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Do Not Call Me Chief Information Officer, But Chief Integration Officer. A Summary of the 2011 Detroit CIO Roundtable

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Abstract:

In 2011 a roundtable meeting of Chief Information Officers (CIOs) that was organized by the Manufacturing Information systems Center at the School of Business Administration at Wayne State University discussed the emergence of public cloud computing and how this is changing the role of the CIO for medium- and large-sized organizations. The nine CIOs represented a range of manufacturing and service industries in the Greater Detroit area. This article summarizes the key themes of that roundtable, namely, the continuing change in role of the CIO as public cloud computing becomes mainstream. Key among those changes is not as much technological, because private clouds have been around now for quite some time, but rather in the broader and more challenging scope of responsibilities the CIOs now have. The role of the CIO is evolving from providing and supporting information technology and systems toward one largely based on managing the integration of externally acquired standardized hardware, software, and services while retaining quality control and remaining within budget, as well as the need to be more acquainted with the legal side of contracting. This changing set of CIO responsibilities has not made the technical skills any less important, but it has added a host of additional skills that the CIOs and those serving under them now need to master.

Keywords: public cloud computing, integration, roles, skills, CIO, Chief Information Officer

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I. INTRODUCTION

The increasing availability and utility of public cloud services is leading to a role shift for Chief Information Officers (CIOs). The CIO's historical focus on building and managing infrastructure is becoming less critical as those services become commoditized and standardized and, therefore, readily available in the marketplace. This transition of utility-type IT to being managed by the market rather than internally corresponds to the predictions of Carr [2003] who suggested that a market would emerge for these services and render obsolete in-house provision of such IT utility technologies, just as the emergence of markets had done in the past to other standardized utility technologies. The question for CIOs as this transition takes place is whether their importance within the firm diminishes because of it or whether it actually becomes more central by placing the CIO in the middle of events as the integrator and alignment person for an increasingly complex combination of existing and continuously evolving new information technologies that are of crucial importance to the business.

This article investigates this issue through a set of questions presented recently to a CIO roundtable in Detroit, Michigan. This program was part of an annual series of CIO roundtables that has been held for several years. The recent roundtable centered on the impact of public cloud computing on the role of the CIO, as seen by CIOs. The topics and questions were shared with the participants in advance to give them ample time to consider their positions before the roundtable took place. The roundtable was video recorded and then transcribed. This article is based on that transcription. The CIOs who participated in the roundtable came from a wide range of organizations with operations in the Greater Detroit area. Present were the CIOs of North American operations for three first-tier automotive industry suppliers, with revenues exceeding $17 billion, $6.5 billion, and $3 billion; the CIO of a Michigan-based bank with over $13 billion in assets under management; CIOs of two hospitals, each with over $250 million in revenues; the CIO of a sports and entertainment company which operates a professional sports team and multiple entertainment venues; the CIO of a university in Michigan with a budget exceeding $900 million; and the CIO of a logistics and fulfillment company.

The conclusions that emerged from the discussions revealed that public cloud computing is pushing a transition in key aspects of what CIOs do, shifting them from being Chief Information Officers to acting more like Chief Integration Officers. In this expanded role, the CIO must increasingly combine and standardize the demands of the business into a vision for the IT group, integrating those demands with the organization's information capabilities and integrating disparate internal and external services. Relying on a utility provider means in part that business needs must now adapt to standard vendor solutions, in contrast to how IT services were managed in the past when the IT was adapted only to internal business needs. This shift represents a change in what the IT department does from providing background IT support activity toward also serving a key C-suite business task of integration achieved through IT. However, rather than making the tasks of the CIO less important and less strategic, the availability of public cloud computing is actually increasing the strategic relevance of those CIOs who embrace it. In this emerging environment, public cloud services can be understood as a sort of "Lego brick" for the IT group. These public cloud modules are self-contained and somewhat standardized, but, to accomplish the organization's goals, the organization must still design and assemble the "castle" that uses these bricks to meet those goals. Only the department managed by the CIO can do it.

CIOs may be best equipped to handle this task, but that means they must master many new responsibilities, responsibilities missing from the typical list in which IT employees excel [Bils, 2013; Wray, 2013]. As the CIO of the university put it, "There are two skill areas that I find very, very difficult to hire and bring in, and one is the integrationist, somebody who really understands how to blend two systems for the good of the business, with the business goals in mind. The other is somebody who understands contracts and licenses, because there's so much of that. Your MIS people don't typically understand how to read a contract or a license and translate that into actionable items in the business."

This article is organized as follows. First, a number of practical challenges posed by the move to cloud computing are discussed: making the transition decision, managing human resources differently, and coping with changes in governance and user relations. Second, the notion of competitive use of IT is reexamined in light of the effects of the transition to cloud computing. The article ends with a discussion leading to the conclusion that the "I" in "CIO" should probably now refer to "integration" rather than "information" for these competitive advantages to be maximally realized.

II. CHALLENGES FOR THE CIO IN THE ERA OF PUBLIC CLOUD COMPUTING

Cloud computing is, in many respects, a solution to the challenge of virtualization of time, space, and resources (referred to below as *delocalization),* but it comes with many challenges. These, according to the Roundtable participants, come in three distinct areas. First, how should the CIO manage the transition to cloud computing? Second, the cloud computing environment entails a significant number of internal management challenges for success in deployment, foremost among which is staffing and training for a new skill set. Finally, cloud computing brings sometimes surprising external management challenges in the areas of governance and user and vendor relations.

How to Manage the Transition

Managing the transition to cloud computing means two important, sequential sets of decisions. First, there is the decision to make the transition itself—and the parameters of that transition in terms of time and responsibility. Second, there is the decision of what to delocalize, i.e., what to put into the cloud.

The Decision to Make the Transition

It is the cloud being public and, therefore, not customizable and controllable as older IT used to be, that poses new software management problems as CIOs migrate existing applications to the cloud. The CIO of the fulfillment company, who is adopting public cloud technologies aggressively, said plainly, "A lot of our systems were built from the ground up with custom code, and so I have a legacy infrastructure that I'm trying to migrate to a more contemporary infrastructure." To this the university CIO added, "I know there's been software as a service out there [for] a long time, but I think these relationships are just getting started, and we're trying to figure out how to operate and integrate, but what about de-investment or wind down of these [legacy] operations?"

Moreover, as IT services are increasingly commoditized on the public cloud, the mission of the IT group is shifting from emphasizing only technical demands and customized solutions toward managing the IT business demands that rely on the public cloud. As one auto supplier CIO put it, "I think we all have to face the fact that if we look at our IT services, there are sections of our IT services that I would describe as being commodity and no longer a core part to the business." The university CIO built on that: "How much time did you spend fifteen years ago on data center operations, telecommunications, networking, server, and storage services? It was a big part of the business because it was evolving; it was fairly new. I feel it in myself—I'm getting less and less patient, even with my own organization, having to deal with that stuff that I really think is commodity. And the stuff that is strategic now is the application development."

This shift also means that the IT department is more closely involved with and dependent on other departments. The legal department is a prime example of this new dependency [Kalyvas, Overly, and Karlyn, 2013a, 2013b]. A key issue here is the change that the adoption of the public cloud brings to organizational policies and the leading role the CIO has to play in bringing this about. The CIO of the entertainment company gave this example regarding contracts: "So it may not necessarily be somebody in purchasing who is going to look through a contract and understand the legalese and all the technical aspects, but there has to be somebody in the organization, and really what I see works best is there's a partnership between the legal department and IT. Legal doesn't know all the issues that IT has to control from service-level agreements or performance or disaster recovery, so they look to IT. But IT can't look at a contract and just be completely blind or not get what needs to be in there from a protection of corporate assets or anything that the legal department—so both of these groups are (pretty well) together, but they both need to understand the lingo on both sides of the house."

What to Outsource to the Cloud

Determining what to outsource to the cloud is more complex than what one many have understood from Carr [2003]. CIOs must be deliberate in their decisions about which pieces of the total portfolio move outside the organization and which remain internal [Henschen, 2013]. At the roundtable, several CIOs shared guidelines they use to make these determinations. One test is economic, as one auto supplier CIOs noted, "I'm part of a company that's a €13 billion company. There's stuff that I'm not going to do in the cloud because we can do it ourselves. We've got economy of scale." Conversely, the fulfillment CIO, from a medium-sized company said, "We are aggressively adopting cloud technologies. We have found that that's the best way for us to kind of leverage our cost and stay best in class, best in service."

Several CIOs noted that mission-critical systems simply are eliminated from consideration for the cloud. This may be for regulatory reasons, financial reasons, or because the system is considered "strategic." The sports and entertainment company CIO related how he determines how critical a system is: "What our acid test really is, is when we evaluate a platform or an application for possible migration to a cloud, if it's something that is mission critical, it comes off the list. We're not going to move anything that has a point of sale or a ticketing—an event

ticketing application. In other words, if there's any chance that I can eliminate multiple points of failure along the food chain, it's the old adage, right—I can't control what I can't control, so we keep that stuff hosted internally."

A hospital CIO expanded on the risk-management perspective, "You need to take a look at what are we going to do. And again, going backwards, how long can I live without my data? Where can I be—if I'm going to have this facility or this system and they go under, can I restore it in X number of days or what not? You keep going back to that formula, then you can really get the true cost of what your DR [Disaster recovery] is." The fulfillment company CIO explained this: "I almost see forty or fifty different key components that will make up my complete infrastructure in the future, and I just have to make sure that, from an administration side, I'm managing that properly."

While many services can be sourced externally, the plan for how to integrate them remains a critical internal function. The difficulty of integration can be a factor in determining whether a function is sourced from the cloud or not [Murphy, 2010]. An auto supplier CIO revealed that in his company integration is so risky that "[w]e don't outsource or allow the discussions or the control of architecture to go outside of our own organization. We consider that one of our primary responsibilities is to ensure that as we look at the business strategy, the business objectives, as we look at problems that we're trying to solve with information technology, that the solutions that we're thinking about fall within some kind of architectural framework that we understand." This kind of strategy resonates well with research observations that also note how this strategy ensures that the firm develops and maintains its competence in system architecture, and should help the system remain flexible in the face of future changes [Henderson and Clark, 1990; Wind, Repschlaeger, and Zarnekow, 2012].

How to Meet Internal Management Challenges

Following the challenges involved in framing and making the decision to delocalize, numerous internal management challenges arise within the IT unit itself. These include reskilling of the IT unit to meet the changed technical and project-related rules of the game and, second, the challenge of increasing the flexibility of the IT unit to meet new, perhaps unanticipated demands which arise from the new set of resources.

How to Acquire the Necessary Skill Sets

Public cloud computing also alters the skillsets needed by IT staff in two critical ways. First, the technical skills needed become less focused on depth in a single system. Second, the need for technical skills decreases relative to soft and organizational skills. Historically, IT staff could specialize in particular products or functions, and a single vendor could effectively train them in their own products. A major focus would be on keeping the systems running, troubleshooting issues, and developing custom implementations. However, as basic IT functions move into the cloud, IT organizations need fewer true IT technology generalists and fewer single application specialists. There is, however, an increasing need for experts in the data and business layer who are able to bridge and integrate systems. As the sports and entertainment CIO illustrated, "I've got to have a DBA that is cross-trained in all these different programming applications, languages really, to be able to dive into a Salesforce or into some other data repository that's out on the server somewhere."

Public cloud computing increases the importance of broad business and organizational skills within the IT group. An organization's security needs change, as the bank CIO explained, "My more technical security analysts are having to become more like auditors, reviewing documentation and paperwork…. I want our own assurances. I don't want to trust someone else's." The university CIO summed it up, to broad agreement: "We're hiring less [*sic*] technologists and more lawyer types." Technologists still matter, but purchasing and legal training are key to help ensure that contracts for public cloud and other services are sufficiently comprehensive to meet the firm's needs. One auto supplier CIO commented along the same lines: "Where I work, it's sort of a tag team between purchasing, who doesn't necessarily have the skills in IT to know what to ask for either. If they haven't written those kinds of contracts, if they don't know what's going on, then there's a discovery for both on the IT side and the purchasing side: What do those contracts need to look like? What do you have to discuss up front before you launch into a contract? So I think that's a whole new competency." Another auto supplier CIO added, "We have to work closely with purchasing, but it's a skill that we've had to incorporate internally." The technological side is moving so quickly that one hospital CIO recommended engaging with consultants to ensure the broadest exposure to the technology and contracts in the marketplace: "When you're in an emerging market, what you need to do is work with people [who] have expertise in it."

Finally, the IT group has to develop a competence in educating users on how to leverage new technology, and how to maintain best practices. One of the auto parts CIOs explained that the public cloud "creates an opportunity … for IT to be able to train these folks on what kind of things they need to think about when they launch [public cloud-hosted projects]. 'Have you thought about what happens next? Have you thought about the backup? Is this really an operating system?'" Correspondingly, one of the hospital CIOs described his pitch to users: "If I can show you how

you can get it and manage your expectations and you can meet those expectations, you're going to be successful." An IT group that manages to develop the competencies required to thrive in the era of public cloud computing offers the opportunity to gain a competitive advantage for its business.

Not surprisingly, changing skill requirements for the IT group are impacting what CIOs think should be emphasized in academic programs. The CIOs focused on skills for new college graduates. One major theme was analytical and problem-solving skills. As one auto parts CIO said: "We are always short of people and particular students [who] can help us to get our arms around a business problem and really have the business analytical skills, sort of base skills, plus the creativity and imagination to think about some of the problems that we've got and how we can sort of put our arms around it in terms of solutions and modeling of those problems…. Half the problem is basically being able to envision what the main issues are and to get confirmation that [these are] really the real issues that we're looking at and what it is that we really need to solve to really drive a solution into that problem. So I think business analytical skills [are] a key thing for people, for information technology graduates entering the marketplace…. Essentially what I want are people that can be—really good, solid technical people that can help us to do analysis and have the aptitude to develop and to grow on into senior IS management roles in the organization." Business skills are critical to the success of IT personnel whom the cloud frees up to move into supporting business-specific needs [Murphy, 2011]. To this, one hospital CIO added, "I have emphasis on project management. Without project management, we're not going to survive … they need to know postmortem, because you can't improve if you can't learn from your mistakes."

The second main theme was soft skills. The other hospital CIO focused on communications: "It's important to know IT, but to me it's even more important to know how my users need to use IT and to be able to communicate with them, because if we can't help them, there's no need for us to be there. I mean, that's really our role … to be that bridge between the tool and the user so the user can effectively use the tool, and we're providing the tool." One auto supplier CIO opined: "I think we would all say that it's critical thinking, analysis, collaboration, and—I'm just going to put over the top of all of that—it's got to be people skills." The fulfillment company CIO thought that MIS graduates would benefit from a sales class: "It would teach them how to ask a question and get a response that can help them understand the pain of the user experience. I think it would be extraordinarily valuable."

How to Increase Flexibility

The CIOs' focus on customization is particularly important to ensure that their firms have the flexibility they need to meet changing demands. The entertainment industry CIO cautioned: "The one-size-fits-all mentality that can be rampant out there is a bit of a challenge. So when you talk about software as a service, we've been using Salesforce and some similar applications like that for years … there's integration, performance issues … and that kind of stuff." Public cloud offerings are not yet offering the full flexibility that the bank CIO needs to meet user requirements, "[b]ut trying to be still flexible with them, with our user community, getting them the systems and the information that they need to make good decisions, we found to be a bit of a challenge, which is why we're looking mostly at infrastructure as a service, as kind of our next step, where we can still control development but maybe move that hardware out to someone else's shop." Indeed, other industries share this concern over lack of adequate flexibility when adopting a public cloud solution. Corporate demands keep changing, through market changes, acquisitions, and new technologies and threats. If an organization changes its strategy or resource base, the IT systems need to be able to adapt rapidly and keep up. External threats keep evolving too. As one auto parts CIO put it, "We are the physicians of the IT world, and we need to be able to be positioned so that when that next 'disease' comes about, how do we react to it? … If we have our business data with Google, we've given them the mastership of our data. How are they going to react to it, and then how can we react to it?"

How to Meet External Management Challenges

The cloud brings into sharp relief a number of challenges in the management environment of the CIO in relations with stakeholders outside the IT unit itself. In particular, there are challenges in the areas of governance, management of user expectations, delivery, and vendor relations.

Governance

The roundtable identified a series of governance issues that CIOs address while adopting public cloud systems. The CIOs shared how they frame these issues. One of the hospital CIOs focused on availability and disaster recovery, describing the problem in this way: "… any time I'm presented with new technology, I look at it from the reverse—not how I'm going to use it, but how I'm going to recover from it." The university CIO summed it up succinctly: "How do I get my stuff back?" Connectivity to a public cloud provider becomes a critical link, as it would be in any centralized system. Public cloud computing brings many of the same sorts of challenges to a firm that other kinds of outsourcing have always presented, as raised in the previous CIO roundtable [Gefen et al., 2011]. Indeed, three of the CIOs said they consider outsourced, offsite systems to be a form of cloud computing. As the bank CIO explained, "Vendor

outsourcing to me has always been considered cloud, where all I'm doing is [moving] data connectivity to someone else's data center. It's not at my data center. It's cloud based, really." Public cloud computing brings the nuance that the work done is outside of the direct legal control of the firm. To this point the hospital CIO asked, "If I have requirements to make sure that data does not go abroad, how do we make sure that we have safeguards in place to ensure that that data doesn't accidentally bleed over into other geographies?"

Without effective controls, public cloud services can promote disintegration by making it technically possible for business units to outsource without the consent and oversight of the IT department. Public cloud offerings can be relatively cheap and can provide easy ways to execute complex tasks, and can easily be done without the IT department's knowledge. Apart from security concerns, this also presents new problems because the cost of implementing a new IT today is mostly in the cost of integrating it into existing systems, rather than the cost of the new IT itself, as was brought up also in the previous CIO roundtable [Gefen et al., 2011]. As an auto parts CIO explained, "Everybody's an IT person. It's everybody's job.… This is a risk we have on a daily basis." The CIO in the fulfillment company added that users today have the capability to actually pull data out of the protected environment of the corporate systems and enter them into their own separate cloud system, such as Salesforce.com. This CIO noted: "… when the auditor shows up, the appointment is with you [as CIO], not with them [end users]." This poses a legal risk that is particularly pronounced for firms with legally protected data, such as medical information. The hospital CIOs observed that "a lot of the users are not even our employees, so we can't dictate by policy and control that [they] do that, but yet you're still responsible." To protect and integrate all of the organization's information flows, the CIO must understand and control these risks.

One procedure used to address this legal risk is to limit access to the cloud so it can be done only through a gateway under the control of the CIO. One of the hospital CIOs told how this is done in his hospital network. All cloud services can be accessed only through the hospital's network, forcing all users, internal or external, to route through the network and its control systems. In his words, "If someone wants to go home and access something, they've got to come through my network. So now that my filters can take a look at that information, see where it's going and how it is, we control that." That hospital also makes sure that users, especially external users, are aware of the sweeping damage and personal liability that data misuse can cause, and so pressures them into compliance with prudent information management policies. This hospital CIO explained, "I like to scare the hell out of them, to be honest with you. So what I tell doctors and whatnot—I say, 'Well, your name is going to be associated with that. It's your area. You're responsible. It's not going to be me. It's your people going to be losing the data. You're going to be in the press release.'"

Management of User Expectations

The CIO and IT department must earn the trust of the executives and members of the organization. The IT department must be seen as work facilitator, not obstacle [Hoberg, Wollersheim, and Krcmar, 2012], but this can be difficult given the changing context of the workforce and technology. Public cloud marketing makes the modern workforce more aware of IT technology, with higher expectations [Wray, 2013]. The CIO of the fulfillment company illustrated the dilemma that the awareness of public cloud computing presents to the CIO: "Things have completely changed, where they sit and watch TV, and they see the Microsoft commercials and the IBM commercials, and they come to you and they say, 'We really need this to show up on that device right there.' And, 'Well, okay, let me go grab the system architects and the security people and the PCI compliance, and the SAS 70—let me go through all this.' 'Well, no, Salesforce says on the commercial they already have that.' … Even if you took your 250 programmers and your legions of IT people, [you can't build effectively] what marketing is looking for today or yesterday.… Where we're losing the battle is … when you look at this where you're trying to protect something, then you're not really leading what's going on. Sometimes leading the charge and driving that can really eliminate some of these risks.… From a business perspective, they see a different kind of risk—not growing, not being innovative.… You can't constrain your organization to the point where you're no longer innovative."

Similar expectations management issues were raised by an auto supplier CIO who described how the technology gets closer to the user: "Things like Salesforce.com and some of those other platforms that then sort of decrease the space between some of your key users and the platform provider—that's all well and good and I think can accelerate the business." However, an associated risk in managing expectations is that the CIO may gain a reputation for a defensive stance toward the new technologies. The fulfillment company CIO described how the cloud can undermine such a defensive CIO: "Your authority starts to get decentralized throughout the organization. So we have human resources now that are talking to vendors and putting human resources information on cloud-based systems that are offered by very reputable companies." This situation marginalizes the CIO and fails to earn what several CIOs called "a seat at the grown-ups' table."

Issues of Delivery

However, to be truly trusted, the CIO must do more than recommend solutions that meet the business's needs. The CIO and the IT organization must *deliver* those solutions. The meaning of delivery has changed in the era of public cloud computing. The organization has higher expectations for reliability, ease of use, and customization and integration from its IT services. As previously noted, CIOs need to ensure that infrastructure services are delivered reliably throughout the organization. As an auto parts CIO said, "You cannot have unreliable infrastructure and think that you're going to be keeping the conversation [at the C-level]." Core services must be reliable, or all else is moot [Wind et al., 2012].

Users' attitudes toward and expectations of technology also have changed over time. As a hospital CIO explained, "If your systems aren't simple, like iPhone, like Apple-type stuff—if they're not simple, they're going to work around us.… The whole idea behind IT is efficiencies, competitiveness, giving the people an edge, helping them out, align[ing] with the business.… You've got to do it. You've got to make it easy. You've got to make it simple for them. And they have to be able to want to use it." In other words, the CIO needs to be able to oversee the delivery of easy-to-use technology that meets user needs and expectations. This CIO explained the pressure that public cloud technologies bring to bear on the CIO: "You have to be ready to deliver, because if you don't deliver … they're going to do it themselves." Adding to this, the fulfillment company CIO noted that "[e]verybody thinks that they can go and sign onto Salesforce.com and launch an enterprise-wide system with a credit card."

Delivery often requires system integration, even if some systems are public [Overby, 2013]. Demonstrating this, one auto parts CIO gave the example of a particularly complex and critical business path: "I've got the just-in-time, just-in-sequence plants who have to deliver to our customers on a ninety-minute call signal, and everything's got to work. Their communication to us has to work. Getting through SAP down to the shop floor has got to work. People have got to know how to ship. They've got to be able to trigger the EDI [Electronic Data Interchange] signal. The ASN's [Advance Ship Notice] got to go. That stuff all has to work, and I do have a hard time imagining that will be commoditized anytime soon, because it's all got to work and it's unique for each of my customers that we have to set that up for. That's always going to be like a real key criteria inside. Then there's also some of the stuff that's a little bit more imaginative as far as reaching out to consumers or the forecasting that you—I mean, that's magic stuff, and it's a competitive advantage, and it's got intellectual property that's part of it, and it's all part of the IT and all one piece. So that part, to me, is not going to become the commodity."

Vendor Survival

Public cloud computing introduces a new layer of vendor risks to CIOs' governance decisions. Public cloud providers pose risks to customers if they fail, or even if they are acquired by a deep-pocketed firm. Ironically, while smaller cloud service providers are more likely to listen to the customization and integration demands of clients, they are also at the greatest risk for acquisition and outright failure. A firm that shuts down can strand critical business processes. This risk was highlighted by the university CIO who related their experience: "One of our providers had one of their … DR sites shuttered because the facility, with the banking and real estate problems we had, went bankrupt. And they were really scrambling to get their DR site maintained or moved, and it made me think, my God, what if that was their primary location? … They actually locked the doors. They were evicted from this DR site, and the equipment was—the power was turned off." In response one of the hospital CIOs pointed out that the legal department may be able to prevent an outage with an injunction. However, a weak business still can pose a risk to clients even without an end to the business. The CIO of the fulfillment company also suggested that an acquisition can be very problematic: "The one that causes the most complexity is if they're acquired, because they're not going to go away overnight. But if a Larry Ellison[1] comes in and acquires a company, generally it's to absorb it into whatever they have going on, and that may or [may] not fit the business model you have set for yourself."

Figure 1 summarizes the *new and expanding* challenges and risks public cloud computing presents to the CIO and the IT organization.

[1] Founder of Oracle and major investor in cloud computing companies Salesforce.com and NetSuite

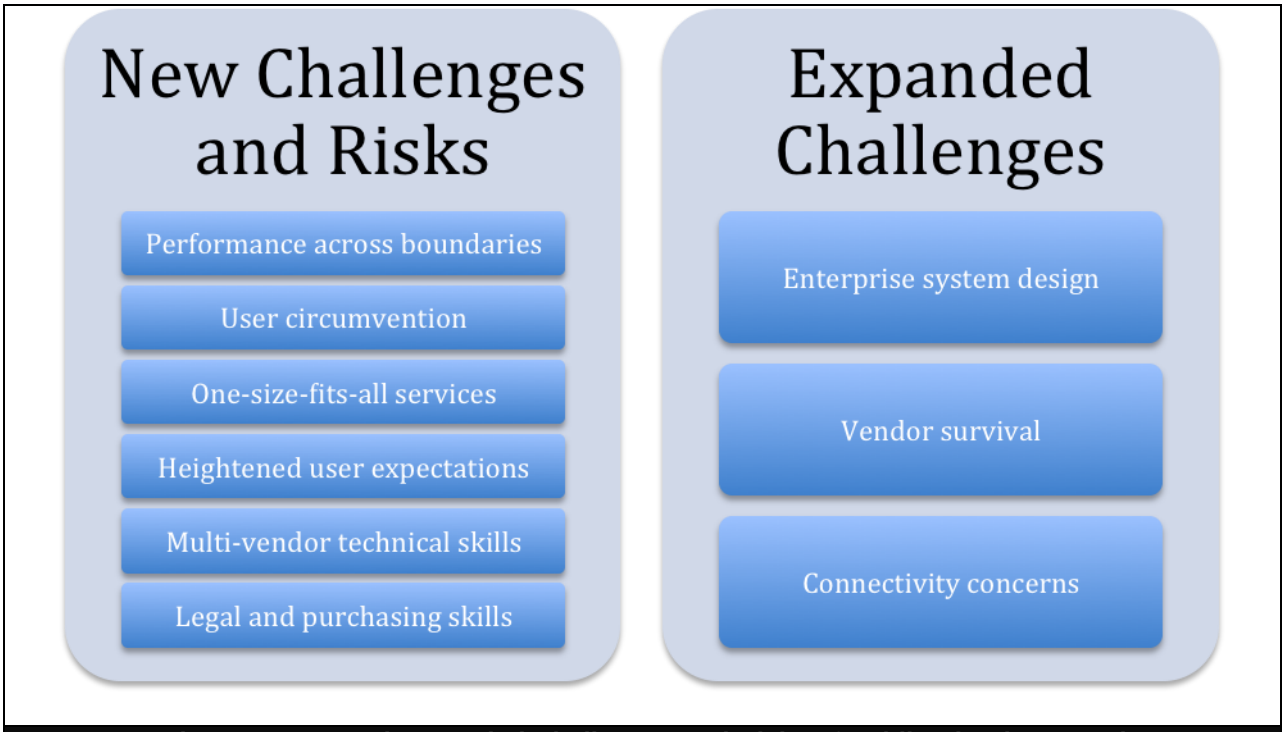

Figure 1. New and Expanded Challenges and Risks of Public Cloud Computing

III. ACHIEVING COMPETITIVE USE OF IT IN A PUBLIC CLOUD ENVIRONMENT

In the contemporary corporate IT world, much IT infrastructure has been commoditized. This environment frames how a CIO has to approach adding value to the firm: it would be unlikely to find a unique application or function that would yield a competitive advantage solely through internal hosting of these commoditized applications. Indeed, Carr [2003, p. 42] suggested that companies should not seek strategic advantage through the use of IT! Carr claimed that "the core functions of IT ... are becoming costs of doing business that must be paid by all *but provide distinction to none* [emphasis added]." In contrast, the CIOs at the roundtable believe that IT can deliver strategic advantage. In the words of one auto supplier CIO, "I think we all have to face the fact that if we look at our IT services, there are sections of our IT services that I would describe as being commodity and no longer a core part to the business. It can be provisioned.… PC Support, network support—there's a range of things—certain types of developments—are they really key to the business? No, I don't think they are." However, IT can add value when it is applied strategically to the business [Son, Lee, Lee, and Chang, 2011], and that comes through integrating systems, and integrating systems with business needs [Bergstrand, 2012]. Cloud technologies can allow, and force, IT groups away from functioning as a Systems Provider in Guillemette and Paré's [2012] framework, and toward types that are more integrated with the business, like the Partner type. Demonstrating this, the auto parts CIO continued, "I think the part of IT that is not a commodity is really understanding what your business is, … what's the key element of your business processes, how are you servicing the customer, and what makes you competitive in the market, and understanding where your information technology is helping you to have a competitive advantage in the market or to reach people that you otherwise could not reach or to process information and make yourself more optimized, that otherwise could not be done."

To get to that point, the CIO needs to be able to speak the language of other functions and know how to help them achieve their goals [Bergstrand, 2012; Malladi and Krishnan, 2012]. As an auto parts CIO described the role, "And that is our job, to make sure that we put our services in the context of how we can drive forward the business and to meet our organization's [goals]." The university CIO used the analogy of IT as an on-ramp to services: "I think the on-ramp is all that stuff … operation, storage, compute, networking. The things that are really strategic are the 'pimp-my-ride vehicles'[2] getting on that on-ramp, which are specially developed applications to really create a distinction and a value-add."

Theory suggests that public cloud solutions can deliver strategic value through deployment speed, simplicity, scalability, and by not redesigning commonly used systems [Son et al., 2011]. This value has been affirmed by the experience of these CIOs. One auto supplier CIO suggested that "it's an opportunity for the business to leverage

[2] Slang for a highly-customized or modified vehicle. "Pimp My Ride" was a series on MTV, in which old cars were repaired and made flashy.

that information and maybe become more agile in developing things." This CIO gave an example of how they used a public cloud vendor to deliver value in logistics through speed and simplicity: "We partnered up with a company that had a Web EDI offering. But it wasn't just the Web EDI offering that they had. They had a program of onboarding the vendors. … they would contact the vendors, they would do the training, they would report back to us on the vendors, on that whole status, and many of these initiatives in the past failed with purchasing because they didn't have the time to follow up with the vendors to get them [on board], to get them trained, show them how to really use the system.… What we were able to do is basically, with my team, just focus on the link from the Web EDI solution back into our core infrastructure, so just a small group tying that up, whilest the company contacted all the vendors, executed the training, and really did a very—a fantastic job—onboarding the customers.… And at the same time, we were able to do this project, complete from start to finish, within six to seven months. That's a great example of showing where we could partner with someone that had a cloud offering, tie it up into our infrastructure, leverage the packaging solutions that they had, and give the organization—if I did that on a conventional timeline … analyze; get the scope pinned down; order any hardware; configure the software test it; then start the process—you know, it would have easily been nine to twelve months, maybe even longer." The fulfillment company CIO added, "And things like supply-chain management, for example, are real sweet spots for cloud applications. We're going through the same thing, because we do global sourcing for all of our apparel, and then trying to communicate with all the different mom-and-pop to the BRICs [Brazil, Russia, India, and China] of the world. This supplier, same thing—we have one EDI connection, and then they have a relationship with UPS where as soon as that package leaves that mom-and-pop store, they give us an update instantaneously, and it ties everything together. I don't even have to get that vendor involved now to know the order has shipped, and those are some of the advantages we're finding."

Public cloud solutions can bring value also from their rapid scalability [Murphy, 2010]. As the university CIO described: "we've got some scientists who got a three-year grant to do genomic decoding. And they came to us and said, 'We need ten terabytes per day, new, every day for the next three years.' Now, I don't know how your organizations operate, but it would take me a while to get the funding, to understand what capital was required, to work with purchasing and legal to do all that internally. And we're having great conversations about how to use the cloud to scale that up and wind it down when the program is done. So I think the rapid scalability is a strategic advantage of cloud infrastructure that none of us likely possess."

However, to truly use IT for competitive advantage requires buy-in from outside the IT organization. As one of the hospital CIOs noted, "What drives that is having a board that understands what IT is.… In my world, IT is viewed as infrastructure, right? It's like an afterthought. I report to the CFO. I don't report to the president." The fulfillment company CIO added that the CIO needs to become "a functioning business partner strategist that's sitting at the table, that just happens to have the accountability for technology."

V. CONCLUSION: CHIEF INTEGRATION OFFICER

Public cloud computing is changing the way CIOs provide services to their organizations. To a large extent public cloud is fulfilling the predictions Carr made ten years ago, but these changes present new challenges to CIOs. These challenges often are exacerbated by strong vendor marketing campaigns directed toward users and circumventing the CIO.

The result of this is to move the Chief **Information** Officer (the executive charged with stewardship of an organization's information resource) to Chief **Integration** Officer (the executive charged with stewardship of the *processes that hold the organization together*).

The CIO's Role in the Organization Is Changing

The CIO has not always been a full member of the top management team, but public cloud computing offers more opportunity for CIOs to move into such a role. As these technologies become more ubiquitous, the CIO can become the expert on integrating technology with the needs of the business. To do this, the CIO must understand both technology and the business and be trusted by the rest of the organization [Malladi and Krishnan, 2012]. One auto parts CIO noted: "We spend a lot of time on this concept of becoming a trusted advisor [to the rest of the business]." He described what such a "trusted advisor" looks like: "I have twelve strategy board members around me. And for every single one of them, I know the initiatives that we're doing in their space; I know what we're doing to increase the top line; I know what we're doing that's going to reduce inventory; I know the last thing that we delivered that should have delivered value on the table.… When I see their [faces], I see the initiatives that we're doing for them.… 'What are we doing to improve cash? What are we doing to drive inventory down? What are we doing to improve scrap? How are we going to improve quality in your area? What is my organization doing to help you drive your business forward?'"

The auto supplier CIO explained that his transition required much effort: “I think [driving a strategic IT focus] is the key role that we have, you know. And trust me; do you think it was easy for me to move the compass away from that infrastructure, email and all the rest of it? Absolutely not.” The CIO can provide insight across the entire business: “We have a unique vantage point where we are part of every process, every person in the entire company at the same time. And whenever there’s a problem, for some reason they go to IT because they think it’s technical. But you’re the process expert; you’re the strategy expert; you’re the cash flow expert—you understand all these dynamics.” With less focus on the lower-level details, the CIO can take on the role of business-wide integrator. The auto supplier CIO outlined: “When I talk to my president, I’m talking to him about what my organization is doing to help him in the overall goal of driving sustainable, global, profitable growth. So I’m combining all these initiatives and telling him what I think we’re going to do this year.” These new technologies and new delivery platforms allow CIOs to focus on the language and objectives of the business, and integrate the information system with the organization’s needs. In companies like these, the CIO is becoming more central to the overall leadership of the company.

Public cloud computing helps the CIO transition into a more strategic role. Moving to a commoditized infrastructure makes delivery of IT projects faster, a well-known strategic imperative among IT managers [Matta and Ashkenas, 2003]. The commoditized infrastructure also enables the CIO to concentrate on addressing more high-level IT needs of the organization. As the fulfillment company CIO said, “There is a part of me that has to rely on these infrastructure technologies to be commoditized so I don’t have to worry about the email falling over on its face, because if email is falling over on its face, I can’t talk to them about their scrap reduction.”

The public cloud can actually alter the role of CIO in one more way—by changing the political context in which the CIO operates within the organization. Public cloud computing offers a clear opportunity for CIOs to reposition from what several participants called “defensive” postures to more proactive ones. CIOs have the opportunity to reposition themselves to be seen more fully as partners, and less as obstacles to business objectives [Hoberg et al., 2012; Winkler, Goebel, Benlian, Bidault, et al., 2011]. An auto parts CIO framed the political context like this: “When this is offsite, you know what? They really don’t care that the CEO [is] in your office trying to figure out where’s the solution? Is that vendor responsive?” Public cloud providers make claims about the quality of their offerings, so when an external system fails, the CIO may be seen as more aligned with the company than the vendor, rather than bearing responsibility as would be the case for internally developed systems.

Toward Integration

The public cloud brings a demand for greater integration for strategic reasons. The public cloud represents standardized building blocks. By standardizing these complex systems, it turns them into “infrastructure” which is useful for IT. However, differentiated organizational routines are an important source of firm competitive advantage [Barney, 1991; Wernerfelt, 1984]. The public cloud offers strong economies of scale [Armbrust et al., 2010], which is likely to lead to winner-take-all markets, based on commoditized functions. Firms that adopt public cloud infrastructure without significant integration to other systems will lose a potentially valuable source of organizational differentiation. It is only through integration to the rest of the organization that the firm can differentiate its internal routines and hope to gain advantage from these IT systems.

Public cloud computing can present challenges when trying to operate seamlessly across disparate systems, some internal and others external, at a corporate scale. The CIO of the sports and entertainment company explained: “We have challenges with integration, sheer volumes of data, as an example. When we put 2.2 million records in the Salesforce, customer records, and then we’re trying to then pull that into operational dashboards or financial reports internally, it is a challenge, just performance-wise.” The fulfillment company CIO said, “What we’re trying to do now is manage the centralization of all these cloud systems. And then that brings up the one area of complexity, which is system integration and data integration.”

The bank CIO explained that his bank has hundreds of separate systems integrated in a central data warehouse. “And so everything that we bring on has to be able to send us the raw data back to our centralized data warehouse so that we can bend and twist and do everything we do with it and get it back out to the user community. And what we found is some of these software-as-a-service … entities aren’t quite ready for that. So trying to integrate a Salesforce with a PeopleSoft with our data warehouse, it can’t happen or isn’t happening. And Salesforce isn’t all that interested in hearing from [us]. They may be interested in hearing from Citi, or maybe collectively they would be interested in hearing from us, or for a large fee they would be more than willing to do anything I want.” This is a serious issue because large- and medium-sized businesses have a strong need to customize their information systems. The bank CIO described increasing regulatory requirements, which means that large cloud providers “really aren’t set up quite yet to support the banking industry as a whole,” even though only the biggest banks can afford to develop and operate all of their own IT needs internally.

CIOs increasingly see their role changing from one of managing customized software to one of integrating standardized utility type packages. This shift was predicted ten years ago by Carr and is now coming into full motion, except that implementation is not as simple as Carr suggested. The standardization of technology opens possibilities to allow the users greater flexibility in how they work. As a hospital CIO said, "If you can mold your IT to your business, right, and if you can give them a menu of what they need and it's easy for them just to choose it, why not do that? Why not strive to make it as easy as possible for the end users?" This CIO was a supporter of integrating a range of end user devices to support bring-your-own-device policies: "If you go to an auto place, when the mechanic comes in, you don't give them the tools to do the job. They bring their own tools. Bring the tools."

The Chief Integration Officer

The result of all this is a transition in the job description of CIO from "Chief Information Officer," who is in charge of managing the IT and information of the organization, toward "Chief Integration Officer, who instead of configuring the proverbial Lego bricks of the IT systems now has to integrate existing public cloud bricks to service the organization's processes. Ultimately, for the organization to succeed, its CIO must design the appropriate overall information architecture, integrating internal and external services effectively. For specific systems, the fulfillment company CIO described the CIO's role as evolving toward something like a general contractor: "Instead of ten years ago when we were sitting down and interviewing the end users and coming up with the architecture [for a system] and the design and the user interfaces, we're general contractors now, right? We're starting to mature."

Public cloud services can help CIOs demonstrate their value to the firm. An auto supplier CIO uses this strategy: "We regularly take certain sections of our IT services and we put them on the market, and we get them bidded out. And there are two aspects to that. One is to show the organization that we are providing it at the best cost, and to make sure that there isn't a better way of providing that service."

As the IT organization's offerings change over time, the activities of the IT department change as well. Public cloud technologies are a component of a more agile IT environment. The CIO needs to lead in mastering the integration of disparate services [Wind et al., 2012]. The bank CIO said, "Our user community is very used to a very quick-responding IT group that will integrate systems.… Getting them the systems and the information that they need to make good decisions we found to be a bit of a challenge."

This shift in the role of the CIO and the IT group is changing the required skills for IT personnel and the expectations CIOs have for the content of academic programs. The focus must be on how to use IT to meet broad organizational needs, rather than on narrow technical skills such as program coding and server maintenance. Public cloud services shifts the emphasis of the IT department from managing custom-made software to integrating publicly available services. This places the burden on academia to emphasize integrative skills such as understanding across the organization, ability to assess integration implications of software decisions, broader process vision as opposed to narrow technical focus, and critical decision making, especially in a project context with a focus on value delivered rather than only on technical excellence.

However the required integrative skills are required by IT staff, the public cloud is a maturity leap for the IT industry technologically and in how the CIO and IT department act and are perceived within the organization. Firms long ago learned how to survive and prosper on borrowed money, temporary human resources, and outsourced factories. Their work is no longer defined by the resources under their personal, physical command. Instead, the CIO's acceptance of information resource stewardship is now taken for granted, as it would be with any executive. CIOs, in the minds of the Roundtable participants, must now learn to take stewardship of integrative processes within the firm in order to demonstrate that maturity and attain the status they desire. It's not the resources any more that distinguish the successful CIO; it's how these resources, wherever they are, work for the benefit of the organization.

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