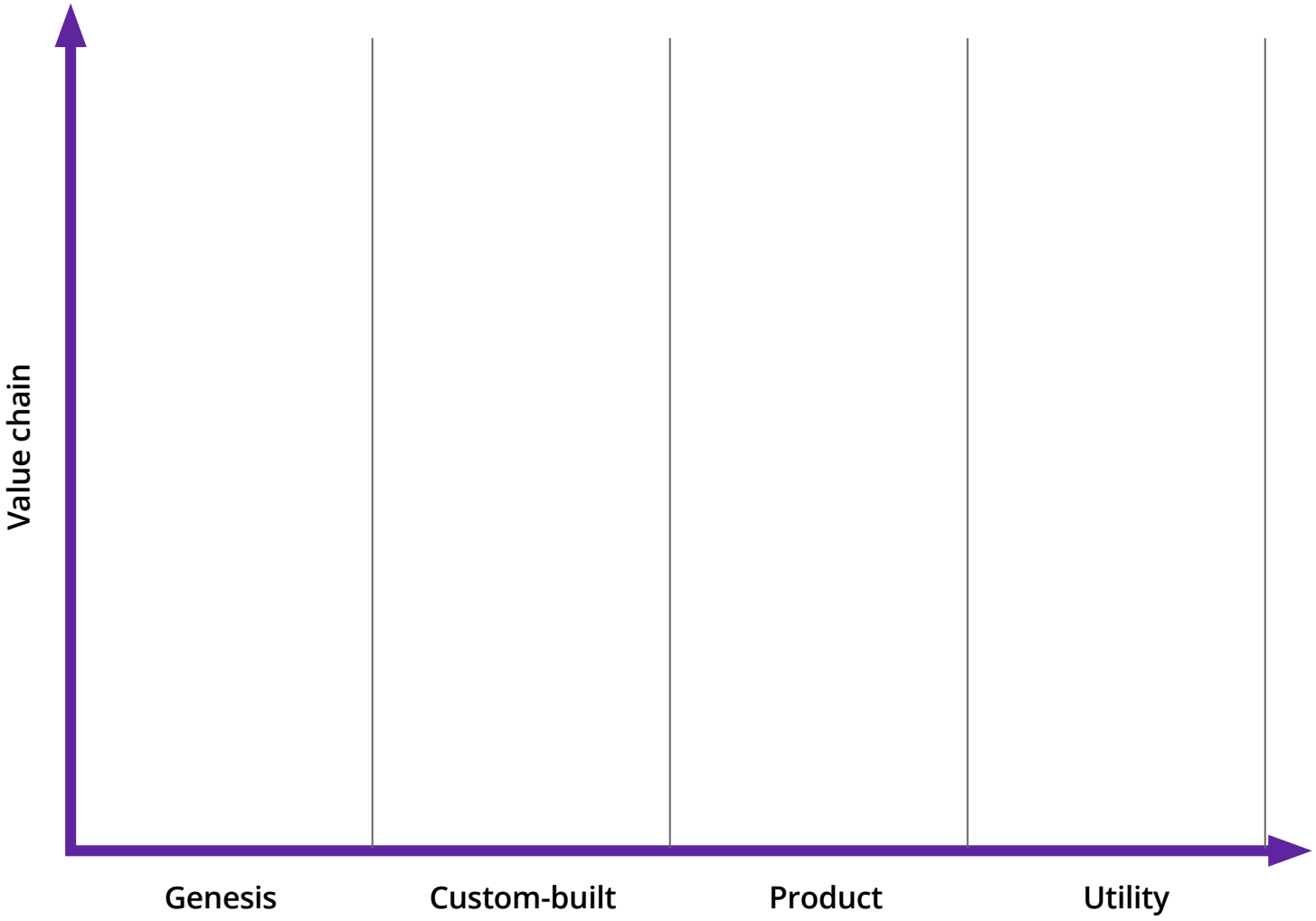

Figure 3. Your cloud business strategy map

Appendix

Table 1. Explanation of examples in **Figure 1** showing cloud components that support banking innovation

Capability	Enabling cloud service	Value
Genesis		
Voice banking	Voice access to standard banking services using speech recognition and conversational AI (e.g., Alexa skills, Google Assistant and Cortana)	• Customer convenience from hands-free and "app-free" banking
Blockchain-based products, e.g., for asset management	Blockchain to enable recording of asset in distributed ledgers/blockchain that replace intermediary centralized systems of record (Microsoft example: Blockchain workbenches and Azure Blockchain Service)	• Reduced bank settlement costs • Reduced bank trading costs owing to disintermediation • Revenue growth from products that have extra asset transparency, e.g., securitized products
APIs/microservices for open banking customer propositions	New banking propositions by combining services from multiple sources (e.g., other FSIs, platforms and retailers), with APIs the means of real-time data exchange. Cloud providers offer API gateways, ID management and microservice management (e.g., AWS Lambda, Google API Management (Apigee) and Azure Service Fabric)	• Revenue growth from products and services that go beyond traditional bank, e.g., aggregated view of family finance across banks and other FSIs
Interactive self-service via chatbots	Online interactive answers to FAQs and access to standard banking services using chatbots (e.g., Amazon Lex, Meena and Botbuilder/Luis)	• Reduced bank costs from diverting calls to cheaper channels • Customer convenience for those who prefer online
Custom-built		
Regulatory archiving	Some data may need to be stored only for regulatory purposes and hence only occasionally accessed. "Cold storage" for inactive data reduces storage costs (e.g., Amazon S3 Glacier, Azure Blob Storage and Google Cloud Storage for data archiving)	• Reduced bank costs from removing costly real-time data access where there is no business requirement • Increased resilience from cloud-based data architecture in case of failure
AI/ML across the entire banking chain (e.g., fraud, cross-sell, lending, quantitative research, reporting and risk simulation)	As the saying goes, "If you aren't using cloud, you aren't doing ML and AI," with countless solutions from all the cloud vendors. (Google example: BigQuery ML and BI to build and operationalize models and interrogate huge data-sets in real time)	• Reduced bank costs from ML deployment to automate operations, lower defaults and fraud • Revenue growth from cross-sell and other targeted customer propositions • Enhanced compliance
OCR/ICR and text extraction for analytics	Pay-per-use services extract data from paper and unstructured and semi-structured electronic inputs, e.g., mortgage documents, emails, letters of credit and other legal documents. (All three cloud players provide a range of OCR/ICR and text extraction, plus text analytics (e.g., Amazon Textract, Amazon Comprehend, Azure text search, Azure text analytics, Google Cloud OCR)	• Reduced bank costs from automation of operations with greater STP • Revenue growth from ability to mine data, e.g., semi-structured mortgage application data

Virtual contact center	Amazon has commercialized its own contact center for inbound and outbound customer communication over telephone, web, chat, email, messaging apps and social media (Amazon Connect)	• Lower cost cloud-based solution • Single customer view to enhance customer interactions • Flexible expansion of call center
Faster model development cycles	Cloud players offer a range of tools to train, test, deploy and retrain models, with potential to reduce greatly the cycle times for models (e.g., Amazon SageMaker, Google AI Platform and Azure Machine-Learning Ops)	• Progressively more accurate models, e.g., to support risk, liquidity/cash management, customer personalization
Product		
Payment fraud APIs	Amazon has commercialized counter-fraud capabilities from its own online retailing business via APIs to identify potentially fraudulent online activities such as online payment fraud and the creation of fake accounts (Amazon Fraud Detector)	• Reduced bank costs by lowering fraud levels • Enhanced customer experience by holding fewer payments in error
Common real-time reference data for front-office, reporting and modelers	Real-time low-latency reference data, e.g., on 35 million instruments such as equity prices, available in the cloud for bank front-office, reporting, modelers and other users (Amazon example: Bloomberg Market Data Feed (B-PIPE) and AWS Data Exchange)	• Reduced bank costs from lower charges for third-party data • Enhanced risk transparency and reduced cost from consistent bank-wide reference data
Cloud-native applications	Applications can be built "natively" in the cloud so that they benefit from cloud's development speed from Day 1. All the cloud players offer a huge range of end-to-end tools, such as DevOps, containers, serverless and microservices, with many specialized for different types of applications (e.g., AWS Journey to Being Cloud-Native, Azure cloud-native applications, Google Cloud-native application development)	• Faster time to market for new products and services, especially where the heritage estate is barely open to change • Access to many features only available via cloud • Reduced bank costs owing to increased developer productivity
Agile development for faster product life cycle	Providing developers and product teams with Agile and DevOps tools (e.g., DevOps and AWS, Azure DevOps, Google DevOps)	• Faster time to market for new products and services
Message queues and buses to speed development	A plethora of tools for exchange of data within the enterprise and with third parties, much now event-based, enable new business capabilities, reduce complexity and bring faster development times (e.g., AWS Messaging, AWS Application Integration, AWS Kinesis Data Streams, Azure Messaging Services, Azure Integration Services, Azure Stream Analytics, Google Firebase Cloud Messaging, Integrating with GoogleCloud Platform services and tools Google Stream Analytics)	• Enhanced customer experience from services using real-time data • Reduced bank costs from new integration and data storage patterns
Utility		
Hybrid IT management	Cloud providers offer services to manage not only their own cloud infrastructure but also traditional infrastructure and other clouds (e.g., Google Anthos and Azure Arc)	• Reduced cost from accessing cloud IT infrastructure, maintaining choice of clouds to ensure flexibility

Database	Countless options to develop and run a range of databases (relational, key-value, document, in-memory, graph, time series and ledger databases), with managed services such as monitoring, threat detection, auto-scaling and tuning (e.g., databases on AWS, Azure databases, Google Cloud databases)	• Reduced cost from cheaper cloud database options, and often lower license costs
Storage	Storage of data in the cloud with access over the Internet — one of the fundamentals of cloud computing (e.g., Azure Storage, Google Cloud Storage Products, Cloud storage on AWS, Azure Storage)	• Reduced cost from cheaper cloud storage options
Compute	Running workloads in the cloud — one of the fundamentals of cloud computing (e.g., Compute on AWS, Azure Compute, Google Compute Engine)	• Reduced cost from burst, scale up/down and right-sizing, with potentially lower raw compute costs

About the authors

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