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Riding the information technology wave in life sciences:

Priorities, pitfalls and promise

Introduction

Advances in technology abound across the industrial landscape, bringing change to all sectors and affecting all of our lives. Life sciences companies - those involved in the discovery, development, production and sale of medical diagnostics, devices and pharmaceuticals - have long embraced technology in pursuing scientific breakthroughs in their research and development activities, including the use of high-throughput screening of drug candidates, genomic screening, and use of proteomics. To meet the next wave of challenges, these companies must also now develop new capabilities in information technology to optimize their commercial operations. This will enable those who use and pay for medicines to receive the full value of treatments, lower the operating costs of life sciences companies, and sustain the ecosystem that supports ongoing investment in the next generation of innovation.

This report provides a view of how the current technology wave - defined in terms of cloud- based storage, new applications, systems integration, and embedded analytics - will be harnessed by life sciences companies in their commercialization activities and why this is necessary for these companies to succeed in bringing innovative diagnostic and treatment options to patients. As the rest of the healthcare system – including payers, providers and patients - also increasingly embraces information technology, the opportunity exists for transformational change in the efficiency of the entire system and the effectiveness with which patients are treated.

The priorities to be set, pitfalls to avoid and promise to be realized are described in this report, which is intended to objectively assess the current situation, challenges ahead, and opportunities for technology to help drive and support positive change in organizations large and small across the life sciences sector. By capturing these opportunities, the industry will ensure its sustainability, and continue to bring important new healthcare options to patients.

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Executive summary

Life sciences companies are in the midst of riding the technology wave that has already transformed many industries. They are using technology to bring new types of value to health systems - value to patients, physicians and payers - not only through the quality of scientific innovation but also by understanding current patient treatment pathways and the value of their medicines based on evidence, to help clarify and support helpful clinical approaches. This is changing the role of life sciences companies and bringing much greater use of technology to commercialization functions.

The technology wave is also providing a means to address the cost and profitability concerns of life sciences companies, which linger even after the consequences of patent expiries have been addressed. With average per-product returns constrained by tighter payer controls, and higher commercialization expenses, over $35 billion of cost reduction is needed through 2017 in order for large pharmaceutical manufacturers to maintain their current levels of research and development activities as well as their operating margin levels. Our survey respondents also confirm an expectation of continued cost reductions, with 45% of executives indicating cuts of more than 10% are planned over three years. Other survey data indicates a strong focus on optimizing commercial organizations, with over 80% of companies having an ongoing centralization initiative intended to balance centralized efficiencies and localized effectiveness.

The Chief Information Officer (CIO) is increasingly being held accountable for bringing the promise of technology to commercialization activities. They are looking to adopt cloud technologies for data storage and will benefit in the future from the availability of large complex data sets including electronic medical records and other real-world data. Cloud companies are now taking greater responsibility for maintaining government compliant environments for health information, thereby removing what has been a significant barrier in the past to making this information available in the cloud.

New cloud-based business intelligence applications are also providing new opportunities for life sciences companies to provide valued services and tools to patients, physicians and payers. These can include mobile patient apps to support medicine adherence as well as education and training materials, and new outcomes-based insights on patient care. Applications that are internally focused on the commercial operations of life sciences companies are also important, especially those aimed at improving master data management, handling large unstructured data streams, improving commercial operations, and implementing multichannel marketing systems.

As technology systems and applications have proliferated, they have often remained siloed and therefore sub-optimized. Interoperability is now a key priority and is seen as a means to optimize the commercial organization by improving workflow speed, eliminating conflicting views of the truth across departments, and paring vendor teams managing manual data handoffs. Integration of point-solutions or systems across the organization for improved workflow is cited by 85% of survey respondents as necessary, with 42% characterizing this as a high or greatest need. Third party vendors are bringing pre-built and cloud-based suites of applications to life sciences companies as a means to achieve an enterprise-wide system and thereby benefit from efficiencies.

Despite abundant and growing amounts of data being generated and accessed by life sciences companies, analytic systems designed to interpret and create actionable insights have not kept pace. Our survey revealed 74% of respondents expressing they have a high level of need for greater insights from data. As the mix of new medicines brought to market by pharmaceutical companies is skewing toward those with relatively small target patient populations, it is more important for analytic systems to help identify those patients and their physicians. This accelerates the improvement of health outcomes while also bringing more efficiency to the entire health system. However, querying large data sets requires application of appropriate clinical expertise which is often highly specialized and uncommon. Cloud applications can now enable non-expert users to derive insights by translating complex disease definitions into pre-built selections. Embedding healthcare-specific analytics into work processes and applications will bring value-added intelligence to the front line in a way that will benefit all healthcare system participants.

As these technologies become more widespread, accessible through the cloud, and proven, they will also provide small and mid-sized companies a greater opportunity to compete on a level playing field with the traditionally better-funded commercial operations of large companies. This may have a significant impact on the industry structure over time as scale-based advantages are reduced.

Getting the most from new technologies will be a high priority for life sciences companies as commercialization approaches are revised amidst changing customer demands and an urgent need for efficiency. Applications that are healthcare-specific, cloud-based, integrated, secure and analytically powerful will bring tremendous benefits to these companies and therefore to patients and the health system overall. Successfully riding this technology wave will prove transformational for the industry and beneficial to all.

New capabilities needed for life sciences companies

Customers of life sciences companies are demanding more compelling evidence of the value of their products, therefore requiring new approaches to commercialization.

The largest life sciences companies will need to reduce their annual operating costs by at least $35 billion by 2017 in order to maintain their current operating margins and level of investment in research and development.

New approaches to reducing costs through optimizing performance are needed as recent efforts, through across-the-board cuts and outsourcing, have not delivered adequate improvements.

Application of information technology can support these approaches through use of cloud-based storage, applications, systems integration, and analytic tools.

Life sciences companies are a vital player in the healthcare delivery system through their discovery, development, manufacturing and marketing of innovative treatment options for patients. They play an important role in supporting the appropriate use of medicines by physicians through education and awareness programs, including efforts to limit mis-use that could bring negative safety or side effect consequences to a patient. These companies also seek to ensure that medicines are accessible to those patients who will benefit from them. While these commercial activities are intended to bring financial success to the life sciences companies and are used to compete with other manufacturers, they also bring benefits to the overall functioning of the healthcare system. A more efficient and effective system results from the active participation of physicians, payers, patients as well as manufacturers, even if interests are not always aligned and competing positions are sometimes taken.

Changes in the marketplace for medicines

The marketplace for medicines has changed significantly over the past few years and further change is expected in terms of the nature and profile of innovative products being brought to market, the needs and expectations of customers for those products, and the market dynamics that determine commercial success. Among the key elements of change and their implications for commercialization are:

- **Portfolio evolution:** Most companies have an increasing focus on specialty pharmaceuticals, defined as those which are often injectable, high-cost, biologic or requiring specialized distribution. They are mostly used by specialist physicians and include treatments for cancer and other serious diseases. They often involve complex patient follow-up or monitoring. The global market for specialty drugs was $171 billion in 2012 and is expected to reach $236 billion in 2017.[1] These drugs are often developed for smaller niche populations with significant unmet need. In contrast to the blockbuster chronic therapies of the last decade which in many cases reached tens of millions of patients, these drugs may target a population measured only in the thousands. Successful commercialization of these medicines requires a highly targeted approach to ensure the right patients are able to access these treatments. Patient and physician education about these drugs is also particularly important to ensure their appropriate use.

- **Proliferation of active stakeholders:** Increasingly, life sciences companies find they are being challenged to meet the needs of additional stakeholders. Individual physicians may still make therapeutic decisions about a specific patient, but they now do so in an environment where payers, provider organizations, and health systems as well as patients, have become much more active in demanding some level of input and influence over those decisions. However, the needs of payers, providers, and patients differ widely across health systems and around the world, bringing a high level of complexity to the task of communicating with, and addressing the needs of, this proliferating set of active stakeholders.

- **Demand for evidence of value:** As total spending on medicines globally reaches the $1 trillion level annually, payers are not surprisingly placing greater emphasis on ensuring they are receiving value for their money. At the same time, payers – whether they be governments, employers, patients or insurers – are bringing closer scrutiny to all parts of the healthcare system they fund. In so doing they require evidence that medicines are contributing to improved patient outcomes, reductions in hospital admissions or readmissions, and more efficient use of healthcare resources. This is particularly focused on the 20% of patients who typically utilize 80% of the costs of healthcare services and are often suffering from multiple chronic, non-communicable diseases.[2] Commercialization approaches can no longer be based on company sales representatives telling a single story about the benefits of their drugs in clinical trials.
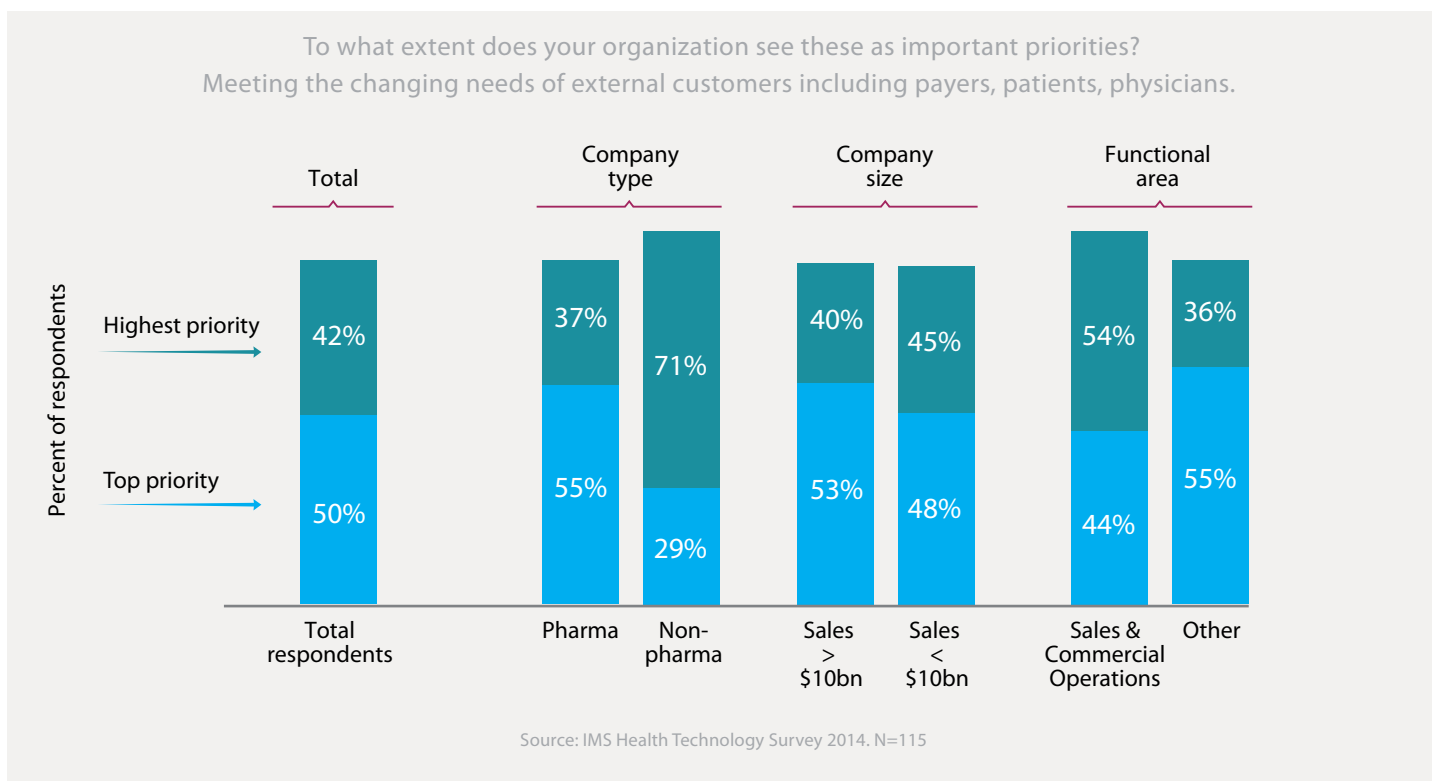
Payers need to know a drug will help a patient meet their treatment goals at the lowest cost. This means manufacturers need to demonstrate a drug's impact on patient adherence, outcomes, quality of life, disease severity, utilization of health resources and a range of other measures.

IMS Institute Technology Survey 2014

As an input to this study, the IMS Health Institute conducted a survey to understand the need for new information technologies, and explore their current and planned use. One hundred and sixteen responses were received from 70 life sciences organizations. Individuals surveyed held positions globally within information technology, commercial and executive functions (see Methodology for more details).

Addressing the changing needs of external customers is well recognized by management within life sciences companies as a top priority. In our recent survey, 92% of the total respondents rated this as the top priority or an important priority for their organization. Similar assessments were made by respondents regardless of their company type, size or their functional area (see Figure 1).

Figure 1: Meeting the changing needs of external customers

To what extent does your organization see these as important priorities?
Meeting the changing needs of external customers including payers, patients, physicians.

	Total	Company type		Company size		Functional area	
	Total respondents	Pharma	Non-pharma	Sales > $10bn	Sales < $10bn	Sales & Commercial Operations	Other
Highest priority	42%	37%	71%	40%	45%	54%	36%
Top priority	50%	55%	29%	53%	48%	44%	55%

Source: IMS Health Technology Survey 2014. N=115

Beyond the marketplace changes, the explosion of new sources of information and the flow of digitized data is also having a significant impact on commercialization activities. Pharmaceutical companies find they no longer have the most information about their own drug's use in the real world. Payers and providers are each aggregating data they can access to assess the value of treatment guidelines, patient pathways and specific interventions. The aggregation of commercially available real world data such as Electronic Medical Record (EMR) data, insurance administrative and claims data, laboratory and genomic data, and other new streams such as remote monitoring and social media information, can provide a more complete view of both patient and population management. This requires all players – including life sciences companies – to be able to access and use these new digital information sources in order that they can speak the language of the "real-world patient" as they seek to commercialize their products.
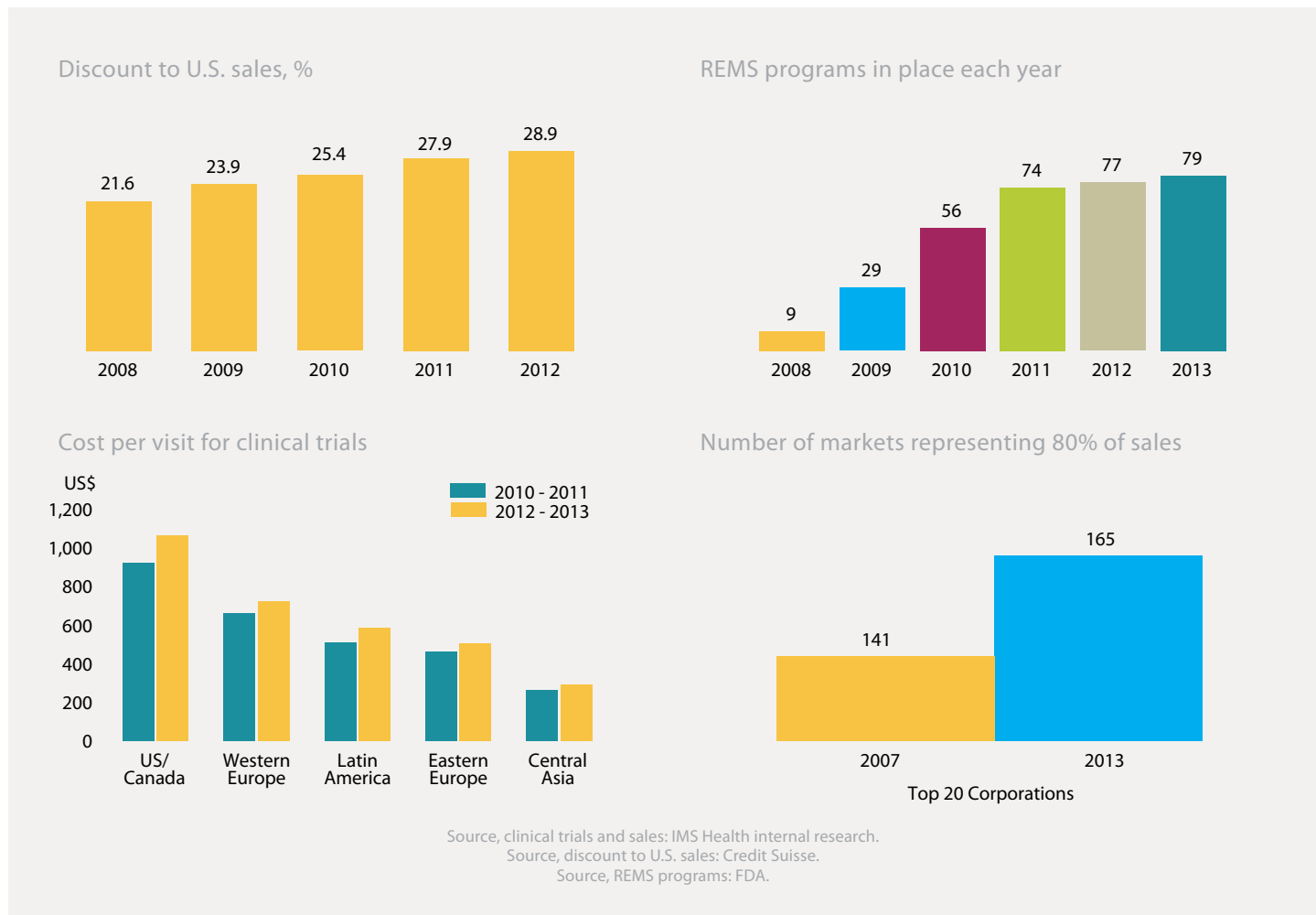
The information technology (IT) challenges associated with this data expansion are substantial and to date, the amount of data flowing in to pharmaceutical and biotechnology companies has exceeded their ability to manage and derive value from these sources. The need for integration of data sources is recognized as high or greatest by 59% of survey respondents (n=115), with those based in companies that are large and North American-based assessing this need even more highly. Those with roles that are global or focused on information technology or marketing also rate this need the highest.

Operating margins in life sciences companies

In 2012, total spending on medicines across the major developed markets declined for the first time, due to a raft of patent expiries and austerity measures, along with policy changes aimed at increasing the penetration of generics.[1] Much of the impact of this decline is felt by the largest pharmaceutical manufacturers which are disproportionately affected by patent expiries and slow growth in developed markets. The past five years have brought mounting pressure to top line sales growth for these companies, triggering significant restructuring and cost reduction programs aimed at limiting the impact on bottom line profitability and margins.

Top line growth prospects for the pharmaceutical industry are expected to strengthen over the next five years – driven by the rapidly expanding middle class in emerging markets, stronger economic prospects in developed markets and a higher number of new innovative medicines being launched. Total global growth in spending on medicines is expected to accelerate from 2-3% in 2013 to 5-7% in 2017 on a constant dollar basis. However, further pressure on operating margins can be expected as companies face rising costs at the same time drug pricing is reduced or constrained. As examples, rebates and discounts applied in the U.S. market have risen from 21.6% to 28.9% of gross sales since 2008.[3] Meanwhile, operating costs such as those associated with clinical trial visits and regulatory programs required for safety surveillance purposes are rising. Moreover, the complexity of managing a global business is increasing as sources of sales growth move away from a small number of mature markets (see Figure 2).

Figure 2: Sources of operating margin pressure

Discount to U.S. sales, %

2008	2009	2010	2011	2012
21.6	23.9	25.4	27.9	28.9

REMS programs in place each year

2008	2009	2010	2011	2012	2013
9	29	56	74	77	79

Cost per visit for clinical trials

US$
1,200
1,000
800
600
400
200
0

2010 - 2011
2012 - 2013

US/Canada   Western Europe   Latin America   Eastern Europe   Central Asia

Number of markets representing 80% of sales

2007	2013
141	165

Top 20 Corporations

Source, clinical trials and sales: IMS Health internal research.
Source, discount to U.S. sales: Credit Suisse.
Source, REMS programs: FDA.
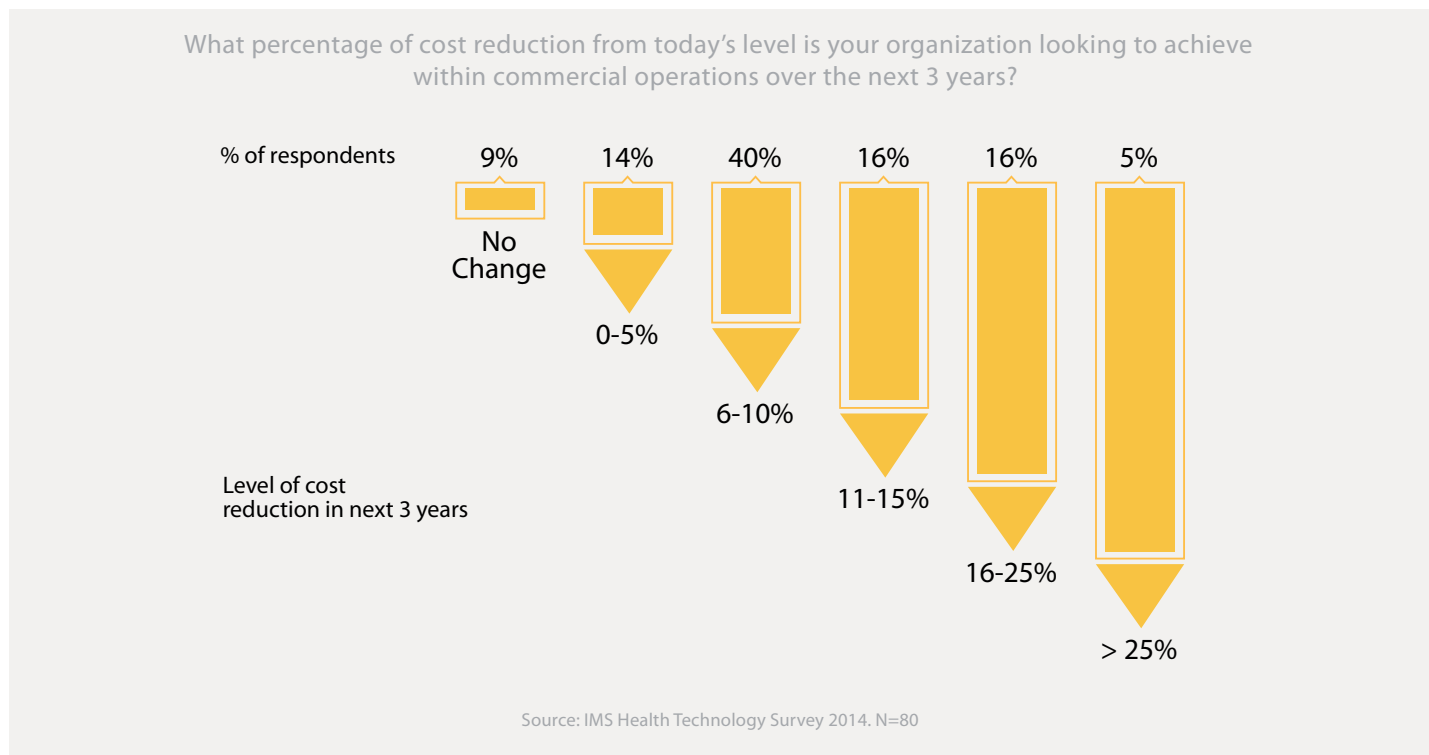
The largest 17 multinational pharmaceutical companies will have to reduce annual operating costs by about $36 billion from their 2012 levels in order to maintain their current level of operating margin – defined as net sales less cost of goods sold, selling, general and administration costs and research and development costs – while also maintaining current levels of R&D activities.[4] This reflects the impact of lower net sales as further patent expiries occur and average sales of newly launched products decline, combined with an expected R&D cost inflation rate of 5% per year.

Figure 3: Large Pharma operating margin dynamics 2012-17

Source: Company financial statements; IMS Health Institute modeling
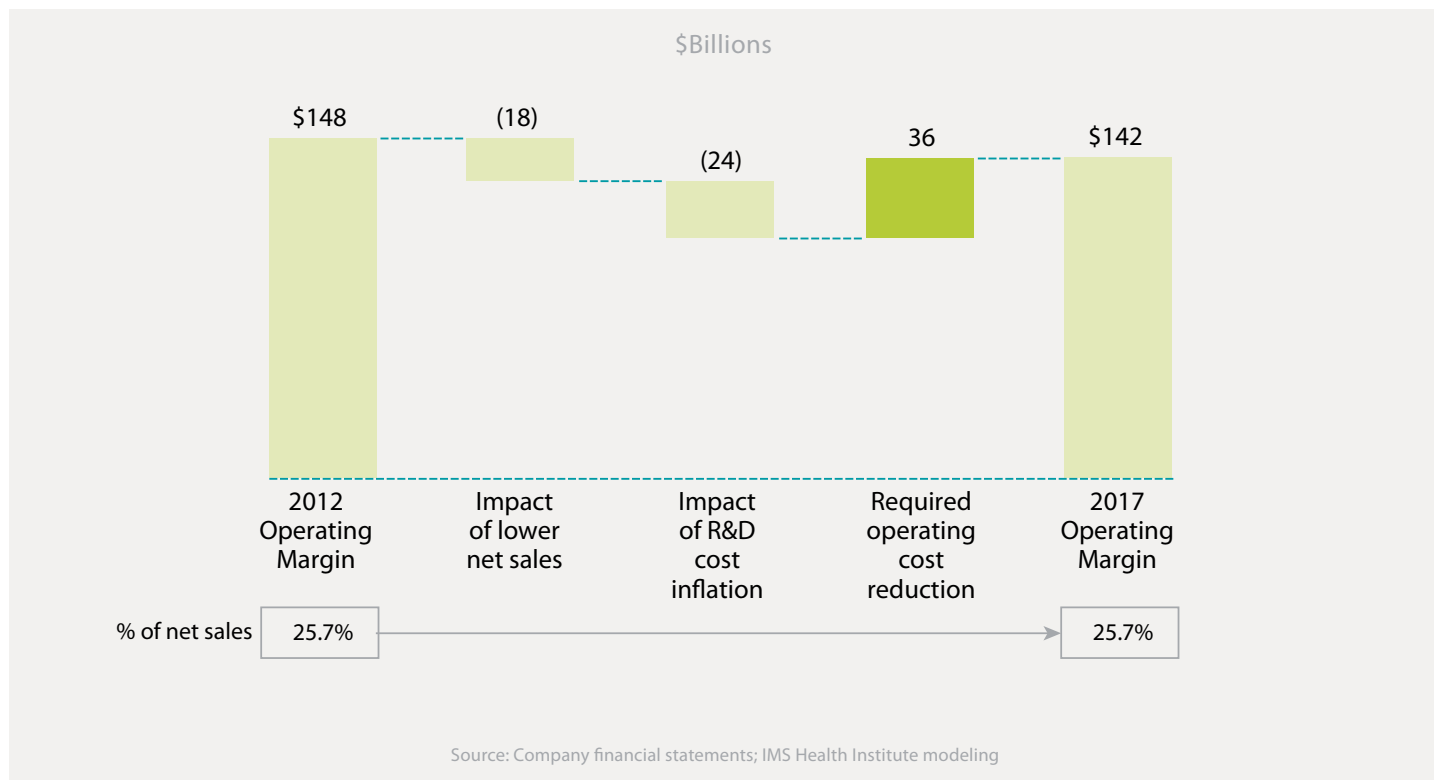
Operating margins in 2012 were 25.7% of net sales for the combined 17 Large Pharma companies and $36 billion of operating costs will need to be cut in order for that margin level to be achieved in 2017 (see Figure 3).

The source of cost cutting will differ by company, but with sales, marketing and administration costs accounting for almost 30% of net sales, management will likely focus their attention in this area. Indeed, almost 40% of our survey respondents expect that commercial operations costs will be cut by more than 10% in the next three years, and over 20% expect the cuts to be in excess of 15% (n=80). Only 9% of the respondents do not anticipate any reduction in costs affecting commercial operations (see Figure 4). Staff within large companies are more likely to expect larger cuts than their counterparts in mid-sized companies: 27% of large company respondents (n=41) expect cuts over 15% vs. 13% of those from mid-sized companies (n=30).

Figure 4: Cost cutting expected within commercial operations

What percentage of cost reduction from today's level is your organization looking to achieve within commercial operations over the next 3 years?

% of respondents

| 9% | 14% | 40% | 16% | 16% | 5% |

No Change

0-5%

6-10%

11-15%

16-25%

> 25%

Level of cost reduction in next 3 years

Source: IMS Health Technology Survey 2014. N=80

New approaches to cutting costs and optimizing performance

The high priority placed by life sciences companies on meeting the changing needs of external customers combined with the need to lower operating costs suggests new approaches will be needed to address these cost issues while optimizing performance. Companies have already made significant progress in reducing operational costs over the past ten years, with efforts expecting to yield $20 billion in savings.[5] The severity of the impact of the patent cliff for many life sciences companies meant that efforts to restructure their commercial operations have been aggressive, hitting at every level from strategic corporate-level restructuring down to departmental cuts and tactical shifts in commercialization approaches.
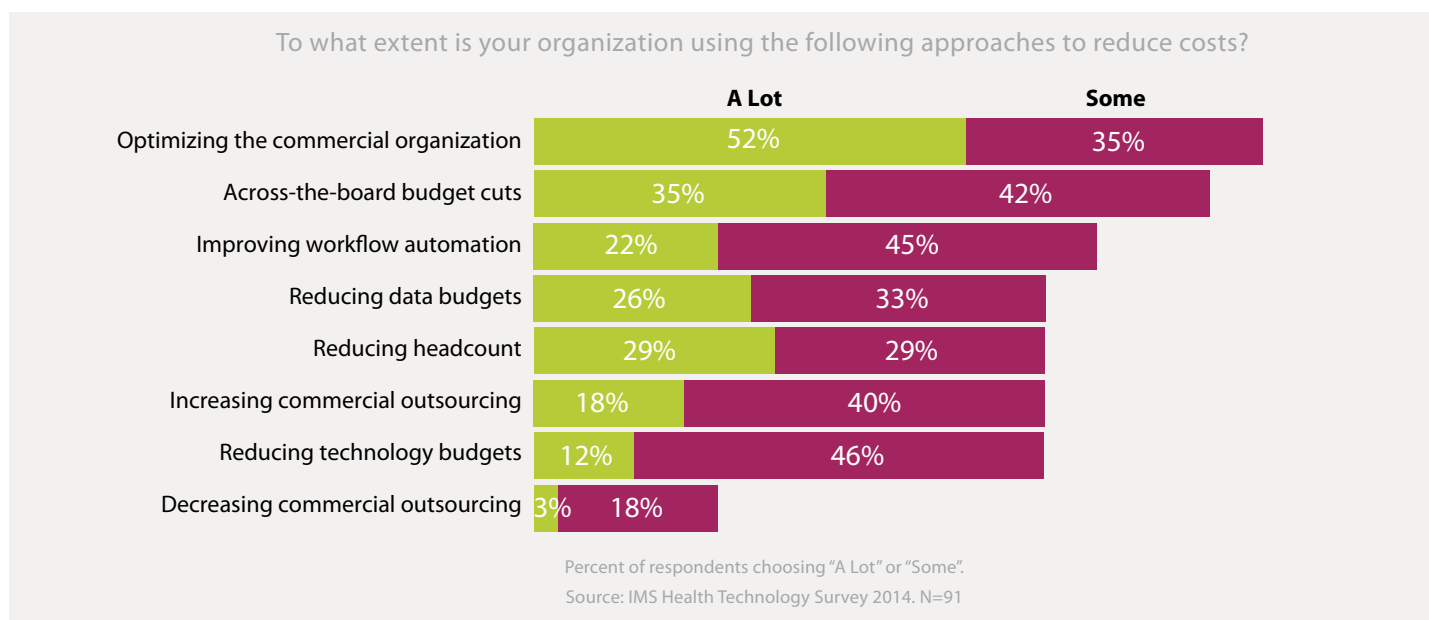
At a macro level, companies reorganized business structures to reduce costs and ensure their success. Companies used mergers and acquisitions to strengthen their existing business segments while spinning off non-core businesses. They also adjusted the number of disease areas on which their companies focus. Separate operating units were created to optimize opportunities for their existing mature, specialty, or consumer healthcare brands, and to maximize opportunities in the emerging markets.

Within commercial operations, cuts were generally implemented across-the-board, with reduced headcount and budgets per brand. Outsourcing of non-strategic functions became a key focus, with companies typically looking for net savings from outsourcing of no less than 25% over their internal costs and an increased level of spending flexibility. Through outsourcing, companies commoditized various low-value activities such as reporting, infrastructure data centers (e.g. server and storage), business processes for payroll and accounts receivable, and software application and solution development.

Looking ahead, efforts can be expected to shift toward more refined and targeted ways of reducing costs, with a heavy focus on supporting the optimization of existing commercial activities. Having diminished waste and inefficiencies in past years through headcount and resource reductions, companies are finding the new challenge is to find ever greater efficiencies in the way they deploy their resources. Companies are now looking to obtain strategic advantages using the resources they already have in house – to go the last mile with optimization of the resources they have.

Survey respondents indicate a broad range of approaches to cost reduction are being taken. While crude approaches such as applying across-the-board budget cuts – regardless of a function's or activity's strategic importance or contribution to commercial success – are being used a lot or some by 77% of respondents, even more (87%) are applying approaches that seek to optimize the commercial organization (n=91). Improvements in workflow automation and increasing commercial outsourcing are important approaches, in addition to the more direct reductions in data budgets, headcount or technology budgets (see Figure 5).

Figure 5: Approaches to reducing costs

To what extent is your organization using the following approaches to reduce costs?

	A Lot	Some
Optimizing the commercial organization	52%	35%
Across-the-board budget cuts	35%	42%
Improving workflow automation	22%	45%
Reducing data budgets	26%	33%
Reducing headcount	29%	29%
Increasing commercial outsourcing	18%	40%
Reducing technology budgets	12%	46%
Decreasing commercial outsourcing	3%	18%

Percent of respondents choosing "A Lot" or "Some".
Source: IMS Health Technology Survey 2014. N=91

A large number of tactics for the optimization of commercial organizations are being implemented across the life sciences sector. These include selective insourcing and outsourcing, shifting of resources, and leveraging of technology-based solutions that were unavailable during past efforts at cost reduction (see Exhibit 1).

Exhibit 1: Optimization Tactics

Knowledge and data management
- Insourcing of strategically important knowledge areas
- Creation of Center of Excellence model to share learning and best practices
- Better analytics to improve performance of commercial teams
- Standardization of processes and metrics
- Harmonization and rationalization of business insights and performance indicators

Resource management
- Closed loop technology to enable commercial teams to adjust course and tactics rapidly
- Standardization of core back office processes across departments and countries

Outsourcing
- Transfer of specific low value functions to third parties and the cloud
- Re-location of labor to lower costs countries
- Shift to a flexible resource model using cloud technologies and third party services
- Shifting infrastructure and hardware to the cloud when feasible
- Replacing internal systems with Software as a Service (SaaS) cloud applications

Workflow automation
- Restructuring of IT systems and processes to remove silos, overlap, and duplication
- Improving the flow of information between systems
- Centralization of systems such as data management, reporting, analytics, Customer Relationship Management (CRM), etc

A further approach to balancing the needs of cost reduction with more complex commercial operations is the focus on working more effectively across the organization and departments including medical, managed markets, commercial, and marketing. Among survey respondents, 78% cited this as top or high priority (n=116), with those working in large organizations placing greater emphasis in this area.
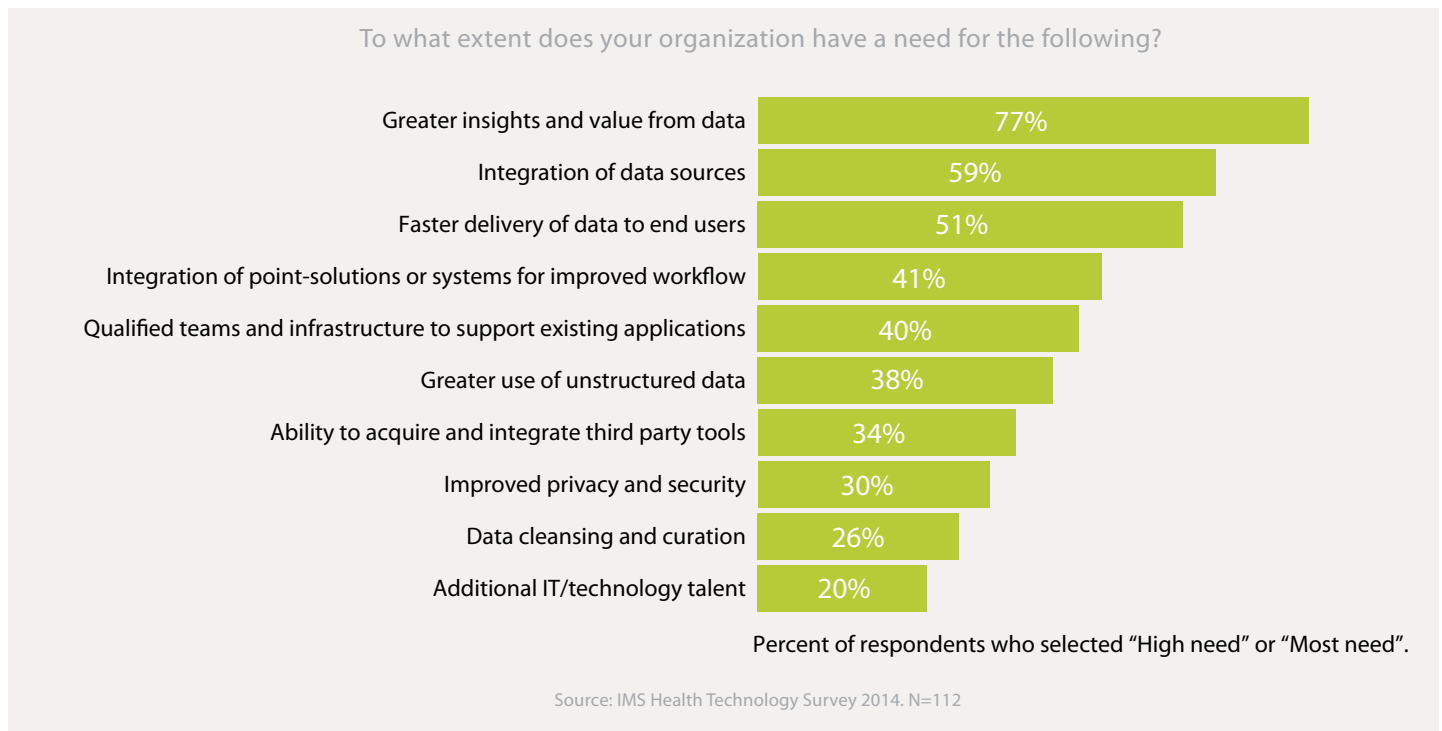
Application of information technology

Information technology has long been viewed as a function or department that supplies data support and delivery services. Within a life sciences company, its purpose is to store and process information on core functions of the business, such as tracking the sale and distribution of medicines, and disseminate that information to internal users in their sales, marketing or analytic departments. Over the past 10 years, basic tasks of the IT function – data integration, warehousing, help desk support, and report generation – were commoditized and often outsourced.

As companies become more focused on developing new approaches designed to optimize commercial performance, management teams are turning to technology-based approaches that can support these aims through cloud-based platforms, applications, system integration, and analytic tools. Technology is being utilized as a critical means by which companies can better align their activities across departments internally, take actions that are better tailored to customer needs, and provide better ability to adjust course and tactics. Properly utilized it is seen as the means by which companies can simultaneously:

- Build stronger relationships with customers by providing new value;

- Reduce costs by doing more with less and optimizing the commercial organization; and

- Improve the effectiveness and agility of commercial teams including speed and effectiveness of decision making.

The needs of life sciences companies in seeking to realize the full potential of current technology are broad and diverse. However over half of our survey respondents indicated the greatest needs were associated with data – gaining greater insights and value from data, integrating data sources, and delivering it faster to end users (see Figure 6). This may reflect the urgency with which tangible advances are needed in light of the business and commercial needs of these companies.

Figure 6: Life sciences company needs

To what extent does your organization have a need for the following?

Need	Percent
Greater insights and value from data	77%
Integration of data sources	59%
Faster delivery of data to end users	51%
Integration of point-solutions or systems for improved workflow	41%
Qualified teams and infrastructure to support existing applications	40%
Greater use of unstructured data	38%
Ability to acquire and integrate third party tools	34%
Improved privacy and security	30%
Data cleansing and curation	26%
Additional IT/technology talent	20%

Percent of respondents who selected "High need" or "Most need".

Source: IMS Health Technology Survey 2014. N=112

This also suggests a very different information technology investment focus, activities, success measures and roles are required today compared to past decades (see Exhibit 2).

Exhibit 2: Changing role of IT

Information technology in life sciences companies - then and now

	1990s	2000s	Present
Investment focus	Build a server Provision new hardware Grow internal capabilities	Build large on-premises data warehouses Replace in-house infrastructure with private cloud for quality and cost	Integrate with public cloud Application & data integration and API Acquire SaaS enterprise applications
Activities	Deliver reports Provide data support Store and process information Install and run applications	Integrate diverse data sets Support data warehouses Manage tools and reports now a commodity Build applications not machines	Integrate company and 3rd party data Integrate private / public apps Use data to benefit the organization Provide actionable insights Adapt to new stakeholders
Success measures	Capacity Response times Rapid and accurate equipment provisioning	Up time of applications Number of applications developed and available to users Existence of applications	Performance tied to company or business unit success: revenue performance, ability to act, impact to sales, improved efficiency, usability, user speed of action
Roles	Systems administrators "Making the hardware work" CIO as designer and operator	Hardware provider Software developers Data integrators	Solution provider Strategic architects Critical contributor to organization

The role of the Chief Information Officer (CIO) necessarily also needs to be very different, both in terms of managerial and technical skills, as well as the profile and role that he or she has within the executive management team. With direct operating budgets typically exceeding $100 million annually and investment budgets similarly scoped, the CIO can now be viewed by brand managers, operating leaders and executive leaders as the critical linchpin to the company achieving success – with its partners in healthcare, investors and employees.

Data storage and sharing in the cloud

The adoption of cloud technologies in the life sciences sector has been slow compared to other industries, but half of companies are now considering moving their primary data store to the cloud.
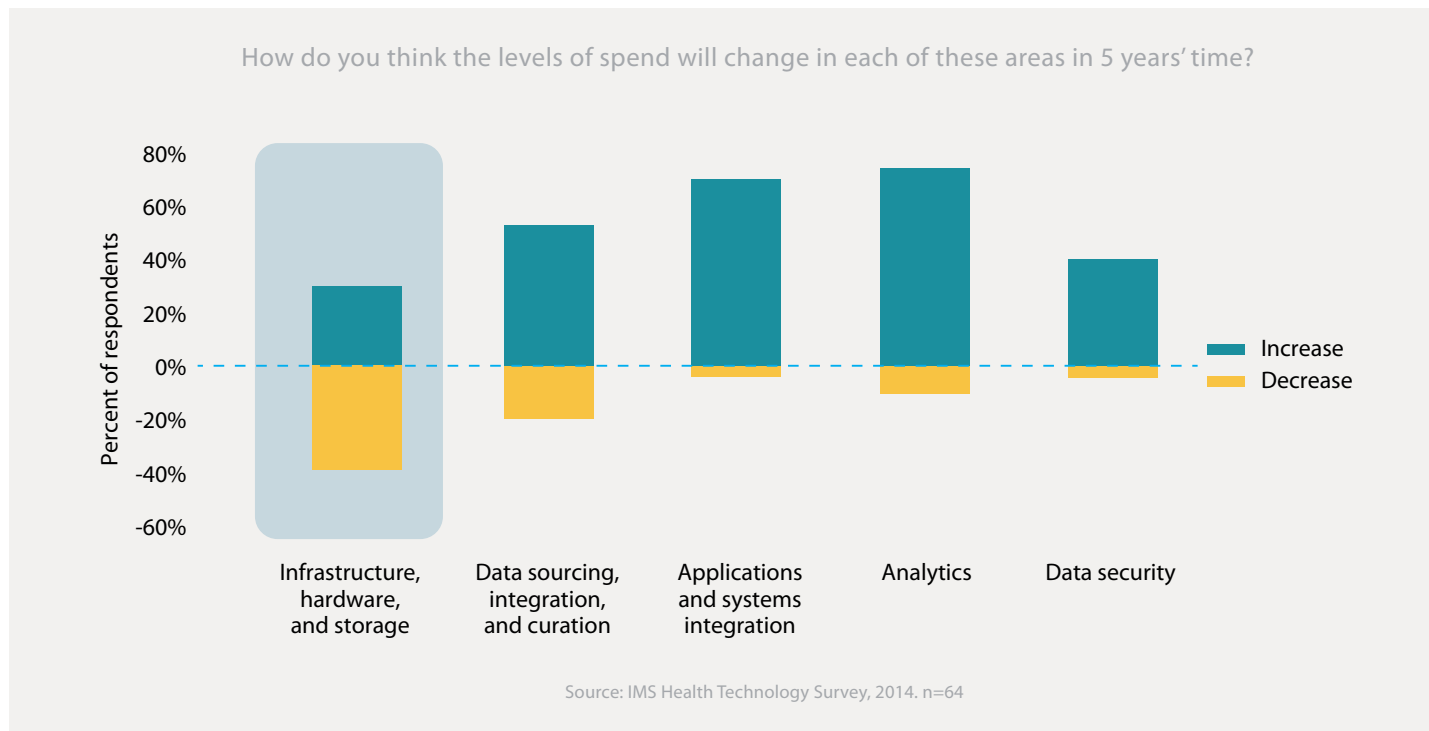
Barriers to cloud sharing of EMR data among multiple healthcare stakeholders include the lack of standardized data formats among EMR systems, and slow progress of cloud providers to maintain government-compliant environments for health information.

Pooling of EMR and other real-world healthcare data will be important to create repositories representative of the patient population to analyze in the cloud.

Cloud companies are now taking greater responsibility for maintaining regulatory compliance of protected health information (PHI) which will help EMR related data sources become more widely available for shared use.

Although the growing use of cloud technologies such as cloud storage and cloud software is not a new trend, adoption by life sciences and healthcare companies has been slower than in other industries.[6,7] Data security has been a key concern hindering their use of cloud storage, where the infrastructure housing their data and applications exists outside the protective walls of their organization.[8] However, cost pressures now make it imperative for life sciences companies to consider how to leverage cloud storage to reduce current hardware and maintenance costs while gaining scalability to meet future market needs.

Cost savings efforts within commercial operations are likely to affect infrastructure and storage budgets to a greater extent than other IT areas. Survey respondents (n=68) suggest that their firms currently spend 25% of their total technology investments on infrastructure, hardware and storage and 40% of all respondents (n=64) and 80% of IT respondents (n=10) expect this level of spend to fall – more than in any other IT category (see Figure 7).

Figure 7: Investments in infrastructure, hardware, and storage over time

How do you think the levels of spend will change in each of these areas in 5 years' time?

Percent of respondents

Infrastructure, hardware, and storage | Data sourcing, integration, and curation | Applications and systems integration | Analytics | Data security

■ Increase
■ Decrease

Source: IMS Health Technology Survey, 2014. n=64

Such infrastructure cost reductions will likely come from a mix of cloud usage, systems integration and workflow optimization. Since cloud providers have built infrastructure taking advantage of economies of scale, life sciences companies can use cloud storage to benefit from the lower cost of this pre-built server capacity. Cost savings estimates indicate that companies typically experience a minimum of 20-30% on operating costs and lower total cost of ownership when moving their infrastructure to the cloud, although some case studies have also reported operating cost savings as high as 80-90%.[9,10,11,12,13]

Using virtual storage, companies can also rapidly scale their infrastructure and capacity up or down in response to changes in the life sciences marketplace. For instance if a company enters a new therapeutic area, makes the decision to acquire new data, or decides to build a new application to meet the needs of a changing market, the underlying data can rapidly be shifted to the cloud without building infrastructure to bring the data in-house.

Potential benefits and risks associated with cloud infrastructure and storage for life sciences enterprises are summarized in Exhibit 3.

Exhibit 3: Cloud infrastructure and storage for the life sciences enterprise

Cloud feature	Benefits	Risks
Shared capacity	Applications can share a single server Shared infrastructure can balance utilization amongst users	Loss of control over infrastructure and inability of users to remedy system failure In case of bankruptcy users may find it difficult to recover their data
Cost savings	Reduced infrastructure management costs Possibility of reduced data storage costs over time Lower per-unit performance costs	Upfront and indirect costs to convert legacy systems may be significant and disruptive
Scalability	Flexibility to scale up/down capacity rapidly as needed without large capital outlay	Less internal discipline to scale down when possible
Information sharing	Shared access to data across departments, global offices or healthcare stakeholders Multiple users can access and interrogate information without the data leaving the cloud	Access controls used on-premises for governance must be replicated if data is shifted Cloud charges can be high for extraction of data
Security	Cloud providers may have superior security systems in place including point-to-point security for mobility	Loss of data and Intellectual Property (IP) if security breached Less than full control over who has access to data

Greater use of cloud storage is now being considered by life sciences companies. Half of the survey respondents who offered their perspectives on planned cloud investments (n=8, all of whom were from the IT departments of large and medium sized pharmaceutical companies) said they were planning to put their primary data store in the cloud in the next 5 years and more than a quarter (n=7) said they planned to put EMR data in the cloud. Both private cloud storage (where cloud infrastructure is provisioned for exclusive use by a single organization) and public cloud storage (where the infrastructure is shared) are available substitutes for acquiring new physical hardware on-premises.[14] However, security concerns may deter companies from storing data off-premises in shared public clouds. Our survey results indicate that 78% (n=9) of respondents are likely to select private cloud hosting for some of the applications they plan to deploy or upgrade and 44% (n=9) plan to use hybrid cloud, whereas none are likely to use public cloud.

Cloud storage can also help life sciences companies gain access to needed patient EMR data by making shared repositories of EMR data available for analysis in de-identified formats. If not made available in the cloud, gaining access to this big data would otherwise require large infrastructure builds. As the entire healthcare industry begins to speak the language of 'real world evidence', the cloud can facilitate access to shared repositories that can be used by multiple stakeholders to gain insights into the value of medicines or optimize patient care.

Already in some countries with national health systems, large de-identified patient datasets are accessible for analysis. Where national systems do not exist however, the pooling of EMR data will be important to create repositories that are representative of the patient population. In the U.S., some hospital systems have already collaborated to pool their patient data for analysis with the aim of refining treatment algorithms to achieve the best patient outcomes. However, the ability of life sciences companies to benefit from this data to examine the burden of illness and contribute to understanding the value of medicine is limited due to the need for de-identified data and other barriers such as the lack of standardized data formats and data privacy standards. Progress has been made recently to resolve these issues and make EMR data more readily available for commercial use in the cloud.

Data standards: the lack of standardized data formats among EMR systems to create a large or national pool of data
Healthcare-specific data models with standardized fields are needed to merge and share patient electronic medical records. No common data model has yet been established to ensure compatibility and linkability between EMR data sources including free text entered in the EMR. Efforts are being made towards national EMR standards to enable effective data sharing among all stakeholders.[15] For instance, standards are being developed by the Nationwide Health Information Network (NwHIN).[16] Commercial data models have also been created that facilitate the integration and mapping of diverse EMR data sources in the absence of national or global standards.

The need for cloud providers to maintain compliant environments for protected healthcare information
Government regulations related to the handling, storage and access of healthcare information differ around the world as described in Exhibit 4. Sharing of EMR data between healthcare participants (e.g. medical facilities, academics, manufacturers, payers) for analytic purposes in the cloud requires that providers of cloud storage and cloud applications protect patient health data, meet data residency requirements, and provide reassurances that they will comply with local regulation. Healthcare companies have been hesitant to store their patient data in the cloud since such reassurances were not in place, as have commercial data vendors seeking to maintain Health Insurance Portability and Accountability Act (HIPAA) standards.

New legal requirements from the U.S. Department of Health & Human Services (the HIPAA Omnibus rule) went into effect September 2013 making clear that cloud providers may be both responsible and liable for protecting patient data (e.g. when acting as a 'Business Associate' storing the data of health providers). They most notably must sign Business Associate Agreements ("BAA"), comply with HIPAA security and privacy rules, and provide notification in case of a data breach.[17]

Exhibit 4: Patient privacy and data security considerations

Consideration	Requirement	Challenge	Solution
Government Regulations - Patient Privacy	U.S. HIPAA/ Health Information Technology for Clinical Health (HITECH) compliance	Cloud must be hosted in a HIPAA compliant fashion for Covered Entities supplying data to not be in violation	Under the HIPAA Omnibus rule, cloud providers are business associates and share responsibility for maintaining compliance with Covered Entities Business Associate Agreements ("BAA") formalize these responsibilities
	European Union Data Protection Directive (EU DPD) and other laws protecting patient data	Health data must be hosted locally and cannot be taken out of EU boundaries without consent or another legalizing measure	Cloud providers may need to ensure global data backup systems and that offshore support models do not cause patient data to leave the particular country or region and provide assurances that they are in compliance with relevant data protection laws, rules and regulations Analysis can be performed on data stored locally and exported as results to other countries
Data Security	Identity management	Public systems in the cloud may be multi-tenant and need architecture that restricts access to other customers hosting data	Authentication systems need to identify and grant access to specific devices and to servers where data is stored
	Access control	To protect data security users should not have access to the entire database unless necessary	Granular access control management systems can give access down to a field level allowing data to be protected and multiple users to share the same dataset Only authorized data fields can be accessed

However, for cloud solutions to become more relevant to the industry, providers must also go further and ensure data backups do not violate data residency requirements of the European Union Data Protection Directive (EU DPD), and commit to more rapid reporting of any data and security breaches.

Compliant cloud-based EMR data systems must now be developed so life sciences companies do not need to individually build large new data systems. Like other data sources, third party providers can develop integrated EMR data solutions and now also make them accessible to multiple users in the cloud, maintaining security for all parties while providing assurances to the healthcare entities that provide the data. Public cloud companies like Amazon Web Services (AWS), VMware, Microsoft Azure, and others are now working towards building secure and compliant healthcare solutions that will help facilitate the development of pooled EMR data repositories in the cloud both in the form of health information exchanges and commercially available repositories that can be shared by life sciences companies.[18,19] Such solutions will also ultimately make the use of cloud storage more feasible for life sciences companies looking for secure and life sciences focused solutions.

Life sciences applications

New cloud-based business intelligence applications are being developed specifically for the life sciences industry and may better help companies adapt to marketplace challenges than their industry agnostic predecessors.

Mobile applications have become a key tool for life sciences companies to deliver value to patients and physicians.

More companies plan to acquire third party applications to optimize their capabilities rather than build applications in-house.

High value applications will be those that are focused on master data management, process unstructured data, and can support multichannel marketing approaches.

Intelligent cloud applications will enable small companies to gain commercial capabilities equal to their larger counterparts thus leapfrogging the standard growth cycle.

Applications used by life sciences companies to optimize commercial action and engage externally with customers – patients, physicians, payers – provide innovative new ways to deliver value to the healthcare sector. Moreover, the delivery formats for applications are changing, with users now being able to access them on mobile devices and in the cloud. This means that additional channels are now available through which to communicate with customers, and new commercial capabilities will be available to life sciences companies without building new infrastructure or bringing large data sources in-house.

Customer focused applications for patients and physicians

As life sciences companies focus on innovative ways to bring value and services to their customers, mobile applications that can keep patients more engaged in their own healthcare, facilitate communication between patient and healthcare professionals, and deliver targeted, helpful information to physicians and payers are likely to play a key role in delivering this value.

Applications for use by patients were rated as extremely or very important to meeting commercial challenges by 60% (n=67) of survey respondents, while 70% (n=68) rated investment in applications for use by physicians to be extremely or very important.

Patient applications focused on adherence are becoming more common, though few randomized trials have been conducted to determine their impact and therefore evidence of their effectiveness remains largely anecdotal.[20] Examples of such adherence applications include 'My Well Planner' from Boehringer Ingleheim and Lilly, and 'OneTouch Reveal' from Lifescan (see Case Study 1), both intended to encourage diabetes patients to self-treat appropriately and remain vigilant about their condition.[21,22] Applications may also provide educational materials to patients or help them share their medical information or activities with their physicians or peers. For instance, Pfizer's 'HemMobile' allows hemophilia patients to log and share information on their infusions and bleeds with their healthcare provider.[23]

Current applications for physicians and other healthcare providers may provide drug-agnostic disease education and training materials, tools to help guide correct diagnosis and treatment such as dosing calculators, or act similarly to a company web page providing information on a specific drug.[24] Since doctors are slow to respond to new information (positive or negative) about medicines and can take years to shift their practice in response to new guidelines, such tools can help speed the time to adoption of best-practices and improve patient care.

CASE STUDY 1 ————————

Blood glucose meter syncs with mobile devices for improved disease management[25]

In 2013, LifeScan, a member of the Johnson & Johnson Family of Companies, introduced a free, downloadable mobile application to aid patients in managing their glucose levels through personalized tracking and analytics. The application syncs the company's blood glucose meter with a patient's mobile device and presents summary data on their blood sugar status over time. The system uses BlueTooth technology to send blood sugar test results to the iPhone, iPad, or iPad Touch wirelessly. The results are then tracked and displayed on the device in color-coded bar graphs.

Patients can see summaries of their results compared against target ranges and receive alerts when readings form a discernable pattern of being either above or below personalized limits. To motivate patients, built-in analytics show the percent of results that are in-range, low, or high, and show the average over a 14-day period. They can also record and view information about their carbohydrate consumption, physical activity, and medication. With the sharing feature, patients can transmit their blood glucose results to their healthcare professionals, caregivers, or family members via text or email.

In revealing trends and patterns in their health status, the application is designed to make patients more cognizant of their health status, improve their ability to self-manage their disease, guide lifestyle changes and inform patients' conversations with healthcare providers.

Internally focused applications for life sciences companies

Companies are rapidly moving toward new cloud-based applications to optimize their commercial operations. A scarcity of skilled software developers, the potential for cost savings, and the increased availability of life sciences-specific cloud applications have shifted the equation for companies assessing whether to acquire third party applications or build these applications internally. Respondents to our survey reported the key motivators for moving to the cloud were to avoid the high infrastructure implementation costs for new applications and reduce the ongoing costs of maintaining and upgrading their internal applications. With continued need to meet new customer demands, companies are therefore growing in their adoption of best-in-class

applications from third parties. Indeed, our survey respondents indicate their organizations now feel a greater need for the ability to 'acquire and integrate third party tools' rather than 'develop new applications internally' as shown in Figure 8.

Figure 8: Need to develop or acquire applications

To what extent does your organization have a need for the following?

Ability to develop new applications internally: No need 13%, Low need 39%, Some need 31%, High need 14%, Most need 3%

Ability to acquire and integrate third party tools: No need 5%, Low need 25%, Some need 34%, High need 32%, Most need 4%

Source: IMS Technology Survey, 2014. N=113
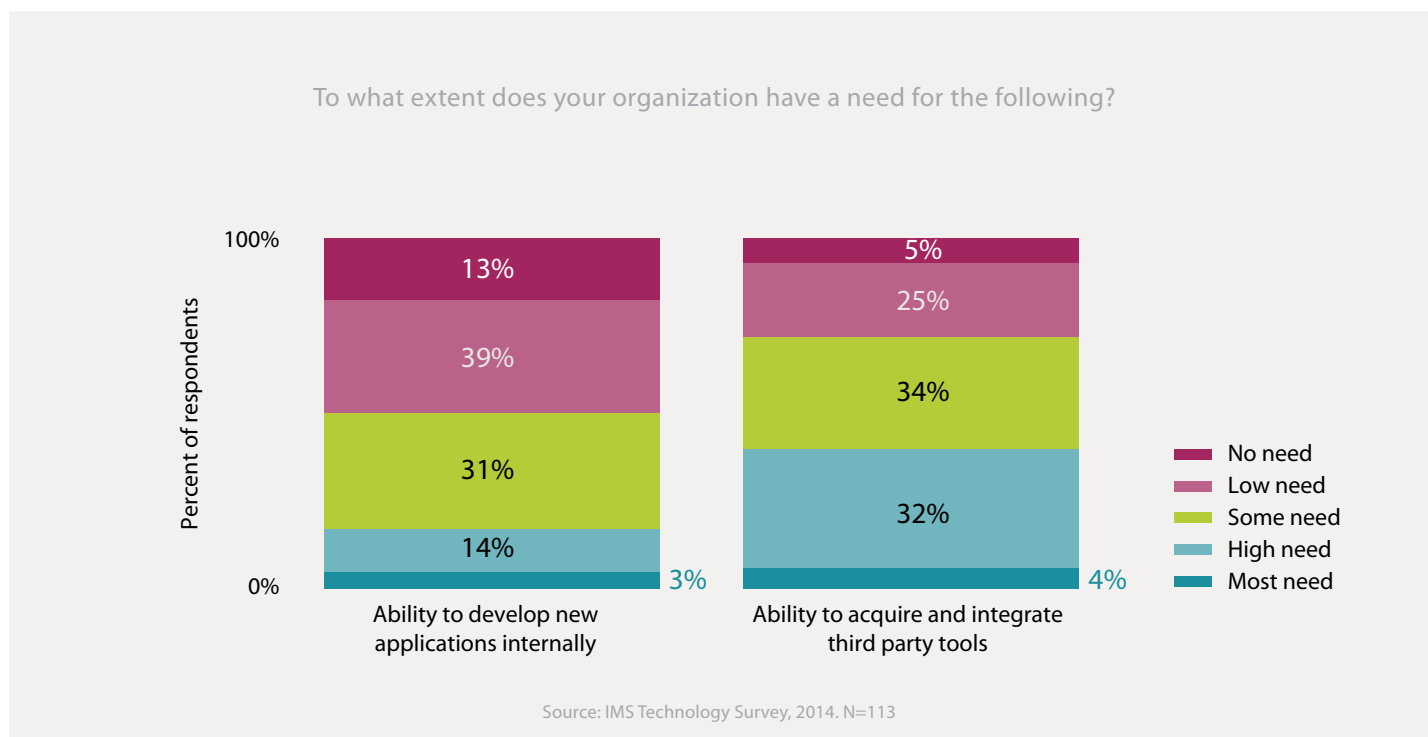
Until recently, the available cloud-based business intelligence tools were not tailored for the life sciences industry and thus had limited utility. To date, more companies have shifted their CRM systems to the cloud than other systems, with 56% of respondents (n=9, all from the IT departments of large and medium sized companies) already having a cloud CRM system and 22% planning to move to the cloud in next five years. This is not surprising as CRM was the first functional area to see a dedicated life sciences specific application, Veeva, which was developed on top of the industry agnostic Salesforce.com application.

For life sciences companies to derive utility from cloud-based applications, they need to be tailored to healthcare's unique needs and challenges. New industry-specific product releases are leading to current and growing uptake of cloud applications focused in four critical areas:

- **Multichannel marketing systems** that use information in an advanced way to deliver more useful information to customers and reduce ineffective action

- **Applications that process unstructured data** like social media, primary market research and free text included in EMRs, and let them contribute to a complete understanding of the patient experience and physician treatment

- **Commercial operations applications** – that are used within sales and marketing that improve customer engagement

- **Master data management (MDM)** systems available in the cloud to curate customer data and meet the needs of a changing healthcare marketplace

Master data management applications

While companies have invested significantly in their CRM systems, rising customer complexity is still driving companies towards continued investments with 77% of respondents (n=71) reporting new investments in their CRM system as very or extremely important for their organization. However, for this investment - and for virtually every commercial application that includes a customer component - the process of MDM is necessary to guide meaningful, high-impact, and efficient action. The lack of governance and stewardship processes to maintain a single 'golden' customer record for the enterprise can make customer information less useful for marketing, compliance and other customer-focused actions.

Life sciences companies operate in an environment typified by change that requires continual updates to maintain a clear picture of their customers. Customers move from one location or organization to another, hospital ownership relationships change, and the markets or therapy areas a company was in one day may not be the ones it is in the next, depending on clinical development successes or failures.

This means that the data a company uses to inform its business is always changing, and the need to curate this data, cleanse it of redundancies and inaccuracies, and maintain an accurate view of their customers, must be met efficiently, accurately, and effectively. The life sciences market also has unique compliance requirements that make MDM critical. For instance, to perform compliance related activities related to the Physician Payments Sunshine Act requirements, companies must aggregate information on all spending activities applied to each individual healthcare professional. Given that various departments will spend on any given individual based on their own sales and marketing plans, ensuring the various spend inputs are assigned and summarized to the appropriate professional becomes a difficult, yet critical, task.

Several of the factors driving complexity in the life sciences marketplace and necessitating master data management are described in Exhibit 5.

Exhibit 5: Accommodating change and complexity through master data management		
Consideration	**Example**	**Challenge**
Compliance demands	Track and trace Sunshine Act & aggregate spend Corporate integrity agreement reporting	Evolving regulatory demands may require companies to track the activities and products deployed to specific customers in aggregate. However many companies engage their customers in silos so aggregating information requires specific expertise.
Organizational shifts	Rise of Integrated Delivery Networks (IDNs) Creation of Accountable Care Organizations (ACOs)	Organizational ownerships have changed rapidly in recent years: these must be tracked to measure the value of an organization, understand how provider needs may have changed, and adjust commercial approaches appropriately - including education, support, and contracting.
Changes in financial status or discount eligibility	Discount eligibility (340B and other federal programs) Reimbursement arrangements (Buy & Bill) Rebates (profitability considerations)	Life sciences customers may be eligible for special federal or company supplied discounts and rebates that impact their profitability and therefore, must be tracked.
Therapeutic area shifts	New drug launches New indications	Companies may be active in several therapeutic areas and the value of a customer - both professionals and organizations - within each therapeutic area may be tracked separately or within separate systems. However, ideally this must be done without creating new duplicate customer records and in a way that allows the value of the customer across the total market basket to be assessed. New launches pose similar challenges to duplication.
Evolving data sources	Real World Evidence (RWE), personalized medicine, lab, genomic data, etc	As the availability of new data assets grows, and large, sometimes unstructured data becomes more available, quick linking of these new data sets to a single customer is necessary to yield rapid consumption, analysis, and action based on new insights.
Customary change in healthcare practice	New practitioners Relocation Retirement, death Name changes (marriage, divorce)	Across a universe of over 6 million potential customers, customer profile changes happen regularly. Having the technology, processes, information, and expertise to keep a customer universe current is critical.

Despite these considerations, over half of our survey respondents (56%, n=16), said accurate MDM software was not seamlessly built into their commercial system. This suggests that companies either are not maintaining a golden customer record through enterprise MDM or are struggling to connect existing MDM systems to all downstream consumers, such as those in sales operations and business analytics.

One barrier to greater use may be the high costs of on-premises installed solutions, which is also the key factor driving MDM systems to the cloud. Multi-vertical MDM solution providers like Informatica and IBM, and life sciences technology companies like IMS Health, are building out these cloud-based MDM solutions. Since this system should also connect directly and seamlessly to customer-facing applications such as mobile sales apps and multichannel marketing systems as MDM solutions move to the cloud, providers who offer broader application suites or platforms, such as IMS Health and Veeva, are also building this function directly into their other cloud applications to ensure interoperability.

Multichannel marketing applications

Life sciences companies now have more information than ever to understand prescribers of medicines, patients and payers, and their needs. However, their information systems are frequently not in a position to use this data to deliver additional value to these customers. This might include efforts to tailor communication to prescribers with specific patient profiles, provide reimbursement services to ensure patients receive financial support available (and to which they are entitled), or deliver education materials tailored to the prescriber's interests. In commercial terms, they typically fail to optimize marketing tactics due to a lack of advanced functionality in their multichannel marketing (MCM) system, namely the ability to run multichannel marketing campaigns or multi-step behavior-triggered campaigns, provide campaign performance data in near-real time, or inform future campaign design using results tracked from past campaigns (see Figure 9).

Figure 9: Capabilities of current campaign management systems

How well does your current marketing system do the following?

Create and run multi-step behavior triggered campaigns

Inform future campaign design using outcomes tracked from past campaigns

Provide campaign performance data in near-real time

Create and run multichannel marketing campaigns

0% 20% 40% 60% 80% 100%

Percent of respondents

■ Does not do this ■ Not well ■ OK ■ Very Well

Source: : IMS Health Technology Survey, 2014. n=22

Companies recognize the need to improve their customer engagement, with 71% (n=69) of respondents saying investments in their MCM system are 'extremely or very important' and nearly 90% of those from large companies saying the same. Cloud-based multichannel marketing applications can deliver the following and align commercial activity to customer needs:

• **Multichannel marketing campaigns:** Finding the ways doctors will listen and learn about medicines is critical, as is the delivery of effective messages across channels. Systems should be able to deliver coordinated customer contacts across channels to ensure messages are received, but deliver them only to the specific subgroups of customers who benefit from hearing this message.

• **Multi-step behavior-triggered campaigns:** In the past, customers were grouped into segments and marketed to based on those static classifications. Event and decision tree models of marketing are now built into cloud-based MCM systems and allow refinement of marketing activities based on customer's earlier action - for instance, delivering written clinical trial data to a provider who attended a lecture discussing a new study.

- **Campaign performance data in near-real time**: To ensure launches are successful, companies require campaign performance data in near-real time to be able to correct course rapidly. In order not to squander resources it is critical to understand what is working. Advanced analytic tools combined with streaming data allow companies to rapidly micro target campaigns only to where they are effective.

- **Informing future campaign design using outcomes tracked from past campaigns:** Closed loop systems can improve insights and support marketing decisions by recording customer preferences, and by measuring the success of the overall campaign. 'Intelligent' MCM applications can learn from past customer responses and allow companies to deliver more relevant messages over time. This can ensure that physicians are equipped with the information they need to help them deliver better patient care. It can also help ensure healthcare provider time and company resources are not wasted.

Ultimately the key value of new intelligent cloud-based MCM systems is that they give greater control to the end user. Rather than past systems where users relied on third party vendors for campaign planning, execution and measurement, and often had significant lag-times to deploy campaigns, cloud-based applications put greater control in the hands of brand managers giving them the ability to execute directly through a cloud-based interface. They can design their own campaigns or refine dashboards and analytics to measure performance. Experts in life sciences commercialization activities indicate that with such cloud-based and user-directed MCM system technology, cost reductions of 25-35% are achievable, with additional benefits from lower campaign administration and management costs, improved customer response rates and campaign revenue gains.[26]

Unstructured data-processing applications

Cloud applications equipped with healthcare-specific semantic engines will be useful for tackling healthcare's big data. New data sources such as patient EMRs, social media, and primary market research interviews, often are written in natural language and are unstructured or have free-text fields. They can be enormously difficult to query and glean insights from, and yet they are growing in importance. EMR data is already a critical part of the value story for medicines, and social media has become an increasingly important source of information on patient behavior and physician attitudes, feeding into market assessment, competitive tracking, brand performance, risk management and consumer engagement approaches.

New cloud-based applications focused on unstructured data are able to scan natural language records and use embedded medical ontologies to process and make sense of this information. They successfully unlock the value of these data sources while avoiding the expense of installing new infrastructure builds. Within EMR data, as an example, it is the free text fields that often contain the most critical information including cancer staging assessments, but for life sciences companies to otherwise obtain this information to gain an understanding of patient treatment pathways, they would typically need to have healthcare providers run manual chart reviews on their behalf.[27]

Commercial operations applications

Commercial operations applications focus predominantly on the management of sales and marketing efforts within the life sciences operation and are critical to advance and improve customer engagement and optimize resource deployment. On-premises applications are used today within sales operations to run territory alignment, compensation, call planning and sample management, but these are also moving to the cloud on integrated life sciences cloud platforms

Planning activities often require significant coordination between user groups to execute well. Cloud-based tools that leverage inputs from a wider audience and feed these into the planning process can optimize execution. For instance, cloud tools that will allow sales reps - who often understand how best to meet customer needs based on local reimbursement, demographics, etc. and can best assess where opportunity lies - to provide greater intelligence and input to the call planning process, will also enable companies to become more responsive to local market conditions and increase effective commercial action overall.

Increasingly, upstream and back-office planning functions such as targeting and segmentation, promotional and portfolio optimization, are also being integrated with sales operations applications involved in execution on integrated commercial cloud platforms. Tying execution to resource management in this way is necessary to fully optimize deployment of resources, allowing decisions made by the organization to flow downstream seamlessly and successfully.

Implications of cloud-based applications

With these and other new cloud-based applications specifically designed for the life sciences space, a new level of competency will now be available to companies regardless of their size. From a cost perspective, small companies will be able to avoid the prohibitive up-front costs of on-premises infrastructure spending, and instead use the cloud to rapidly gain new applications and new capabilities equivalent to larger counterparts. Larger companies on the other hand, can consider shifting legacy applications to best-in-class cloud applications to avoid the cost of upgrades, or reduce the time their IT staff spends on application maintenance and refocus their talents on strategic and value-added projects intended to meet new customer needs as well as those of their own company (see Figure 10).

Figure 10: New areas of use for cloud-based applications

Which of your applications are currently in the cloud?
Planning to move to the cloud in the next 5 years?

Legend:
- Currently in the cloud
- Planning to put in the cloud in the next 5 years
- Don't plan to move to the cloud
- Don't have the system

Source: IMS Health Technology Survey, 2014. n=8, IT respondents only
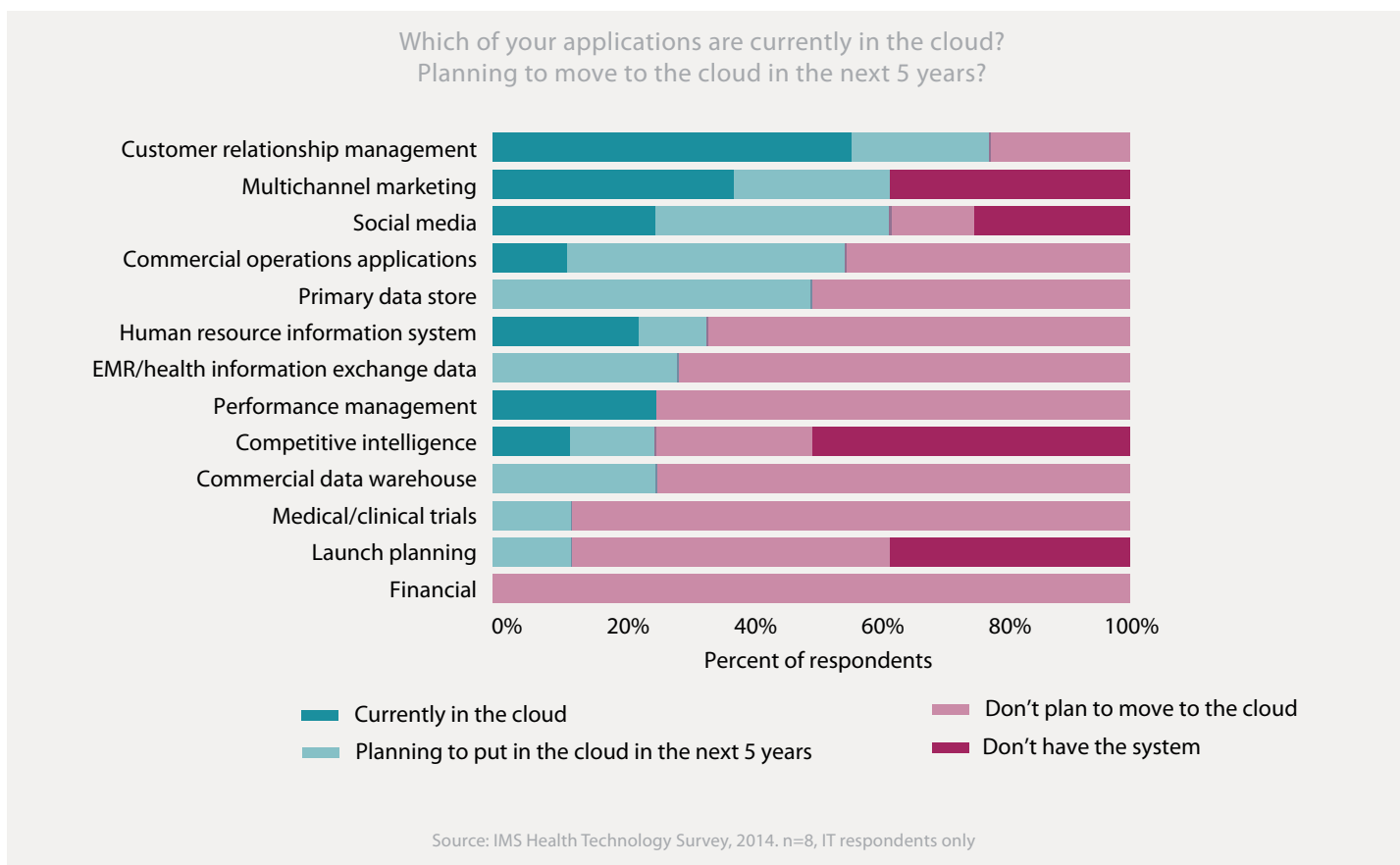
Interoperability and cloud-based software suites

The cloud has perpetuated a problem of disconnected systems and applications rather than solving it, creating continued pressure on life sciences companies to develop an enterprise interoperability strategy.

Companies see interoperability as a way to optimize their commercial organization by improving workflow speed and performance, eliminating conflicting views of the truth across departments, and paring vendor teams managing manual data handoffs.

85% of respondents said that 'integration of point-solutions or systems across the organization for improved workflow' was needed.

Third parties are developing pre-built suites of applications for the life sciences that will help them progress towards an enterprise-wide system and benefit from efficiencies, but no third party will offer enough applications for companies to become single source.

Coordinated action across departments is necessary to have a successful launch of new medicines. As companies are challenged to act with fewer resources, systems that can improve commercial effectiveness by synchronizing action across the enterprise are critical. The task is to eliminate data silos and build commercial systems that communicate seamlessly across functions – to create system 'interoperability'.

All departments must be looking at the same data to track and adjust performance and understand when market realities shift. This allows companies to shift their market strategies quickly when ineffective and deliver better information to the marketplace. As large data repositories were assembled in-house at pharmaceutical companies during the past decade, software applications were typically built to serve one department or set of users. The same data flows might be treated differently by each user group providing each a slightly different picture of the marketplace or some departments might be using older data. The result: users' time is wasted trying to reconcile data differences and actions are hindered.

The lack of connectivity between systems also increases the risk of incorrect action. Data typically flows from one system to another through manual handoffs and incorrect versions can be transferred. Ultimately this can mean that brand opportunity is incorrectly estimated, too much or little is spent on customer awareness and good medicines either fail to reach patients or do so at profitability levels that limit future investments in innovation.

The cloud is now replicating the same complexity and problems of legacy systems. With the increased use of new third party cloud applications, there is now a multiplicity of diverse systems and applications in the cloud, unlinked, that do not easily cross-talk. These problems can be resolved only by creating a way for these systems to work together more seamlessly or replacing them with systems that can. The CIO and information technologists now find themselves in a critical role as strategic interoperability 'architects' and in the position to increase operational efficiencies in their organization.

The need for greater operational efficiencies and improvements in workflow are widely recognized. According to ICD research, improving operational efficiency was one of the top three priorities in 2013 for global pharmaceutical industry buyers, and in the IMS Health Institute's recent survey 74% (n=115) of respondents consider 'improving the effectiveness of the commercial organization to launch new molecules and indications' to be a 'top' or 'high' priority.[28] An additional 85% (n=114) of respondents said that 'integration of point-solutions or systems across the organization for improved workflow' was needed with 42% (n=114) saying this was an area of 'high need' or 'most need' (see Figure 11). The hope is that systems integration will improve customer alignment, create a 'single version of truth', and achieve cost savings by reducing IT teams managing manual data handoffs.

Cloud-based 'application suites' are being developed that make progress toward this goal of a seamless enterprise system. These applications sit atop the same cloud platform and, in most cases, pull from the same underlying data repository. Updates in one application automatically cause relevant actions and updates in the others. This creates a single enterprise view of the truth and a seamless user experience across all systems. Although possible to build software programs known as Application Program Interfaces (API) to connect new cloud systems to one another and to legacy systems, users may still feel like they are shifting from one program to another which can hinder usability and use rates. Cloud providers like Microsoft Azure, Force.com, IMS Health, Veeva, SAP and Oracle are all working towards such pre-integrated application suites. For instance, SAP offers human resources, finance, procurement, and sales and marketing applications on their cloud platform, and other vendors are developing such suites specifically for the life sciences space.[29]

Figure 11: Need for systems integration and improved workflow

To what extent does your organization have a need for the following?
Integration of point-solutions or systems across the organization for improved workflow.

Source: : IMS Health Technology Survey, 2014. N=114
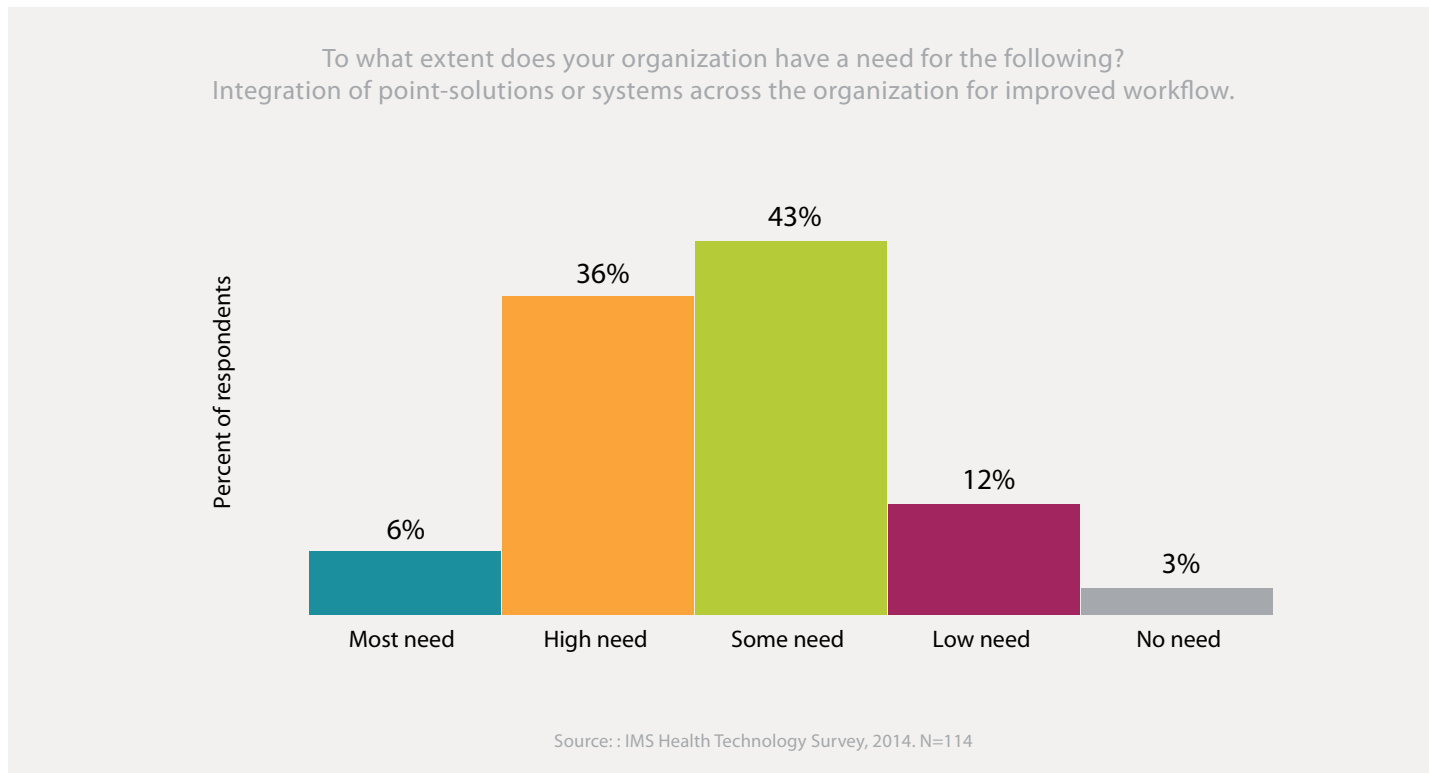
Life sciences application suites will also allow companies to obtain more value from their data by extending data use to additional parts of the organization. For instance, a standalone social media application might currently be used by brand teams to understand how patients and physicians are responding to their drug at launch. However, once that system is integrated with compliance, commercial operations and market access applications, it can alert compliance departments of adverse events, guide sales teams to deliver more relevant information to healthcare providers or enable reimbursement teams to proactively provide assistance where complaints about patient access have been expressed in social media (see Exhibit 6).

Not surprisingly companies are investing heavily in this area. IMS Health Institute research indicates that 66% [n=58] of respondents expect to see increased spending on applications and systems integration.

Exhibit 6: Evolution of life sciences applications

Current state

- Redundant data marts
- No central data repository
- Point-solutions serving single user groups
- Multiple views of the truth
- IT teams to support each separate application
- Additional siloed systems and applications in the cloud
- High complexity and cost

Integrated Enterprise System

- Integrated applications: application suites or API
- Single view of the truth
- Enterprise warehouse or common data repository
- Finance, HR, brand teams, sales, medical affairs, managed markets, CRM, contracts and legal/compliance teams, all with shared data
- Integrated data model
- Cloud-based accessibility
- Built specifically for the life sciences
- Security and compliance protocols already built
- Access control to accommodate separate business needs
- Seamless and intuitive user experience

Figure 12: Future investment in applications and systems integration

How do you think the levels of spend will change in the area of applications and systems integration in 5 years' time?

Percent of respondents

- Increase: 66%
- Decrease: 3%
- Stay the same: 31%

Source: IMS Health Technology Survey, 2014. n=58
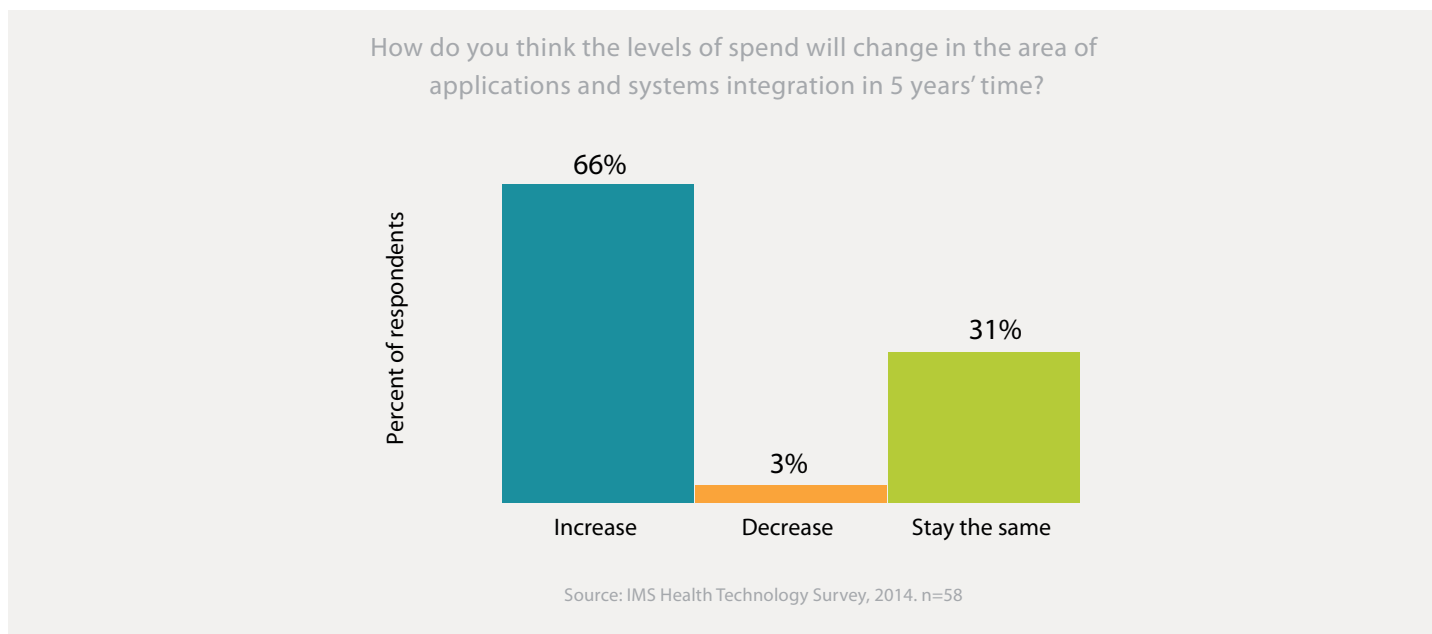
Figure 13: Levels of future investment in applications and systems integration

How much do you think the levels of spend will increase in each of these areas in 5 years' time?

Level of spend
increase in next 5 years

51-100%

26-50%

11-25%

0-10%

% of respondents 36% 53% 8% 3%

Source: IMS Health Technology Survey, 2014. n=36
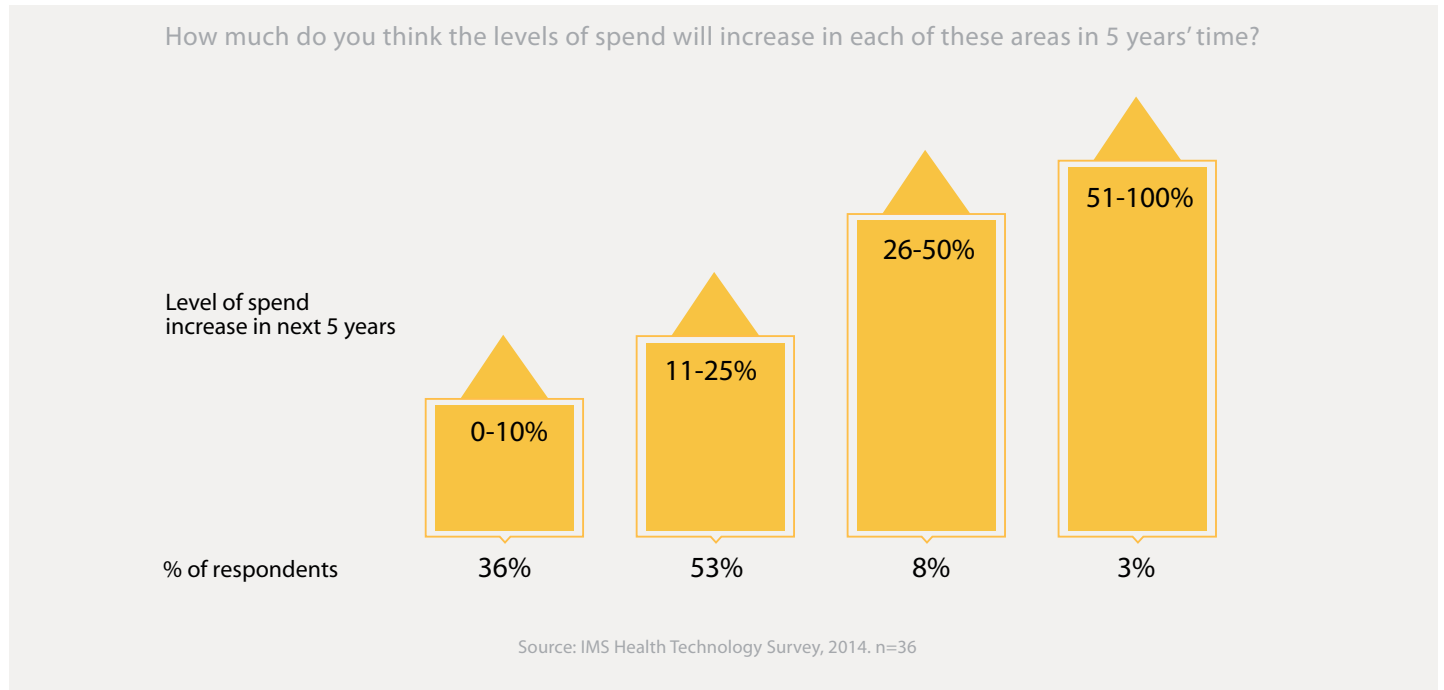
CASE STUDY 2 ———————

Integrated platform for commercial operations speeds time to insight[30]

A web of data transfers and manual processes

In anticipation of losing market exclusivity for its flagship product, a mid-sized pharmaceutical company downsized its commercial teams quite dramatically. In the process, it lost manpower and institutional knowledge that had been serving as the glue holding together various commercial operations. Suddenly, the drawbacks of relying on multiple software vendors for its critical functions (including forecasting, segmentation, goal setting, call planning, territory alignment, incentive compensation and sales reporting) became glaringly obvious.

It had taken tremendous manual effort and constant oversight from IT staff to manage the data handoffs between vendors, ensure compatibility between systems and resolve the inevitable issues. And now, without the internal staff to compensate for the inefficiencies of the structure, information was falling through the cracks and inconsistencies were mounting. Senior management realized this patchwork of solutions would not be sustainable, especially once the company emerged with its new portfolio strategy, promoting to specialist providers in new therapeutic areas. It needed a streamlined way to run its commercial operations.

Commonality and interoperability

The company took a bold step: it packaged all of its commercial intelligence applications together into one cloud-based platform to support commercial processes in marketing, sales operations, managed markets and IT. The integrated solution consists of:

- An open architecture capable of accepting data from multiple sources;

- A filter that automatically converts inbound data – including data from promotion partners –to the proper format;

- A common data repository for all commercial source data;

- An interoperable suite of application modules with built-in connections;

- Tools to perform analytics in real time and to create alerts, dashboards and reports; and

- A secure computing environment hosted in a private cloud with outsourced user and systems support.

CASE STUDY 2 *continued...*

Once managed in silos, the company's data resources and tools for running its commercial operations are now seamlessly integrated. All modules are automatically in sync, eliminating data handoffs across applications. Plus, the tools are available to all users whenever and wherever needed—on any type of device, including smart phones and tablets. Users experience a consistent interface across applications and need only use a single sign on.

Analytics for operational excellence

By turning to cloud-based hosting and outsourced support, the company is realizing annual cost savings in infrastructure and data management of around $3 million. But even more significant is the increase in value derived from business intelligence through:

- **Speed to insight and action.** Actionable data are available weeks earlier than in the past. For example, marketing teams are now able to track performance of in-market brands and assess diagnostic trends weeks ahead of their previous timelines. And sales reps now receive their compensation up to two months faster than before.

- **Alerts and dashboards** that recommend next steps. A sales rep might, for instance, be alerted through a dashboard that the company has received favorable access with a particular payer, with details on which physicians have patients that could benefit from the change in formulary status.

- **Real-time, closed-loop analytics.** Consistent measures and integrated tools allow users to link cause (a promotional effort) and effect (market performance) and provide a uniform means for discussing that performance internally.

- **A self-service approach.** Users can interrogate the data directly, allowing them to spend more time interpreting and acting upon data.

- **Business rule engines that scan for trends.** As an example, the system can send alerts when call activity is below goals or when a customer's sales are in decline.

At a critical time when the company was entering new specialty therapeutic areas and needed to build strong relationships with a few critical physicians, this comprehensive commercial platform enabled the company to monitor its progress quickly and uniformly. The system has eliminated the data transfers, manual manipulations and lengthy delays that stood between incoming information and decision makers putting it to use for market success.

Although a growing area, no single cloud platform currently contains all the applications necessary for life sciences operations. This means that although out-of-the-box integrated cloud-systems might be ideal, some custom application integration will still inevitably be required. For larger life sciences companies with legacy systems this work may be significant and result in a multi-platform solution. As new life sciences application suites are released, companies should select the ones that can support the largest part of their business or commercial functions seamlessly, to reduce the downstream work needed to link remaining legacy or cloud systems, and reduce the cost of vendor teams supporting manual data handoffs.

Analytic systems and embedded analytics

74% of respondents report a high or greater level of need to derive insights and value from data.

New analytic systems will help make use of big data and put insights into clinical and commercial practice earlier, which in the current state is used mainly by outcomes experts and academics.

Large companies are more likely to have analytics and alerts embedded in commercial applications providing them a competitive advantage versus small companies, but cloud-based analytic tools with pre-built prescriptive analytics will remove some of this advantage.

Companies are building global analytic performance platforms that can balance the conflicting need for increased centralization and coordinated action with the need for local flexibility through access control.

Data analytics are necessary for life sciences companies to make sense of the healthcare marketplace and optimize action within it. Finding the right patients for a drug that targets a rare disease, proving the value of medicines, and measuring success have all become much more complicated and require more complex data and analytic systems than ever before. In our survey, companies clearly expressed they are not gaining needed insights from existing analytic processes and tools, with 74% (n=115) saying they had a high or greater level of need for greater insights and value from data.

Life sciences companies compete on the quality of their analytics and their ability to take actions in the marketplace, and yet the analytic systems currently in place often fail to deliver value to end users (see Figure 14). Confusing visualizations, poorly designed data queries, and gaps in underlying data are major contributors, and can all return nonsensical output to users or fail to deliver needed insights. When this happens, analytics are underutilized by the end user and fail to guide sensible business action. Only by building better technologies that include intelligence, standardization and improved user experiences, can life sciences companies reap the full benefits of the data they have already purchased and deliver the benefits to the healthcare marketplace.

Figure 14: Need for better insights and value from data

To what extent does your organization have a need for the following?
Greater insights and value from data.

Percent of respondents

- Most need: 27%
- High need: 47%
- Some need: 22%
- Low need: 3%
- No need: 2%

Source: : IMS Health Technology Survey, 2014. N=115
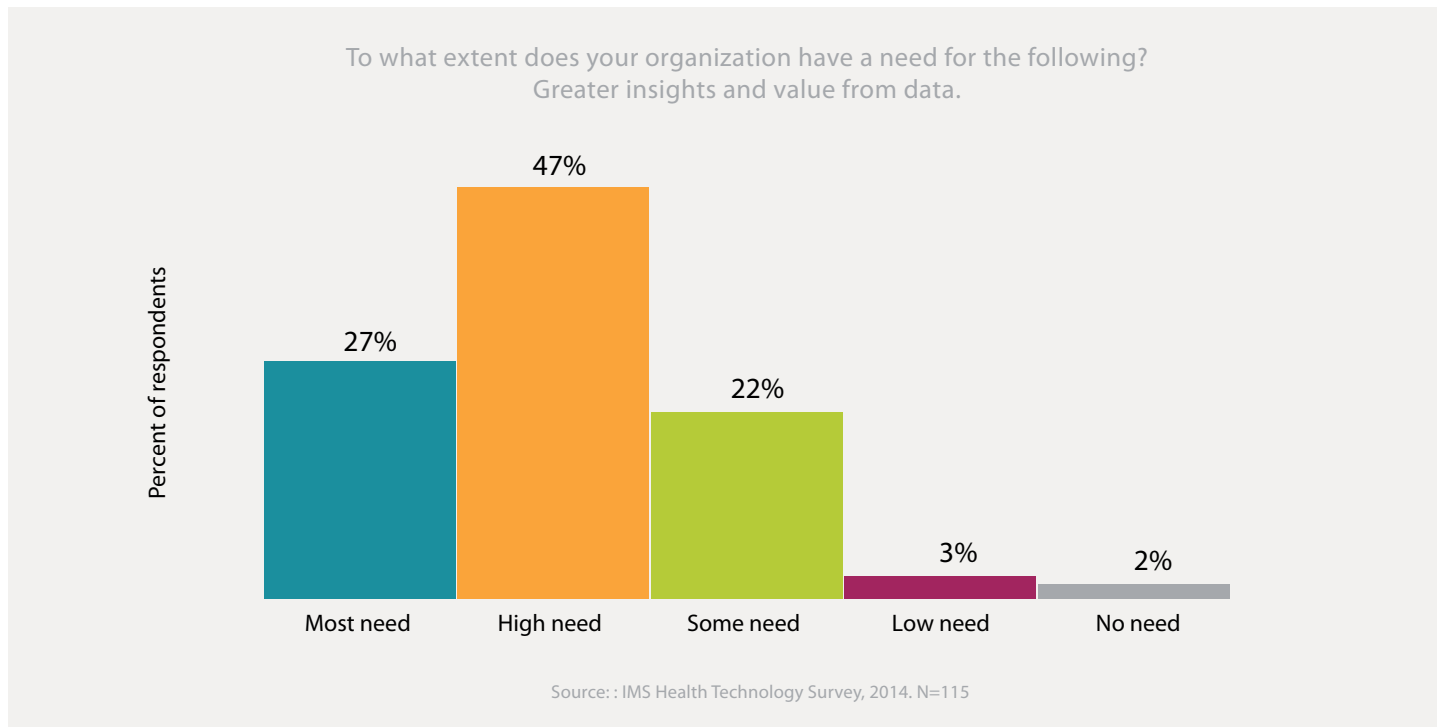
Exhibit 7: Improving the value of analytics

- **Limit the number of metrics** - dashboards may be too complicated or confusing to drive action

- **Make metrics more meaningful** - use predictive or prescriptive analytics that serve the answers to the user; limit the number of metrics that simply describe the marketplace or trends so implications are clear

- **Digitally embed analytics as action alerts** within performance tools; dashboards are still useful but behavior triggers will guide users to take action

- **Create simple visualizations** - ensure a high level of ergonomics and consumable formats

- **Improve click-through speed and reduce user clicks** -if a tool is not fast and easy to use, users have demonstrated they will not use it

- **Designate a few metrics as** key performance indicators that the entire organization will use to track the consequences of actions taken

Analytic tools that deliver insights can help optimize interventions and use of healthcare resources: they can drive post-marketing research by unearthing early signals of value for investigation, help companies better engage and deliver value to their customers, and contribute to better health outcomes for patients. Life sciences companies that are able to access anonymized patient information covering all care settings have a unique ability to apply advanced analytics and gain new insights about a patient's journey through the health system. This information can advance understanding of how medicine is practiced in the real world - from disease prevention through diagnosis, treatment and monitoring - and the role of patient decisions or variations in care.

Life sciences manufacturers can use these insights gained to provide value added services to customers and optimize therapeutic interventions and use of healthcare resources. For example, an understanding of patient and physician behavior and their decision patterns can reveal new ways of educating, advising and supporting them. It can also help companies identify new ways to speed the time to diagnosis or remove barriers to care.

Efforts to drive efficient use of resources can be strongly supported by new analytic approaches. Analytic tools can help companies focus attention on small segments of patients and physicians, by providing greater understanding of local opportunity and need. By helping companies locate sick or non-compliant patients, determine what information physicians would find valuable, or determine when patient access to medicines might be limited, company spend can become more targeted and better health outcomes for patients can be achieved. Some of the challenges that companies face to act efficiently in the marketplace, and the analytics that can be used to help engage stakeholders, are discussed in Exhibit 8.

Exhibit 8: Delivering better healthcare through micro-market segmentation

Data Type	Analytic Challenge	Intelligent Customer Engagement
Patient data (use of medicines, demographic info, financial ability to pay, preferences, etc)	Identify patients with relevant diseases who can benefit from medicines Locate patients who require financial assistance Locate patients who are non-compliant	Use predictive modeling tools to help locate undiagnosed patients and share digital DTC ads or links to disease info Track total patient cost burden and use this to provide coupons or assistance programs to improve patient access Use patient adherence metrics to deliver tailored information to healthcare providers and deploy adherence efforts
Physician or institution practice data (prescription, procedure/diagnosis data, buy & bill arrangement)	Locate physicians with diagnosed or potentially undiagnosed patients Provide information to guide treatment and appropriate use Locate physicians whose patients require reimbursement assistance	Use analytics to rank the influence of external stakeholders, uncover practice needs, and tailor personal and non-personal promotion at the prescriber level Use closed-loop and promotional response systems to learn from physician response to delivered information and deliver information according to physician preferences
Payer contract data	Determine where to contract with payers to improve patient access Facilitate access in areas where prior-authorizations or other barriers exist	Use info on physician payer mix to guide messages around patient access Communicate new payer coverage to physicians so patients can gain access
Observational data (EMRs, claims data, laboratory and genomic data)	Determine where along the healthcare journey barriers exist to patients receiving care Understand treatment pathways driving IDNs and ACOs to control product choice and utilization	Use EMR/claims analytics to give payers info on the value of medicines relevant to their local patient population Deliver info to ACOs demonstrating a drug will help meet treatment goals at lowest cost including: impact on patient adherence, outcomes, quality of life, disease severity, utilization of health resources
Customer affiliation (IDN relationships and influence, ACO and 340B status)	Understand level of control exerted over prescribing Provide reimbursement assistance and relief to physicians purchasing injectable and specialty products to treat in-office	Rank provider independence based on affiliation and embed these metrics in mobile apps for the field Determine which physicians may be assuming reimbursement risk to provide discounts and assistance

However, companies currently underutilize analytics to achieve such targeted action, and many fail to transfer analytic insights from their data into other systems to guide and optimize customer engagement. For instance, while companies report their campaign management systems typically use customer affiliation and behavioral response to influence engagement, less than 15% of survey respondents reported that their current system leverages segments based on social media, net profitability (reflecting rebates) or a physician's payer-mix 'very well', although they often have the underlying data to do so (see Figure 15).

Figure 15: Capabilities of current campaign management systems

How well does your current marketing system generate target customer segments based on the following?

Source: IMS Health Technology Survey, 2014. n=22
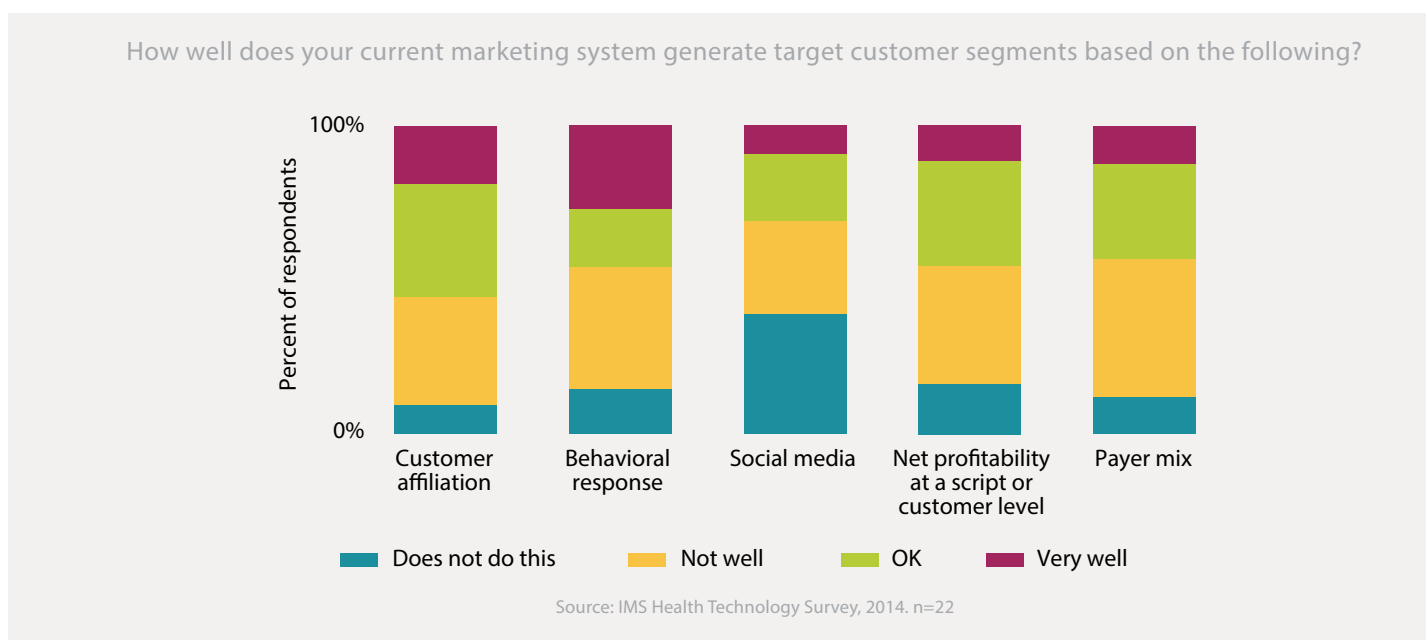
Addressing this analytic gap is critical as analytic tools hold the key to optimizing the deployment of resources as resources themselves are squeezed. Companies understand that they must build capability in this area and suggest they are investing in new analytic capabilities with 68% (n=63) expecting increased spending on analytics. Additionally 68% (n=40) expect those increases to be greater than 11% over the next 5 years and 23% (n=40) expect significant increases of over 26% (see Figures 16 and 17).

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Figure 16: Company investments in analytics over time

How do you think the levels of spend will change in analytics in 5 years' time?

Source: IMS Health Technology Survey, 2014. N=63
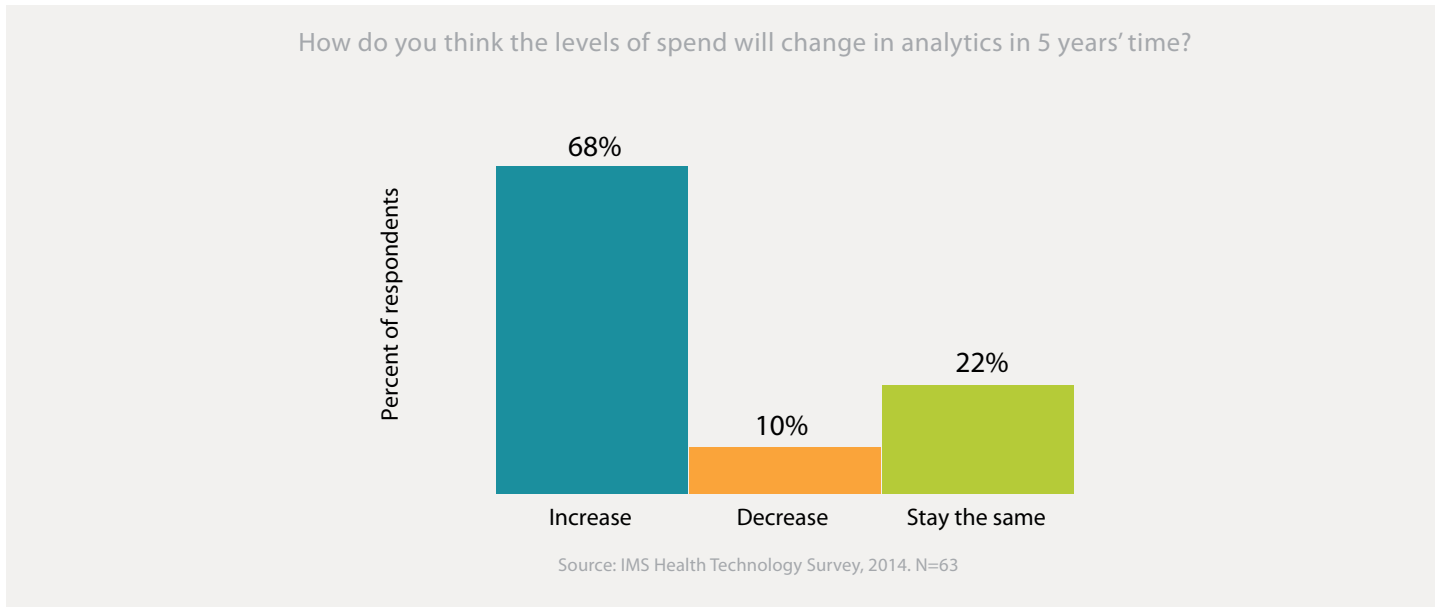
Figure 17: Increases in company investments in analytics over time

How do you think the levels of spend will increase in analytics in 5 years' time?

Source: IMS Health Technology Survey, 2014. n=40
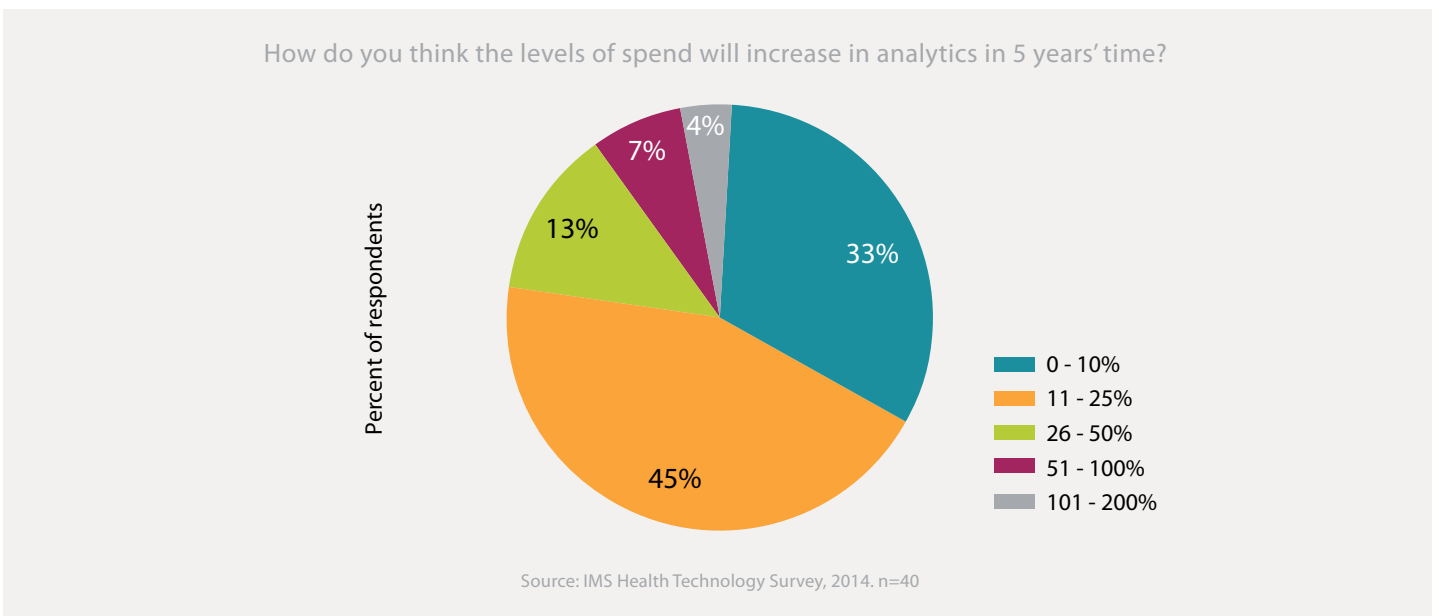
However, our survey indicates they may be under-prioritizing the importance of initiatives in this space. Despite planned investments, only 53% of respondents (n=116) called 'enhancing analytic capabilities' a high or top priority for their organization.   Larger companies called this a greater priority than their smaller counterparts (see Figure 18).

Figure 18: Focus on enhancing analytic capabilities

To what extent does your organization see these as important priorities? Enhancing analytic capabilities (e.g. integrating new data sources, building analytics into workflow, accelerating decision making)

Percent of respondents

Organization size: Large, Medium, Small

Large: Top priority 19%, High priority 39%, Medium priority 31%, Low priority 10%, Not a priority 2%

Medium: Top priority 16%, High priority 37%, Medium priority 42%, Low priority 5%, Not a priority 0%

Small: Top priority 6%, High priority 35%, Medium priority 41%, Low priority 12%, Not a priority 6%

Top priority · High priority · Medium priority · Low priority · Not a priority

Source: IMS Health Technology Survey, 2014. N=116

Big data analytic tools

New cloud-based analytic tools will help life sciences companies tackle the challenge of big data and gain more value from these sources. SAS and SPSS have been core analytic tools of the pharmaceutical industry for years and support advanced analytics. However, available analytic technologies are evolving and new systems are now available that use new analytic models, language processing tools and supercomputing power to tackle the problem of big data.

'Intelligent' analytic engines in the cloud like IBM Watson and WolframAlpha are supercomputer systems able to mine insights from various data sources.[30] These systems can run a single query against a library of thousands of statistical models in parallel to derive and rank hypotheses, and then present the user with answers in visual formats like trendlines and graphs. They can also select which statistical models to apply to a problem and learn from mistakes to refine future suggestions.[31,32]

Although Watson and WolframAlpha are initially being applied in healthcare and among other industries, these highly tuned technology platforms also provide the promise of integrated big data analysis in the cloud for the life sciences.[32] For instance, applied to an EMR dataset, these systems can mine for correlations between treatment patterns and health outcomes to guide post-marketing research, or create insights for commercial use.

In addition to the flexibility of locating the data in the cloud and not landing it on-premises, a key value of these new analytic systems will be their ability to help even non-expert commercial users make use of big data, granting them insights into clinical and commercial practice. Currently, observational patient data like EMRs are used predominantly by outcomes experts within life sciences companies. However, with new cloud-based analytic systems brand researchers and analytic staff will be able to share in the use of these data sources to gain a complete understanding of the patient journey or examine how care varies for different cohorts of patients using definitions of disease severity, co-morbidities, concomitant drug use, etc.

Cohorts in the cloud

One of the great barriers to using EMR and other real world evidence data for commercial use is knowing how to query the data correctly. Building patient cohorts – defining the population to study – is a fundamental step in any research endeavor involving patient-level data. Yet, because this exercise has traditionally required deep scientific knowledge of a given therapy area – combined with SAS programming skills – few could perform it, or perform it well. Investigations could lead to the wrong answer if data queries or patient cohorts are not built with tremendous disease expertise and an understanding of the limitations of the underlying data, particularly in oncology markets where disease definitions are not straightforward. Querying EMR data has therefore been a task reserved for experts, not only because of the technical challenges, but also because 'getting it wrong' could invalidate research findings. Commercial users would often have to rely on their colleagues, creating delays often times of many weeks.

Analytic applications with cohort-building software tools have solved this difficulty by translating expert-level knowledge of disease and treatment patterns into pre-built selections thus opening the data to interrogation by multiple commercial user groups. Data elements that establish a patient as having a particular medical condition are built-in market by market, making available standardized disease definitions. Alternately, a company's scientists can also custom build template definitions of the patient population to be investigated and allow it to be shared across the electronic workspace for access by non-expert, commercial users. Such analytic applications also speed the time to insight, by allowing users to proceed straight to querying the data for the cohort of interest, while ensuring a consistent approach within an organization and the scientific integrity of research findings.

Driving the value of analytics

Companies are increasingly using analytic tools to drive correct and aligned behavior across the commercial organization and are doing so in three ways: selecting the best metrics to align to commercial success, embedding value-added analytics into the work processes through analytic applications, and standardizing these metrics across the organization on enterprise-wide analytics systems.

Advanced analytics

To drive commercial success as market complexity has grown, analytics have progressively gotten more sophisticated. Efforts to build intelligence into tools mean retrospective analytics, which displays a picture of what happened in the market in the recent past, are being replaced by ones that take the user farther along the decision-making process. These include predictive analytics that use past trends to help the user understand future probabilities, and prescriptive analytics that conclude based on past trends and current states the actions that should be taken to improve efficacy.

Exhibit 9: Levels of sophistication within analytics

	Retrospective analytics	Predictive analytics	Prescriptive analytics
Definition	Displays a picture of what happened	Informs how future behavior might unfold based on current trends	Suggests actions to improve efficacy
Function	Requires interpretation by user	Trends already interpreted and predictions made Requires user to determine possible actions	Determines optimal responses to trends Guides the user to high-value actions
Output	Typically spreadsheets and dashboards Sometimes alerts of trend breaks	Delivered alerts and action triggers within applications	Options presented to users in the form of menus Alerts recommending action

However both predictive and prescriptive metrics are still vastly underutilized within life sciences companies. Nearly all respondents 98% (n=98) have analytic systems that include retrospective analysis, but only 37% confirmed having predictive analysis capabilities, and only 28% confirmed having prescriptive analysis (see Figure 19).

Figure 19: Capabilities of current analytic systems

What do your current analytic systems typically include?

Source: IMS Health Technology Survey, 2014. n=98
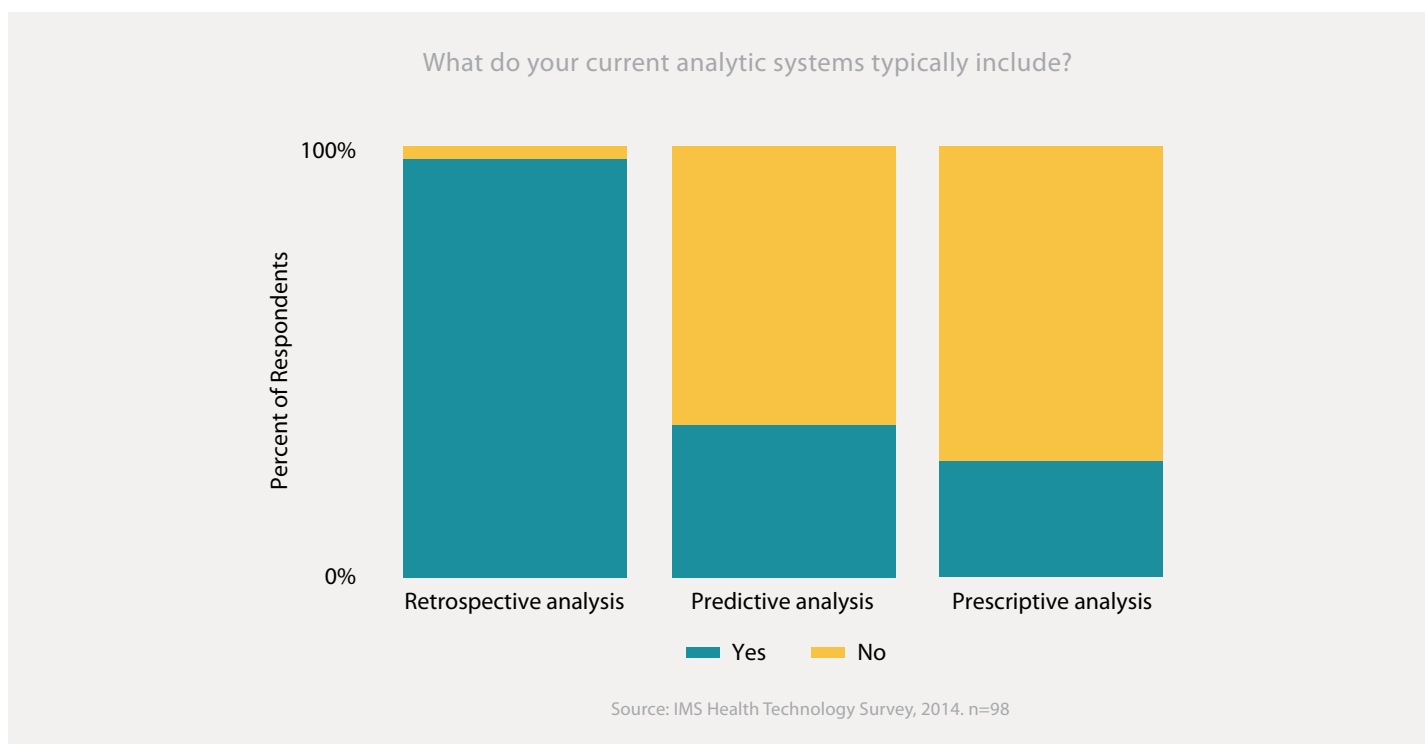
Embedded analytics

Regardless of metric used, analytic tools are of little value if commercial staff does not actively use them to inform decisions. In recent years, companies have sought to take these analytics and translate them into action triggers embedded in the work process. By embedding prescriptive analytics - recommending action be taken - digitally in commercial tools and applications as alerts or action triggers it becomes harder for decision makers to avoid the use of analytics.

Still companies have a long way to go to achieve this vision. 86% (n=14) say that analytics including alerts that instruct sales reps to take specific actions are not currently embedded in commercial applications. Large companies were more likely to have this functionality, providing them a competitive advantage versus small companies. However, with the arrival of life sciences-specific cloud-based applications and cloud platforms, analytic tools with built-in prescriptive analytics will become more common, helping to drive 'right actions' for companies of all sizes.

Enterprise-wide analytic systems

The need for 'right action' by the enterprise is now matched by the need for coordinated action within the enterprise. As stakes are higher and flawless launches are essential, it is critical to ensure commercial teams and even global teams are all looking at the same advanced key performance indicators (KPIs). Having aligned objectives, incentives, and performance measurements enables life sciences companies to recognize underperformance and take action.

For this reason, life sciences companies are moving towards building global analytic performance platforms that create a single view of performance throughout the organization. These are being used to tackle coordination and inefficiency issues within companies while accommodating the enterprises' need for increased centralization and control. They also typically accommodate the need for teams to have local flexibility within the system through governance and access controls. Companies are making significant investments - up to $10 million USD - in such global KPI harmonization platforms and estimates indicate cost reduction of 24% over 4 years is possible.[33]

CASE STUDY 3

Integrated performance management system delivers 'one version of the truth' for informed decision making[34]

Data, data everywhere, but not a drop of insight

One of the world's largest pharmaceutical companies recognized that its commercial information strategy and internal systems were not up to handling two of its most strategic imperatives: engaging a wider array of healthcare stakeholders and launching a series of new products in rapid succession.

The company spent millions of dollars each year in primary and secondary market research to understand its audiences and track its performance. Yet, because it didn't have the technology infrastructure, data governance protocols, and analytical tools to ensure that everyone was working with the same, synthesized information, its investment in market intelligence was sorely underperforming. Managers all came to the table with different sets of numbers related to market share, sales, market growth, competitor growth etc. The measures did not agree and so could not be compared across brands and geographies or totaled. So, before they could make decisions, managers were forced to sift through extraneous information, validate methodologies and settle data discrepancies. Leaders were drowning in data, yet didn't have what they really needed to guide the business.

From hundreds of conflicting metrics to an enterprise-wide analytical platform

The company first determined what measures should be tracked by brand, whittling down the hundreds of metrics it had been tracking (although not necessarily using) across its brands to just 40 Performance Indicators (PIs) and Key Performance Indicators (KPIs). The company established that it would track progress through four clusters of PIs/KPIs: progress against its strategic objectives, operational execution, customer impact and sales performance. Many of the KPIs were innovative, leading and actionable indicators in addition to traditional lagging metrics.

It then installed a holistic system for managing, analyzing and presenting the information along those clusters of KPIs. The solution required an information framework that captured, integrated and harmonized all of the incoming data from 15 different datasets into one data hub. In the process, the data were scrubbed, put into standard formats and a compatible coding schema. This was especially challenging as much of it was unstructured primary research findings from customer questionnaires.

CASE STUDY 3 *continued...*

Superimposed on the information architecture was a dashboard engine capable of configuring views of the data suitable for different roles and responsibilities within the company globally. Thus, a single analytical tool could feed off the same underlying data and deliver the same KPIs throughout the enterprise for coordinated action. To support mobile roles, the dashboards are delivered on the Apple iPad.

Evidence-based decisions at all levels

From the C-suite to brand managers to sales representatives in the field, users can now see, at a glance, the results pertinent to their role, with the ability to drill down into details by either brand or geography. Such visibility and consistency has had a profound impact on the company's approach to its business, ushering in greater discipline and confidence in its decision making.

The company now:

- Devotes time to strategizing instead of struggling to align the numbers;

- Can follow its strategic decisions all the way through execution;

- Has a clear line of sight into performance at all levels of the organization;

- Shares research findings and between countries and regions;

- Supplies brand and sales teams with the feedback they need to continually improve their performance;

- Plans to create innovative forms of incentive compensation based on these KPIs; and

- Can focus on its global brand objectives while rolling out new products.

It is ensuring that payers appreciate the value of its innovations and that these new medicines reach the right patients. Brand teams are able to gauge the market's reaction and adjust their long-term plans to best serve patients' and payers' needs.

Conclusion

Getting the most from new technologies

As market pressures reduce the lifetime earnings of medicines, life sciences companies will need to reduce spend within their commercial operations, and use new information technologies to accomplish this. An increasing number are taking advantage of digital and mobile technologies to engage better with customers, but life sciences companies have been late adopters of cloud-based technologies which can yield significant efficiencies and cost savings.

For cloud technologies to be used more broadly in the life sciences, this will require improved security and compliance commitments from cloud providers, a greater availability of industry specific cloud solutions including interoperable application suites, and analytic systems with built-in intelligence to optimize commercial action. These changes are occurring rapidly. Recent legal rulings in the U.S. have clarified that cloud providers are responsible for maintaining HIPAA compliance, making it easier for valuable patient data sources to become more widely available in the cloud, and a growing number of cloud solutions are being developed specifically for the life sciences industry.

These developments mean life sciences companies should now investigate ways to gain efficiencies and cost savings through cloud technologies including storage, building platforms, and applications. Features of the cloud that can support stronger relationships with customers, optimize the commercial organization and reduce costs, improve the speed and effectiveness of commercial action - all while meeting the unique needs of life sciences - are summarized in Exhibit 10.

Exhibit 10: Putting information technology to use in the life sciences

Storage & Platform	Application	Interoperability	Analytics
Cloud-based A private or public off-premises cloud to house your data store	**Strategic** Select cloud-based applications system that are best fit for purpose and specifically for life sciences to rapidly gain capability	**Shared data** Common data repository or enterprise warehouse with a data model designed for healthcare serving many or all applications	**Embedded analytics** Intelligent cloud systems with analytics completely embedded in workflow to inform decision-making and deliver insights … not data
Compliant Protocols and signed BAAs in place to ensure compliance with patient privacy and data residency requirements for health info	**Simple & user-friendly** Visual display that creates an interactive and intuitive experience and increases use rates	**Cloud-based application suites** Prebuilt, modular suites integrate the right systems seamlessly on a cloud platform and reduce silos	**Prescriptive & predictive** Use of clearly actionable prescriptive analytics where possible
Secure Security, identity and access controls in place	**Current** Ensure master data management flows into applications reflecting changes in life sciences data structures and relationships	**Shared look and feel** Constant visual display between applications that creates an intuitive experience and increases use rates	**Advanced metrics across the enterprise** Enterprise-wide performance systems aligned to future realities including drug quality metrics, ACO metrics, net profitability
Globally accessible and connected Available for use across the global enterprise or for use by multiple healthcare stakeholders	**Mobile applications** Deploy mobile applications to improve customer engagement, and increase business intelligence use internally	**Shared standards & governance** Access control to accommodate local/global business needs across the enterprise	**Correct questions** Query tools that help commercial users create clinically-correct queries on patient and EMR data
Extendable Leverage platform tools to rapidly build custom applications, link to existing ones and deploy mobility	**User enabling** Applications should make users self-sufficient to analyze trends and take customer focused action	**Tied to legacy systems** Integrate cloud platform applications with on-premises legacy applications using API	**Unstructured data use** Use Natural Language Processing systems to create novel analytics from interviews, social media and EMR data across the enterprise

Legend:

👤 Builds stronger relationships with customers

📈 Improves the speed and effectiveness of commercial action

$ Optimizes the commercial organization and reduces costs

⚠ Meets the unique needs of life sciences

While most companies will find ways to use mobile and cloud-based applications to gain new capability, not all companies will be able to leverage cloud technologies equally, nor reap the same benefits. For instance, large companies may find it too difficult or costly to replace or relocate existing systems. Over the past 10 years these companies developed large on-premises data warehouses and applications, which delivered an ability to gather, process, and manage information beyond that of smaller companies with lower IT budgets, and enabled smarter and more strategic action in the marketplace. However, this infrastructure now makes it more difficult and less cost-effective for larger companies to shift as fully or quickly to the cloud, optimize data flows, or create a fully-interoperable system. At the same time, the competitive advantage these systems provided will diminish as smaller companies take to the cloud.

Both cloud platforms and cloud applications can rapidly deliver a level of commercial ability beyond what new and smaller companies could typically attain in the past, including the ability to execute their own sales and marketing strategies. New companies are also likely to put these cloud technologies to use in their business more rapidly – opting to build on public or private cloud platforms and acquire cloud-based applications rather than build expensive on-premises infrastructure – and they will reap the advantages in cost and functionality.

Cloud technologies therefore provide new opportunities for smaller and younger life sciences companies to leapfrog traditional development cycles and match the capabilities of their larger competitors while building more efficient systems. The cloud has been called 'the great equalizer' for this reason.[35] New companies may be able to leverage commercial cloud applications to market their first drugs successfully without signing commercialization agreements with large companies. The shift to specialty drugs which may have relatively small target patient populations and fewer prescribers, and a marketplace with tighter payer controls, have already diminished the need for large direct-to-doctor sales forces. Cloud technologies may further lessen the need for distribution power of larger companies. Consequently, this may restrict the ability of larger companies to find in-licensing and commercialization candidates that currently help fill their pipelines.

Regardless of company size, the person who will be on point to deliver optimized commercial operations is likely to be the CIO. The CIO will not only be the key systems architect to deliver a more efficient and more capable system to serve customers better, but also the key person to deliver much needed cost reductions. If the cost burden of the current commercialization infrastructure is not reduced now, continued external cost pressures will begin to erode margins within the next five years.

Current market challenges are putting pressure on the margins of life sciences companies with a greater impact on large companies facing product expires. The current IT burden within life sciences and especially these larger companies is high since legacy systems have significant inefficiencies. Companies have attempted to address these, but have done so using horizontal platforms that are not tailored to the life sciences industry. Efforts to get these to work for the life sciences industry have been similarly costly. These pressures are urgent but emerging cloud technologies that are life sciences-focused can provide a way forward. The CIO will urgently need to assess ways to leverage cloud storage, platforms and applications to create interoperable systems that save money. This can only be accomplished as part of a more integrated strategic relationship with others in the commercial organization. Supporting such efforts will require the entire executive management team of life sciences companies to recognize the transformation that new technologies can bring to their organizations – and jointly setting priorities, avoiding pitfalls and realizing the promise.

Methodology

As an input to this study, the IMS Health Institute conducted a survey to understand the need for new information technologies, and explore their current and planned use. The survey was sent to 5,284 individuals derived from IMS Health's proprietary contact list working within life sciences companies. The survey was run anonymously and thus respondents were asked to self-identify along various parameters including:

- **Company Type**
  - Pharma / Biotech / Diagnostic /Medical Device / Other

- **Company size in terms of global sales**
  - Large (>US $10 Billion) / Medium (US$1 Billion - US$10 Billion) / Small (<US$1 Billion)

- **Functional role**
  - Information Technology / Marketing / Sales & Commercial Operations / Executive Team / Managed Markets / Other

- **Scope of Role**
  - Global Role / Regional Role/ Country Role

- **Geographic region**

The survey remained open for 9 business days starting January 27th 2014 and in total, 116 responses were received from 70 life sciences organizations. Individuals surveyed held positions globally within information technology, commercial and executive functions. As this survey included highly technical questions, users were permitted to skip questions or select 'don't know' as an option. All survey results within this report are cited based as a percent of knowledgeable respondents excluding responses of 'don't know' and non-response. For this reason, all results are reported with a corresponding 'n' number to indicate the number of responses received per question. Several questions requiring specific expertise were presented only to select functional groups, most notably: questions on current and future use of cloud technologies were presented only to IT users, and questions on current functionality of multichannel marketing systems were presented only to those who self-identified as holding marketing roles. All results are reported rounded to the nearest whole percentage point.

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Murray Aitken is Executive Director, IMS Institute for Healthcare Informatics, which provides policy setters and decision makers in the global health sector with objective insights into healthcare dynamics. He assumed this role in January 2011. Murray previously was Senior Vice President, Healthcare Insight, leading IMS Health's thought leadership initiatives worldwide. Before that, he served as Senior Vice President, Corporate Strategy, from 2004 to 2007. Murray joined IMS Health in 2001 with responsibility for developing the company's consulting and services businesses. Prior to IMS Health, Murray had a 14-year career with McKinsey & Company, where he was a leader in the Pharmaceutical and Medical Products practice from 1997 to 2001. Murray writes and speaks regularly on the challenges facing the healthcare industry. He is editor of Health IQ, a publication focused on the value of information in advancing evidence-based healthcare, and also serves on the editorial advisory board of Pharmaceutical Executive. Murray holds a Master of Commerce degree from the University of Auckland in New Zealand, and received an M.B.A. degree with distinction from Harvard University.

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About the Institute

The IMS Institute for Healthcare Informatics leverages collaborative relationships in the public and private sectors to strengthen the vital role of information in advancing healthcare globally. Its mission is to provide key policy setters and decision makers in the global health sector with unique and transformational insights into healthcare dynamics derived from granular analysis of information.

Fulfilling an essential need within healthcare, the Institute delivers objective, relevant insights and research that accelerate understanding and innovation critical to sound decision making and improved patient care. With access to IMS Health's extensive global data assets and analytics, the Institute works in tandem with a broad set of healthcare stakeholders, including government agencies, academic institutions, the life sciences industry and payers, to drive a research agenda dedicated to addressing today's healthcare challenges.

By collaborating on research of common interest, it builds on a long-standing and extensive tradition of using IMS Health information and expertise to support the advancement of evidence-based healthcare around the world.

Research Agenda

The research agenda for the Institute centers on five areas considered vital to the advancement of healthcare globally:

The effective use of information by healthcare stakeholders globally to improve health outcomes, reduce costs and increase access to available treatments.

Optimizing the performance of medical care through better understanding of disease causes, treatment consequences and measures to improve quality and cost of healthcare delivered to patients.

Understanding the future global role for biopharmaceuticals, the dynamics that shape the market and implications for manufacturers, public and private payers, providers, patients, pharmacists and distributors.

Researching the role of innovation in health system products, processes and delivery systems, and the business and policy systems that drive innovation.

Informing and advancing the healthcare agendas in developing nations through information and analysis.

Guiding Principles

The Institute operates from a set of Guiding Principles:

The advancement of healthcare globally is a vital, continuous process.

Timely, high-quality and relevant information is critical to sound healthcare decision making.

Insights gained from information and analysis should be made widely available to healthcare stakeholders.

Effective use of information is often complex, requiring unique knowledge and expertise.

The ongoing innovation and reform in all aspects of healthcare require a dynamic approach to understanding the entire healthcare system.

Personal health information is confidential and patient privacy must be protected.

The private sector has a valuable role to play in collaborating with the public sector related to the use of healthcare data.