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Intelligent Healthcare and Life Sciences:

The Movement of Enterprise Applications to the Cloud

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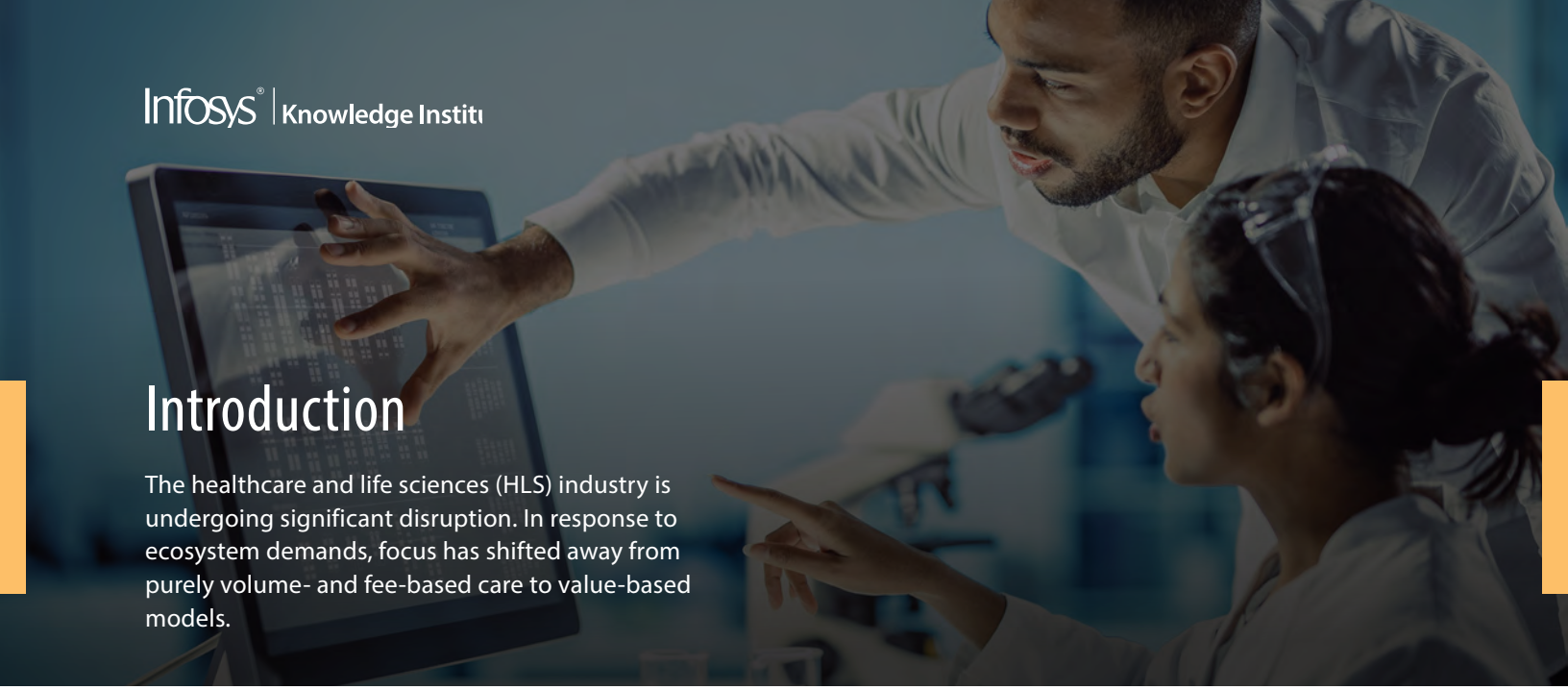
Contents



Introduction

The healthcare and life sciences (HLS) industry is undergoing significant disruption. In response to ecosystem demands, focus has shifted away from purely volume- and fee-based care to value-based models.

Technological advancement, a changing demographic and more accessible information have encouraged patients to expect value-based services. Additionally, fierce competition and stringent regulations have compelled HLS enterprises to innovate and overhaul existing ways of conducting business, all the while seeking new avenues for growth and finding ways to keep stakeholders satisfied and loyal.

Digital technologies can be a game-changer in this situation, as they enable enterprises to become more efficient, provide intelligent and differentiated services, and engage with stakeholders more meaningfully. Cloud computing is an integral part of this boon to organizational health. By reducing the hardware and software assets in an enterprise, the cloud has the ability to rapidly scale the enterprise and improve efficiencies. These efficiencies are often found through service automation and simplified operations, and they pave the way for better interoperability between technologies, effective governance and agile ways of working.

> *"Cloud has the ability to rapidly scale the enterprise, simplify operations and improve efficiencies"*

As part of the transition to the cloud, enterprise applications come under the spotlight as firms move away from monolithic packages and massive implementation cycles toward shorter, agile implementations. This increases the acceleration path and in turn spurs more digital transformation in a flywheel effect, with confidence in one initiative leading to further successes.

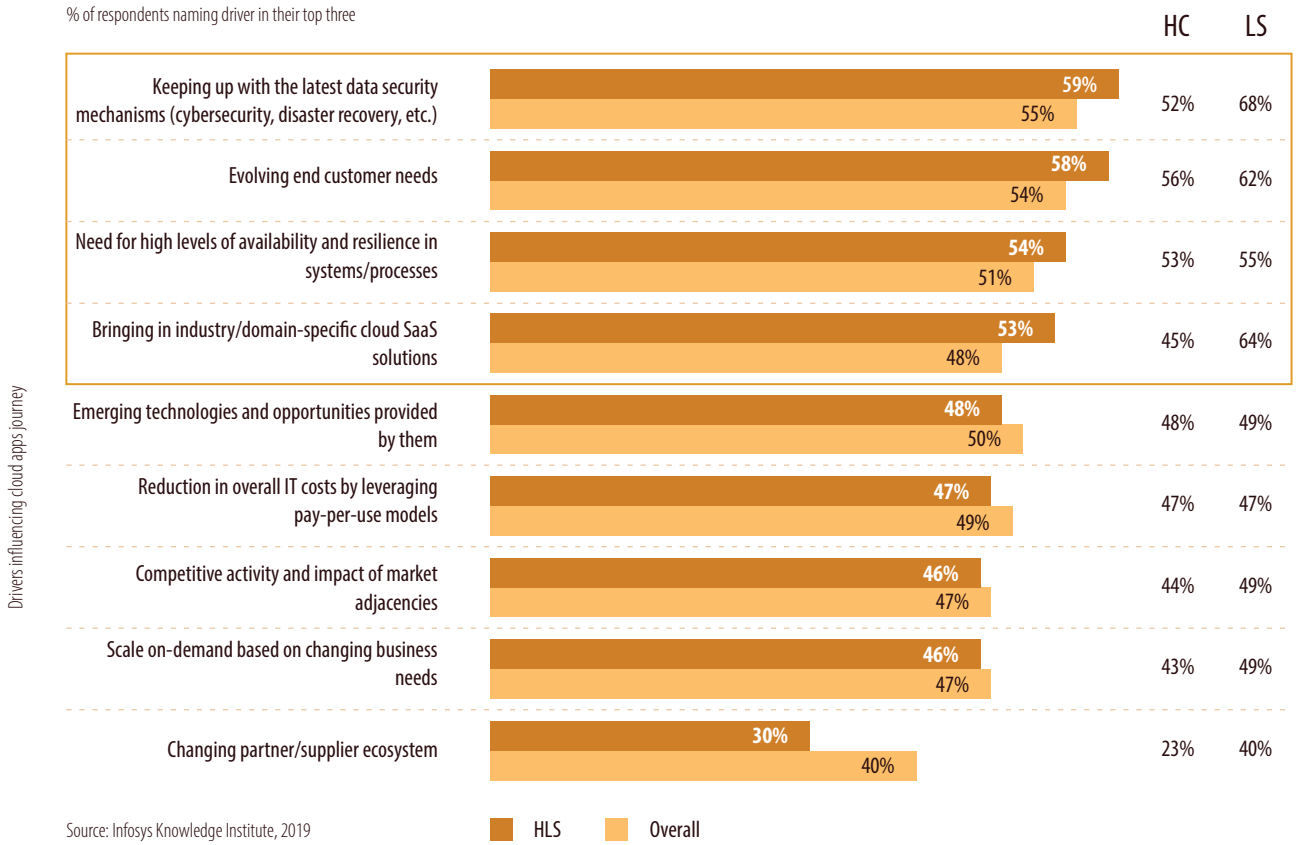
Given the critical role played by enterprise applications in a business, it seemed timely to get a comprehensive idea of their movement to the cloud in the HLS industry. Enterprise applications include those that run the full gamut of business operations, including enterprise resource planning (ERP), customer relationship management (CRM), supply chain management (SCM) and human resources management (HRM).

Infosys launched a study in the first quarter of this calendar year to understand the experience of application cloud transformation across 142 HLS firms from the United States, Europe, Australia and New Zealand. To understand the pulse of the market moving forward, the survey was further validated by qualitative interviews with senior executives in September and October. Respondents were senior executives involved in digital and cloud initiatives at firms with revenues exceeding $1 billion.

The cloud: a strategic move for enterprise applications

A mix of external and internal drivers trigger the movement of HLS applications to the cloud (Figure 1). The top three are the following: keeping pace with data security trends (59%), meeting evolving customer needs (58%), and ensuring high levels of availability and resilience in systems (54%).

Figure 1. Technology and customer-facing initiatives are the top reasons for movement to the cloud



Source: Infosys Knowledge Institute, 2019

There is an upsurge in the amount of customer data, due to increased automation and connectivity in the HLS ecosystem. However, the data, while valuable, places the enterprise under threat from cyberattacks. In fact, according to BakerHostetler, an American law firm, healthcare accounted for a full 25% of the total cyber breaches in 2018. Cybersecurity is clearly a justified priority for moving applications to the cloud. With managed services and encryption, cloud is seen as actually more secure than on-premises applications by industry experts. Also, the number of cyberattacks on cloud infrastructure is almost half the number of attacks on on-premises infrastructure[1].

> *"Managed services and encryption makes cloud actually more secure than on-premises applications"*

Patients today are empowered with information and hence demand convenience, transparency and personalized yet affordable services from the HLS industry. New care delivery models have sprouted to meet these evolving customer needs. The cloud offers new self-service business models, and more automation and disaster recovery, ensuring that the customer experience is as seamless as possible.

While efforts to manage the diverse market forces are underway, HLS firms must also focus on operational performance parameters such as availability and resilience to ensure business functions smoothly.

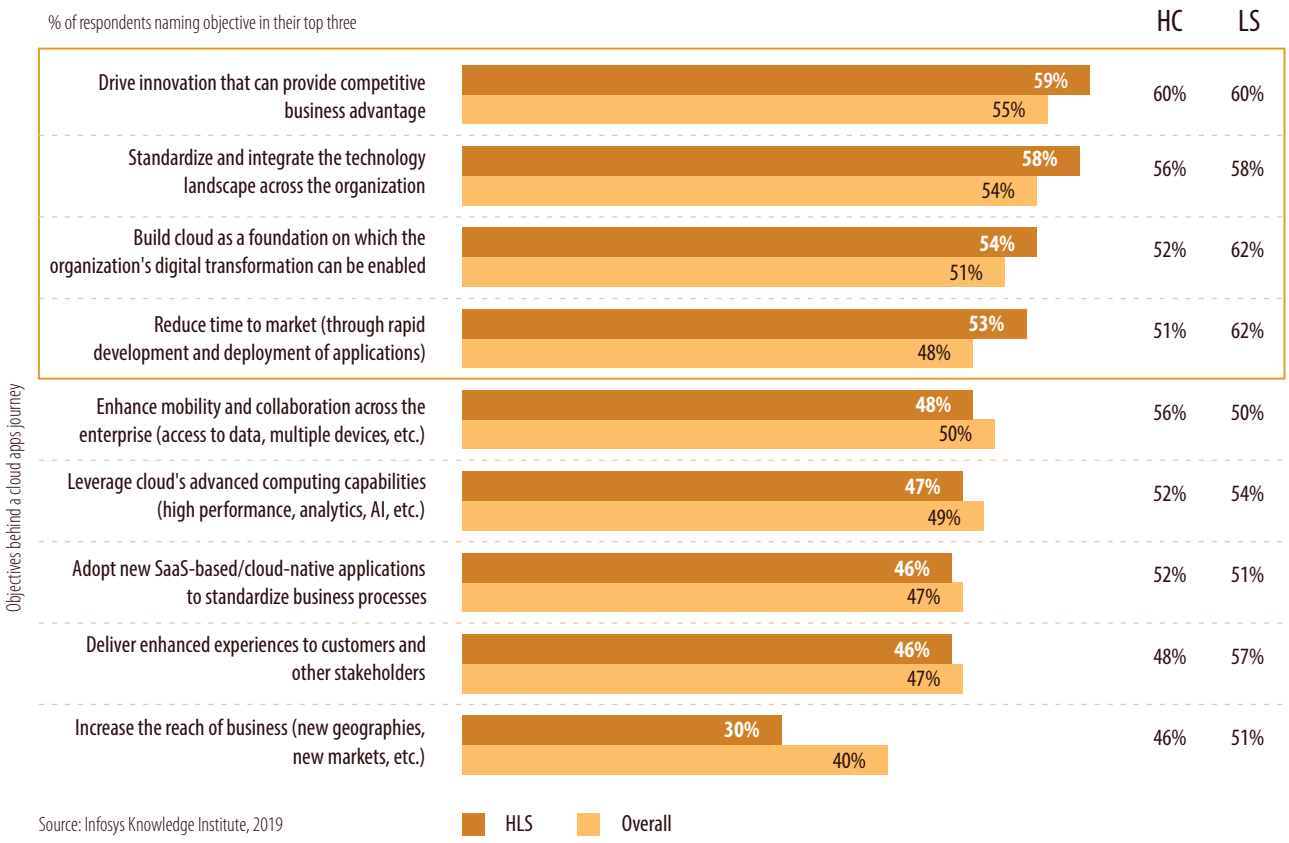
The cloud enables this through clever server switching. As a case in point, one has only to look at the way Netflix achieves 99.99% availability through prodigious use of cloud services from Amazon to take inspiration.

Other executives that we spoke to cited cloud's "anywhere, anytime" availability as a dominant factor for cloud adoption. A senior director at a U.S.-based multinational pharmaceutical firm wanted to optimize the procurement process across the business. "We wanted self-service thinking to dominate over what was once a time-consuming and tedious procurement process," he said. "Also, post-streamlining the buying process, we wanted to use insights strategically to understand which vendors were making a valuable difference."

The top objectives – rather than drivers – of the surveyed firms include innovating to gain competitive advantage (60%), standardizing and integrating the technology landscape (57%), using the cloud as a foundation for digital transformation (56%), and reducing time to market through rapid development (56%) (Figure 2).

Cloud is relatively cheap, powerful, scalable, agile and more resilient than legacy IT. It also allows DevOps to take root in an enterprise. Vendors such as Salesforce, Oracle and SAP offer cloud solutions as a service, acting as scaffolding from which to build other digital technologies. By exposing APIs to a wider ecosystem and utilizing open source code, the cloud enables agile teams to produce high-quality software faster and less expensively.

Figure 2. Top HLS objectives for the cloud apps journey include innovating to provide competitive advantage and standardizing and integrating the technology landscape across the enterprise



Source: Infosys Knowledge Institute, 2019

The four types of enterprises

The study evaluated the maturity and direction of the application cloud program across the HLS companies surveyed. Maturity was determined by asking the following questions:

- Are the business objectives of HLS firms strategic or operational in nature?
- Do business or IT-led reasons drive HLS enterprises to the cloud?
- Are enterprises occupied with quick wins today, or are they thinking and planning ahead?
- Have HLS enterprises expanded to include the external ecosystem, or are they internally focused?

This examination led to four distinct clusters in the HLS industry:

Business-focused (46%)

Visionary enterprises looking at long-term business impact. Competition, enhanced stakeholder experiences, increased innovation, market reach and keeping up with the changing ecosystem drive these firms.

IT-focused (30%)

Enterprises absorbed in technology-led operational outcomes. These organizations are not fundamentally changing their business model in response.

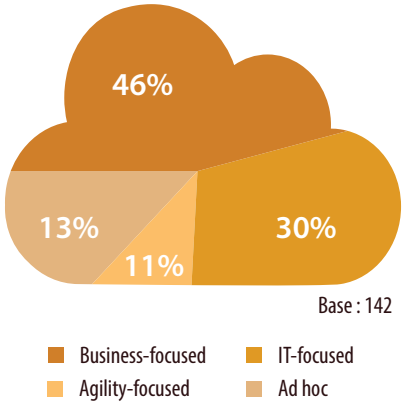
Agility-focused (11%)

Progressive enterprises focused on improving organizational agility. These firms rely heavily on operational transformation to deliver business outcomes.

Ad hoc (13%)

Enterprises lacking a clear vision or plan for IT or business transformation. They respond to triggers in an ad hoc fashion.

Figure 3. Business-focused enterprises (46%), IT-focused enterprises (30%) and agility-focused enterprises (11%) comprise the key clusters



Source: Infosys Knowledge Institute, 2019

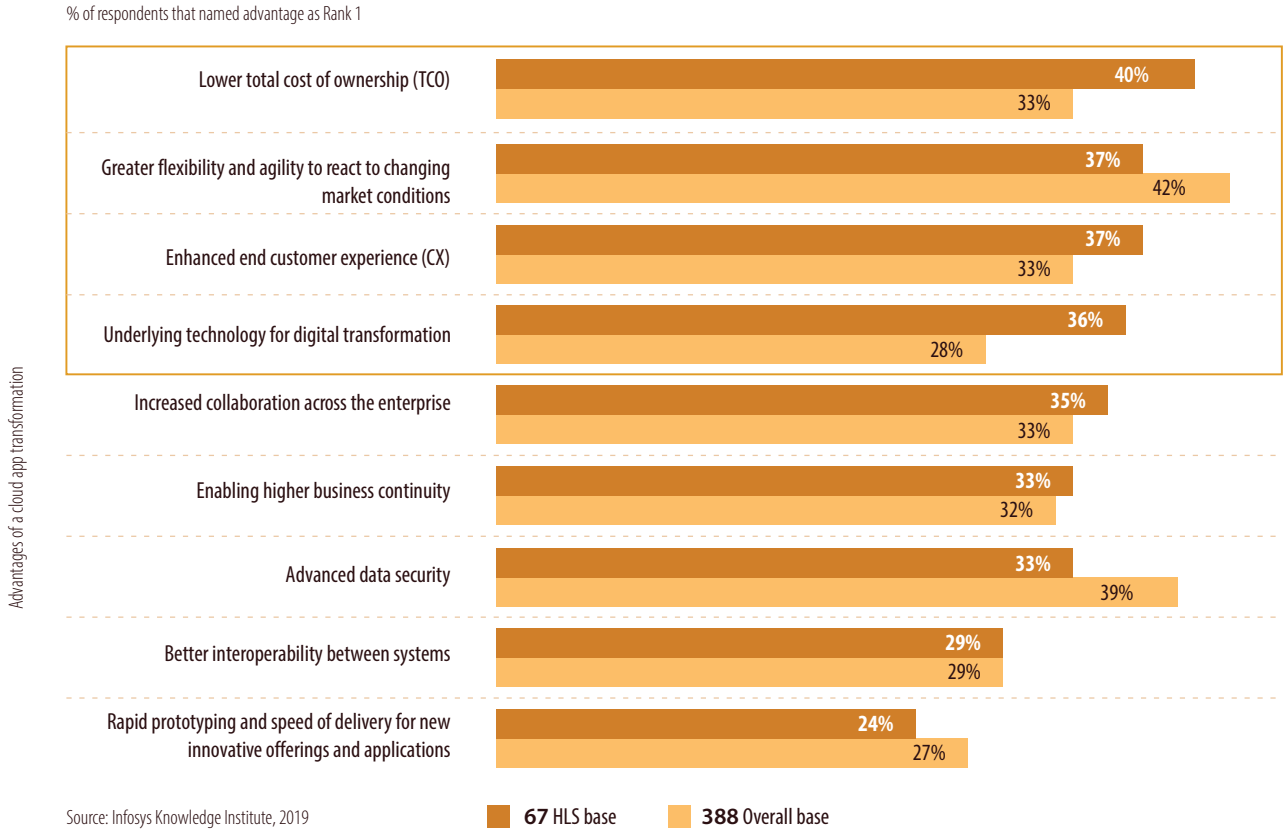
The HLS industry has a similar profile of clusters to the median across industries, though there were more IT-focused firms and fewer firms focused on agility. According to a report by The Economist Intelligence Unit[2], the healthcare industry trails other industries, such as banking, retail and manufacturing, in cloud adoption. As a more immature industry, many HLS firms are concentrating on using cloud as scaffolding around which to build other technological capabilities. This points toward the higher number of IT-focused firms in the analysis.

Read our master report – Behind the Scenes of an Intelligent Enterprise: Moving Enterprise Applications to the Cloud – for more insight into each cluster.

Enterprise clusters expect both strategic and operational benefits

Though advanced data security was a driving factor for HLS actually adopting cloud, the expectation of benefits from cloud data security actually was significantly lower than other attributes, such as total cost of ownership (TCO) (40%) and greater market flexibility (37%) (Figure 4).

Figure 4. Lower TCO, greater market flexibility and enhanced customer experience are top cited advantages for cloud app transformation



Source: Infosys Knowledge Institute, 2019

Top solutions implemented (%)	Overall	HLS	U.S.	EU	ANZ	HC	LS
Lower total cost of ownership (TCO)	33	40	56	21	25	40	41
Greater flexibility/agility to react to changing market conditions	42	37	39	36	33	39	33
Enhanced end customer experience (CX)	33	37	38	33	50	29	46
Underlying technology for digital transformation	28	36	38	27	50	35	37
Increased collaboration across the enterprise	33	35	32	27	71	31	40
Enabling higher business continuity	32	33	29	38	40	28	43
Advanced data security	39	33	36	44	-	39	24
Better interoperability between systems	29	29	20	46	-	30	29
Rapid prototyping and speed of delivery for new innovative offerings/applications	27	24	16	32	40	22	27

Source: Infosys Knowledge Institute, 2019

Healthcare spending is set to rise globally, and HLS organizations must emphasize prudent financial management, efficient operations and enhanced customer relationships to be able to handle the growing market successfully. In our interviews with HLS CXO's, cloud computing was seen as a boon to inventory management and procurement optimization. The executive of a hospital chain in the U.S. said that "with cloud, financial forecasting and revenue management was made that much easier due to its "stream" processing of data."

Region-wise, the expected advantages varied significantly. The United States was most focused on lowering TCO (56%), while Europe looked for better interoperability between systems (46%) and Australia and New Zealand expected increased collaboration across the enterprise (71%).

Cloud concerns persist, characterizing large-scale programs

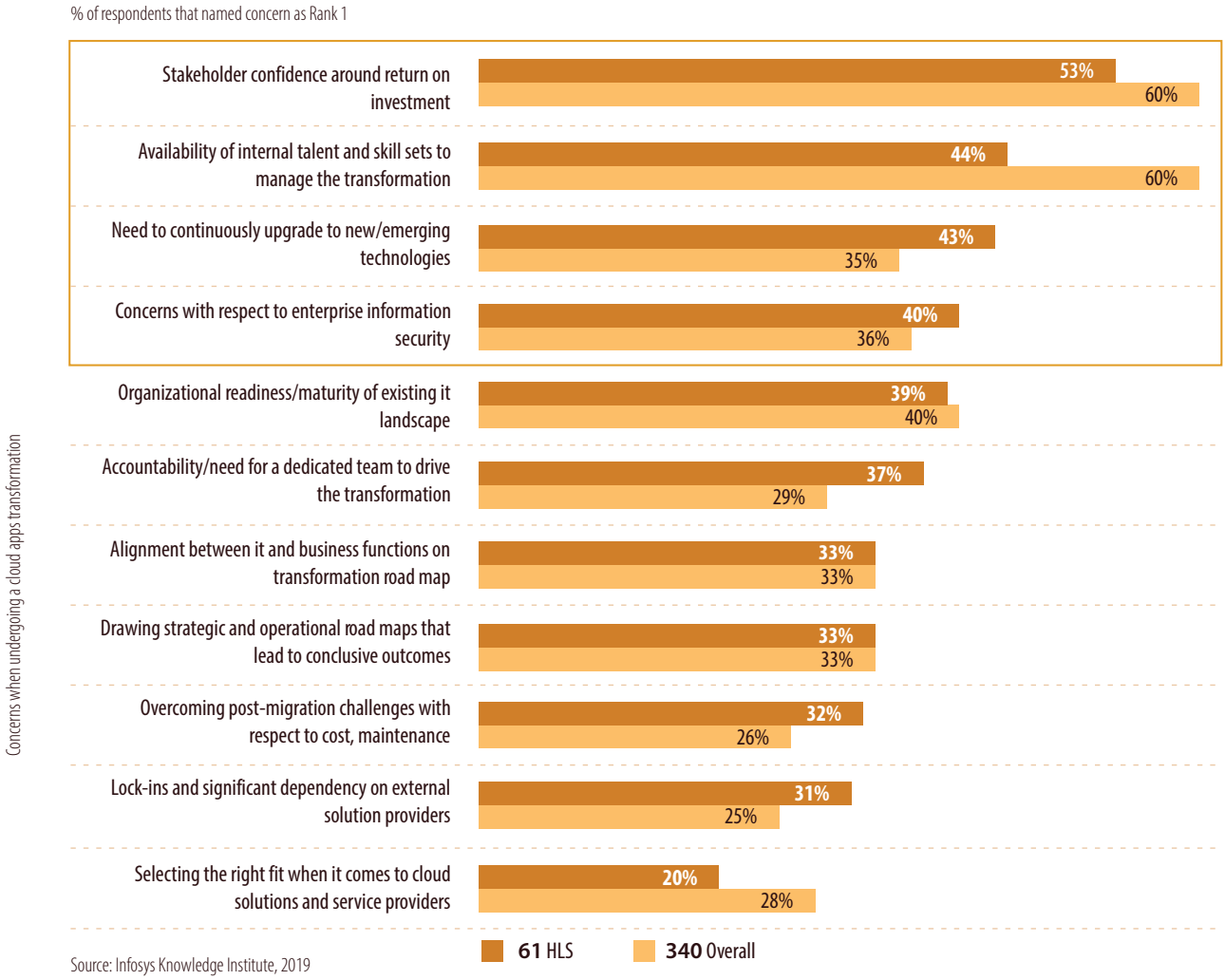
The top concern for HLS firms is delivering a return on investment to build stakeholder confidence (53%) (Figure 5). Cloud transformation programs mandate high investments and consequently garner significant visibility, especially among senior leaders. Large-scale programs of this nature require ownership and direction from top management to succeed, and so delivering significant RoI deservedly becomes a key concern across business and IT groups, and across industries and regions.

The respondents also expressed concerns over the availability of internal talent to manage the transformation (44%) and continuously upgrade to new technologies (43%). Post-migration challenges such as maintenance and effective collaboration with managed service providers (MSPs) figured low down on the list of challenges, indicating that HLS firms are still somewhat immature on their cloud journey.

Australia and New Zealand (75%), followed by the U.S. (53%), appeared more worried about building stakeholder confidence than Europe, for whom lack of a dedicated team to drive the transformation (43%) was a bigger issue.

The business-focused (60%) and IT-focused (60%) clusters also ranked retaining stakeholder confidence as a top concern.

Figure 5. HLS firms are apprehensive about building stakeholder confidence, availability of internal talent and the need to continuously upgrade technologies



Source: Infosys Knowledge Institute, 2019

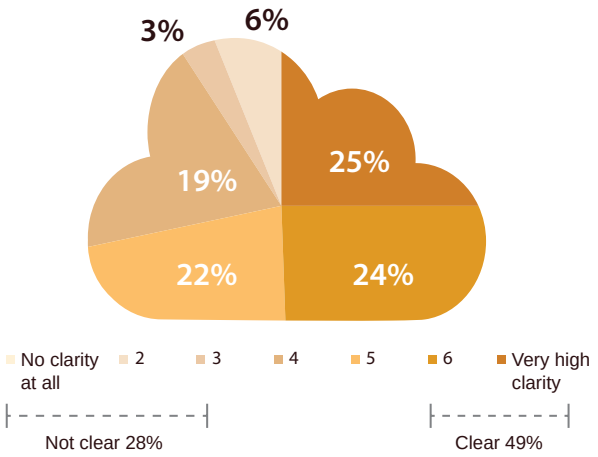
Top solutions implemented (%)	Overall	HLS	U.S.	EU	ANZ	HC	LS
Stakeholder confidence around return on investment	60	53	53	36	75	45	63
Availability of internal talent/skill-sets to manage the transformation	30	44	47	38	40	46	41
Need to continuously upgrade to new/emerging technologies	35	43	50	33	-	43	44
Concerns with respect to enterprise information security	36	40	43	42	-	48	20
Organizational readiness/maturity of existing IT landscape	40	39	41	38	25	44	32
Accountability/need for a dedicated team to drive the transformation	29	37	40	43	-	32	47
Alignment between it and business functions on transformation roadmap	33	33	24	33	71	32	33
Lock-ins/significant dependency on external solution providers	25	31	33	36	-	23	46

Source: Infosys Knowledge Institute, 2019

The importance of a clear strategy and road map

Game-changing initiatives such as cloud cannot succeed without the support of multiple stakeholders across the organization. To garner support, stakeholders must have clarity on the initiatives and what to expect from them. While 49% of the respondents said they had clarity on the digital path, a significant 28% of HLS enterprises said they were unclear (Figure 6). This was four percentage points higher than the median number across industries.

Figure 6. Almost half the HLS firms had clarity on digital initiatives, though three-tenths are still unclear



Source: Infosys Knowledge Institute, 2019

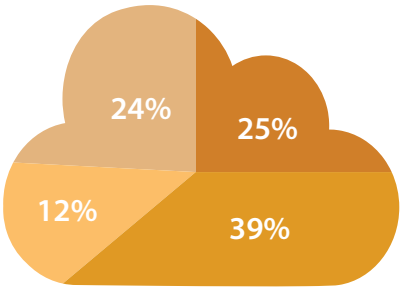
"While collaboration within companies has increased dramatically thanks to the introduction of new collaboration tools, productivity has only increased modestly because teams lack true clarity," says Robbie O'Connor, head of EMEA sales for work management platform Asana. "The more complex the project, and the more parties involved, the harder it is to keep everyone focused on the work that matters."

The respondents who were clear on the digital transformation path looked to increase market reach (54%), use the cloud as a foundation for digital transformation (53%), and standardize and integrate the technology landscape (52%). From a cluster perspective, it was the business-focused firms that had higher levels of clarity. Experience breeds clarity; the more mature firms are on their digital transformation journey, the more challenges arise to impede progress. However, as firms garner more experience in one digital technology, the more confident they are of succeeding on other initiatives. They can think about standardizing software as processes become more transparent, and create new efficiencies with automation.

Enterprise cloud applications adoption is well underway

This research revealed that a significant 51% of the HLS respondents had shifted all or some critical enterprise applications to the cloud (Figure 7).

Figure 7. 51% of HLS firms have moved all or some of their enterprise applications to the cloud, with 24% still entirely on premises



	Current state of cloud transformation (%)	Overall	HLS	U.S.	EU	ANZ	HC	LS
	Base	853	142	75	50	17	82	60
	Some pilots/POCs for cloud adoption are underway but, currently, all enterprise applications are still on premises	24	24	19	32	24	18	32
	Cloud adoption is underway for some applications/ functions, but none have been completed	26	25	27	26	18	27	23
	Cloud adoption is already complete for some enterprise applications/functions	34	39	40	32	53	44	32
	All major enterprises applications have moved to cloud	16	12	15	10	6	11	13

Source: Infosys Knowledge Institute, 2019

Adoption was higher in healthcare than life sciences (55%), signifying the higher levels of maturity in this more customer-facing industry.

> *"Being a customer-facing industry, healthcare enterprises are ahead of life sciences in adopting cloud applications, displaying a higher level of maturity"*

As one Infosys SME noted: "Healthcare enterprises that have embraced application cloud transformation and are working toward it ensure that they have a firm slot on the digital journey, a prerequisite to surviving and thriving in a tough market."

Still, almost a quarter of HLS firms have not yet ventured on the cloud apps journey. These "watchers" are still unsure of the promise of cloud technology. They are waiting to see if the promise of cloud really does reduce costs in healthcare, even as customers now expect more personalized services, including long-distance monitoring of patients, and more effective treatments that rely on automation. One way for these firms to get a leg-up on their journey is by using agile ways of working, with small wins in getting effective products and services out to patients, paving the way for cloud applications that cater to more and diverse needs. They should concentrate on high-priority use cases, implementing automation where needed and bringing about a change in culture where workers are not afraid to push boundaries.

Three choices for migration to the cloud: LOB, enterprise or both

HLS enterprises must carefully examine the objectives and expected outcomes before deciding on the cloud approach to take.

The line of business (LOB) approach allows a business unit to independently activate a new cloud service with less involvement from the enterprise IT team. Such an approach is best suited for situations that require quick deployments and minimal disruption. Moreover, HLS enterprises can select best-in-class software such as SAP SuccessFactors or NetSuite by adopting a LOB approach.

In contrast, enterprise-level cloud approaches are complex, requiring immense efforts, and ideal for long-term projects that integrate applications on a single homogeneous platform. Such efforts cause significant disruption and take a long time to complete.

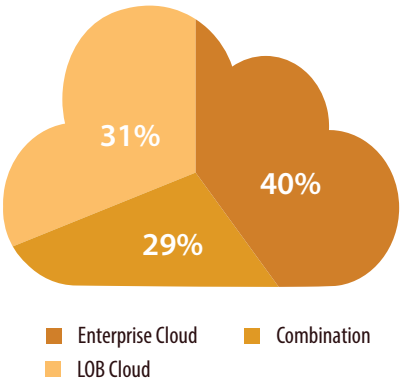
The combination option presents the best of both approaches.

The enterprise cloud approach is the preferred option, with 40% of HLS firms looking for enterprise-wide wins (Figure 8). The LOB approach was a full 14 percentage points less popular in the healthcare industry. According to Infosys Knowledge Institute analysis[3], the healthcare industry is the least mature industry in terms of technological aptitude. Such firms are more likely to opt for a solution that tackles enterprise-wide change, anxiously forgoing the more niche capabilities that are provided by the LOB cloud.

> *"Healthcare is the least digitized industry, as per the analysis of Infosys Knowledge Institute"*

European firms (52%) led the regions in opting for the enterprise cloud, while the U.S. was ahead with the LOB cloud (36%). Australia and New Zealand used the combination approach (47%) more than the others.

Figure 8. Enterprise cloud is the way forward for four-tenths of HLS firms and is even more popular in Europe (52%)



Approach adopted	Overall	HLS	U.S.	EU	ANZ	HC	LS
Base	814	140	73	50	17	82	58
LOB cloud	30	31	36	28	24	29	34
Enterprise cloud	39	40	34	52	29	43	36
Combination of LOB cloud and enterprise cloud	30	29	30	20	47	28	29

Source: Infosys Knowledge Institute, 2019

Breaking down this data by cluster raises some interesting insights. Business-focused enterprises tend to use all three approaches almost equally. It takes a high level of maturity and experience to be able to adopt any of the methods in differing use case scenarios, which is why this cluster is best placed to execute such decisions confidently.

> *"Business-focused firms use all three approaches in various use case scenarios, pointing to higher levels of maturity"*

IT-focused firms chose the enterprise approach for its advanced data security, enhanced end customer experience and increased collaboration across the enterprise.

The implementation process

Once the right cloud approach has been identified, and the cloud solution identified (SAP, Oracle, Salesforce and so on), how do HLS firms go about actually implementing these solutions?

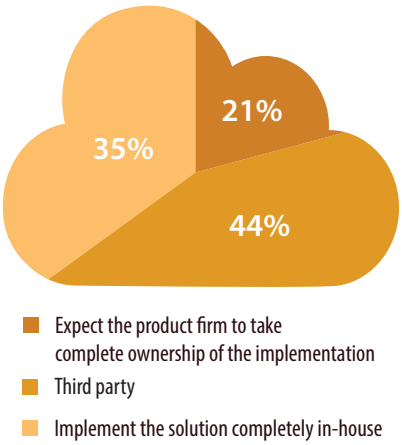
Third-party vendors enable a high degree of customization, giving HLS firms the ability to meet evolving customer needs and keep pace with emerging technologies. No surprise, then, that third-party implementations figured highly across the board (44%), with HLS firms in Australia and New Zealand expressing a very strong preference for partnering (Figure 9). It should be noted as well that a trusted partner brings about culture change, and infuses an organization with thought leadership and skill in emerging technologies.

Infosys analysis[4] also shows that partnering yields higher chances of success, quicker implementation and a greater transfer of skills.

> *"Partnering yields higher chances of success, quicker implementation and high levels of skill transfer"*

However, this research further found that implementing the cloud solution in-house (35%) was also popular, perhaps due to the preference for controlling project costs and building a capable talent pipeline.

Figure 9. 44% of HLS firms expressed a desire to implement the cloud solution through a third-party provider, while more than a third implement the solution in-house



Source: Infosys Knowledge Institute, 2019

Product Implementation (%)	Overall	HLS	U.S.	EU	ANZ	HC	LS
Base	844	141	75	50	16	82	59
Third party	39	44	39	44	69	50	36
Implement the solution completely in-house	36	35	33	44	13	34	36
Expect the product firm to take complete ownership	25	21	28	12	19	16	29

Preparing for the cloud challenge

The top challenges faced by HLS enterprises during the cloud apps journey include promoting cultural change within the organization (53%) (something that can be solved through effective partnering), aligning legacy systems and technology environments (51%), absence of an internal dedicated team to drive the initiative (51%), and deciding on tools and technologies to pick from (51%) (Figure 10).

Figure 10. Diverse issues such as legacy system alignment, promoting cultural change and absence of a dedicated team were the top cited pain points

Challenges (% Top2 box)	Overall	HLS	USA	EU	ANZ	HC	LS
Base	840	141	74	50	17	81	60
Promoting a culture change within the organization	48	53	55	53	41	47	60
Aligning existing legacy systems/architectures and technology environments	49	51	54	37	76	49	53
Absence of an internal dedicated cloud team to drive the initiative	45	51	57	46	38	49	53
Deciding on choice of tools/technologies to pick from	48	51	55	41	59	47	56
Accurate estimation of time and financial costs involved	51	50	57	48	29	49	52
Tracking and monitoring systems/processes on cloud	51	50	55	47	35	49	50
Lack of high levels of clarity in the execution road map	45	49	54	43	47	46	54
Collaboration/integration with external service providers/ stakeholders	47	47	54	37	50	43	53
Pace of execution/implementation of the initiative	48	47	54	38	47	48	47
Application refactoring/tweaking to suit cloud architectures	46	47	50	41	53	41	55

Source: Infosys Knowledge Institute, 2019

Constrained by tight budgets, HLS enterprises have made do with legacy systems, be it for customer-facing applications or antiquated hardware. Now, in the quest to become a modern healthcare organization, these firms struggle to align existing legacy systems with newer technology platforms. Working on APIs and business process management is a good way to tackle this apprehension. That said, firms must also ensure that industry-specific talent is built up in-house once applications are shifted to the cloud. One executive we spoke to, the COO of a U.S. hospital chain, said that once the new cloud system was in place, very few people in their organization had the skill to collaborate effectively with the cloud vendor. "Most of our people had left the company, which led to delays in the project. Multiple iterations of the solution were needed, to ensure historic data was read accurately and so that new information was captured properly."

Once basic technologies are in place and the surface of the enterprise is made cloud capable, partners can be brought in to consult on the best tools and technologies to amplify the business.

Conclusion

The HLS industry is going through a transformative phase as it moves from fee-based to value-based models as demanded by a demographically diverse patient population. Savvy patients, used to instant fixes from the media industry, also expect a staggering level of change in the way service is delivered. This leaves HLS enterprises with no choice but to undergo digital transformation. The cloud, with the capabilities it enables, is surely a mainstay initiative, and should be factored into CXO blueprints on their road to visionary status.

As we've laid out in this report, almost half the respondent firms stated they had clarity on the digital path, though a significant 28% were still unsure of their enterprise road map. Fifty-one percent of HLS firms have moved either all or some of their critical applications to the cloud, perhaps an indicator that healthcare and life sciences are moving quickly from a watcher industry to an explorer. To gain significant benefits, top-down leadership is mandatory, with support from business CXOs.

Research also showed that respondents prefer the enterprise cloud approach more than the LOB approach. HLS firms are likely to opt for a business strategy that encompasses the whole organization, and business units have less agility and experience in turning on a new service (which is the main benefit of LOB).

To counter this, and remain competitive in an industry where automation is changing customer expectations, partnering is a go-to strategy that increases confidence and births quick wins and faster implementation cycles.

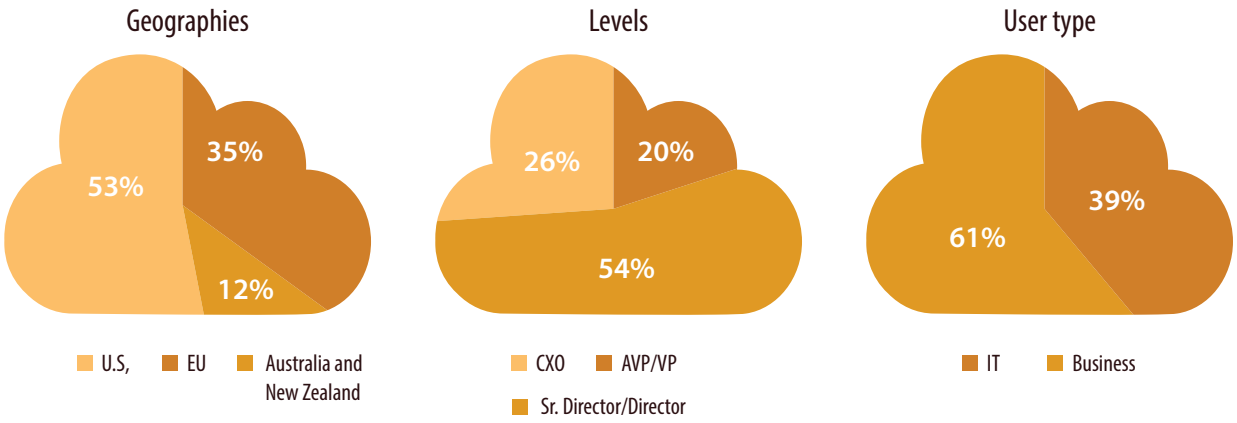
The path to cloud transformation is challenging, especially as HLS enterprises must navigate a complex legacy environment. Firms must first analyze their level of digital maturity and take a frank look at initiatives relative to objectives. They must look at how customer expectations are changing with the rise of digital giants and change their business and operating models accordingly.

> *"HLS firms must keep pace with digital giants, using cloud to change both business and operating models"*

Additionally, they must pick those areas of the business that are ripe for cloud app transformation, and show high levels of RoI to bring more key stakeholders along on the journey. Once business and IT are working together successfully, other initiatives such as DevOps, better design processes and accelerated learning for employees will ensure the industry remains on the path to true digital transformation.

Survey methodology

A total of 142 HLS senior executives and leaders involved in digital and cloud initiatives responded to this research, which took place in the first quarter of this calendar year. To understand the pulse of the market moving forward, the survey was further validated by qualitative interviews with senior executives in September and October. Only companies with revenues exceeding $1 billion were invited to participate. Respondents hailed from the United States, Europe, Australia and New Zealand.



Source: Infosys Knowledge Institute, 2019

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