Inside Track
Research Note

FREEFORM DYNAMICS

In association with

Tintri

The role of machine learning and automation in storage

Drivers, perceptions, readiness and practicalities

Freeform Dynamics Ltd, 2020

Introduction

There has been lots of hype around the increasing role that machine learning, and artificial intelligence more broadly, will play in how we automate the management of IT systems. Whether it's labelled as Intelligent Infrastructure, AIOps, "self-driving IT", or even private cloud, the aim is the same: to embed machine learning (ML), workflow automation and infrastructure-as-code capabilities into systems, enabling them to automatically make changes in real-time to predict and adjust for future requirements – without human intervention. The claim is that this can both remove much of the manual drudgery associated with routine IT administration, and dramatically speed up the process, with the ultimate goal being continuous, automated, self-optimization.

Major concerns remain, however. Are the latest AI/ML-powered intelligent automation solutions trustworthy and ready for mainstream deployment, especially in areas under heavy resource, cost and SLA pressures, such as storage management? And more important, are we ready to trust in full hands-off automation when it comes to core business services, or is the hands-on involvement of admin staff still required?

To help answer these questions and understand the attitudes and perceptions of IT professionals towards automated IT, and in particular automated storage management, we conducted an online survey to which 171 people responded, from organizations large and small.

What does Intelligent Infrastructure mean?

For any conversation to be meaningful, it is essential that the context be clear, especially in an area such as this, where marketing forces have been working overtime. So we started by looking at what survey respondents understand by the term "Intelligent Infrastructure " in the context of storage and its management (Figure 1).

What do you understand by the term 'Intelligent Infrastructure' in the context of storage provisioning, management and optimization?
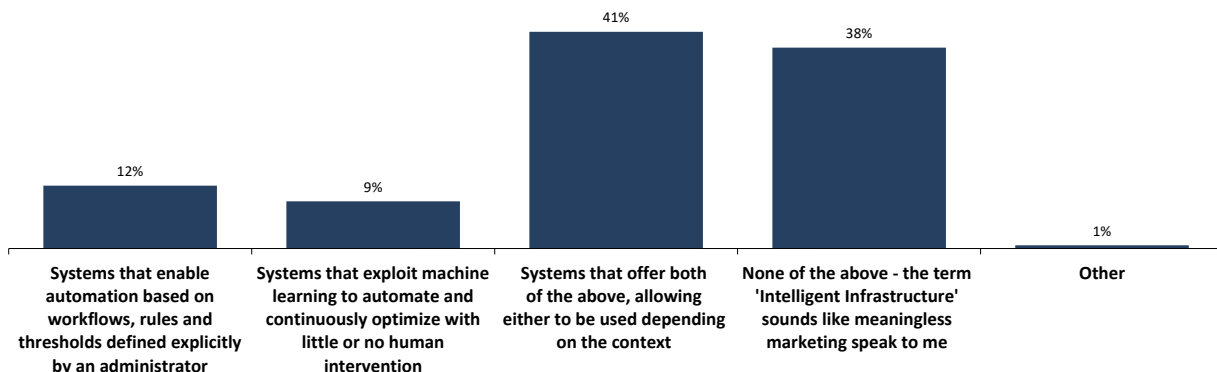

Figure 1

Clearly, some are looking for hands-off AI to take care of everything, while others just want AI to provide assistance, leaving the administrator in control. However, it is important to note the prevailing view is a blend of the two. This makes sense as it enables routine work to be handled by AI, while IT focuses on tasks where human experience and judgement remain important.

What the replies also show is that language can sometimes get in the way of useful ideas and developments being accepted by the IT pro community. For example, over a third of those in our study responded with a virtual rolling of the eyes when faced with the term 'Intelligent Infrastructure', which can easily come across as ambiguous marketing-speak.

Fortunately, as we moved on in the survey we addressed those perception and uncertainty issues by defining Intelligent Infrastructure more accurately. The definition given in the survey was as follows: "Systems that blend the admin-driven and ML-driven approaches to automation so you can choose the level of control you want/need in any given situation."

The good news is that nearly everyone felt comfortable continuing with the survey and answering subsequent questions on Intelligent Infrastructure based on this definition. We believe this indicates a general acceptance of the concept, at least in principle.

Could Intelligent Infrastructure help with storage?

Given that storage management is an area under particular pressure, do IT pros see potential for Intelligent Infrastructure here, and if so, how and where? The answer is that substantial numbers still require convincing, but for those who do see opportunity, it is a very broad one (Figure 2).

How much do you see Intelligent Infrastructure having a positive impact in the following areas?

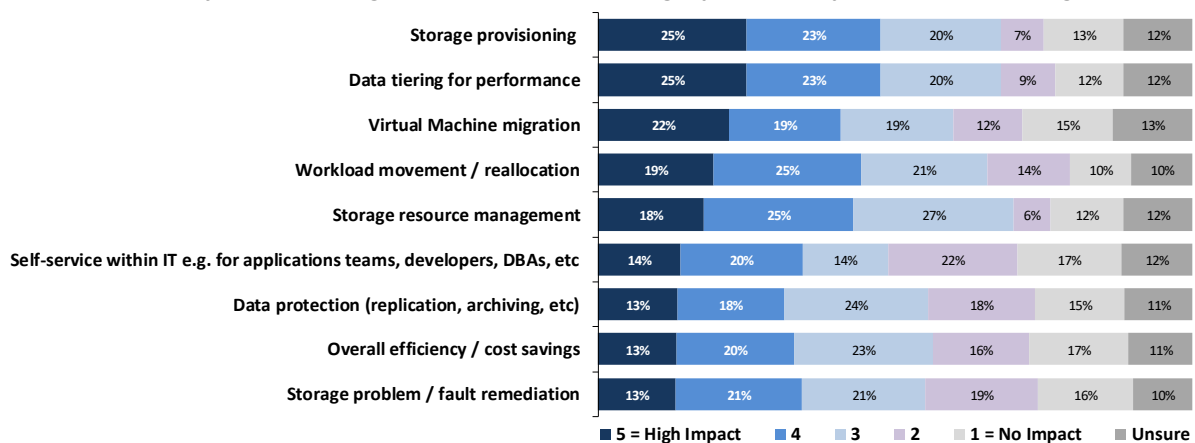| Area	5 = High Impact	4	3	2	1 = No Impact	Unsure
Storage provisioning	25%	23%	20%	7%	13%	12%
Data tiering for performance	25%	23%	20%	9%	12%	12%
Virtual Machine migration	22%	19%	19%	12%	15%	13%
Workload movement / reallocation	19%	25%	21%	14%	10%	10%
Storage resource management	18%	25%	27%	6%	12%	12%
Self-service within IT e.g. for applications teams, developers, DBAs, etc	14%	20%	14%	22%	17%	12%
Data protection (replication, archiving, etc)	13%	18%	24%	18%	15%	11%
Overall efficiency / cost savings	13%	20%	23%	16%	17%	11%
Storage problem / fault remediation	13%	21%	21%	19%	16%	10%

Figure 2

Key areas where Intelligent Storage Infrastructure has already established some mindshare are storage provisioning, data tiering and VM migration. This is not very surprising as these are functions where storage automation is already being deployed. Adding intelligent systems to manage them autonomously is therefore an obvious next step.

In all other areas questioned by the survey, the potential positive impact of using Intelligent Infrastructure is less widely recognized. But, just as important, a sizeable minority, hovering around the one in ten mark, say they are unsure about Intelligent Infrastructure having a positive impact in any area of storage management. Vendors and analysts and the media clearly have work to do to help separate hype from reality.

So where, if anywhere, is Intelligent Infrastructure already being deployed in storage environments?

Current usage of Intelligent Storage Infrastructure

As might be inferred from the results shown above, the use of Intelligent Infrastructure in storage is still at a very early stage, something confirmed in Figure 3. The use of AI and ML is still mostly confined to early adopters, even in relatively well-established areas of automation such as virtual machine (VM) migration, data tiering for performance, storage provisioning and data protection.

Are you already using Intelligent Infrastructure in any of the following areas?

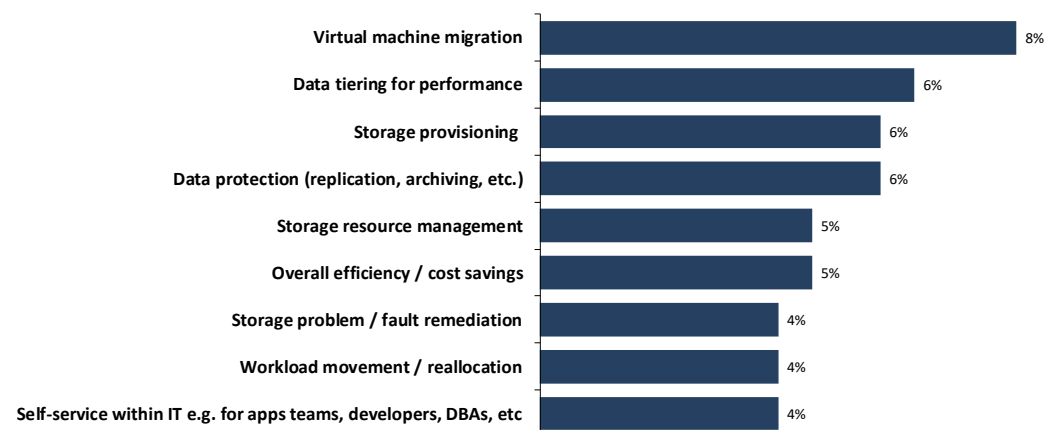| Area	Percentage
Virtual machine migration	8%
Data tiering for performance	6%
Storage provisioning	6%
Data protection (replication, archiving, etc.)	6%
Storage resource management	5%
Overall efficiency / cost savings	5%
Storage problem / fault remediation	4%
Workload movement / reallocation	4%
Self-service within IT e.g. for apps teams, developers, DBAs, etc	4%

Figure 3

Adoption is slightly lower when we look at bringing intelligent systems to bear on tasks such as more generic workload movement and storage fault remediation, even though these have long been on the 'if only it were possible' wish-lists of storage admins. Equally low is the use of intelligent systems to optimize costs or allow non-specialists to self-provision storage.

It seems evident that for the take up of Intelligent Storage Infrastructure to expand, confidence in its usage needs to grow dramatically, or the perceived potential of such systems will need to change markedly.

Having looked at Intelligent Storage Infrastructure, let us use this grounding to look more broadly at how survey respondents feel about the potential for AI and ML in the wider IT infrastructure.

Attitudes to AI and Intelligent Infrastructure

So what are the prevailing attitudes towards AI in terms of its role in Intelligent Infrastructure solutions in general? Figure 4 indicates that different IT job roles fall into three major groupings which we will term Optimists, Pragmatists and Pessimists. There are also considerable numbers of respondents who honestly admit they have no idea how they felt about AI in Infrastructure. Of course, optimists, pragmatists and pessimists can be found in every area of IT and business, but there are some distinct differences in the proportions of each group in the various job roles.

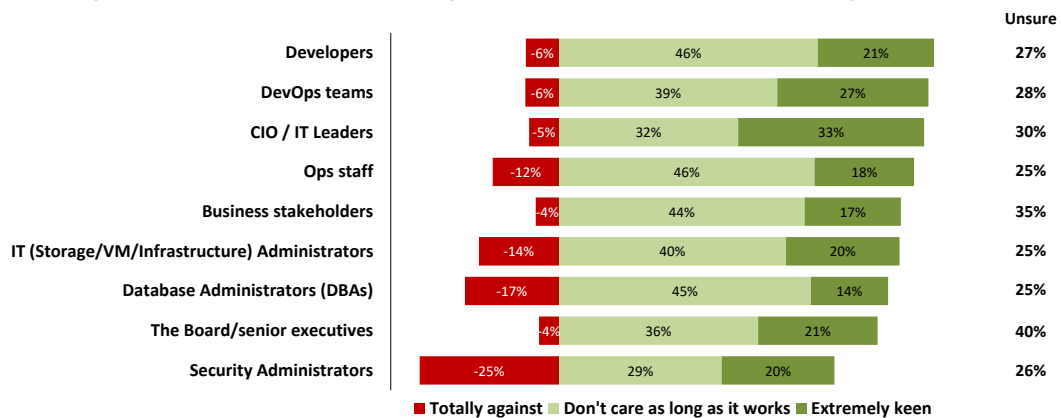**What is the general attitude of the following towards the AI elements of Intelligent Infrastructure?**

Job role	Totally against	Don't care as long as it works	Extremely keen	Unsure
Developers	-6%	46%	21%	27%
DevOps teams	-6%	39%	27%	28%
CIO / IT Leaders	-5%	32%	33%	30%
Ops staff	-12%	46%	18%	25%
Business stakeholders	-4%	44%	17%	35%
IT (Storage/VM/Infrastructure) Administrators	-14%	40%	20%	25%
Database Administrators (DBAs)	-17%	45%	14%	25%
The Board/senior executives	-4%	36%	21%	40%
Security Administrators	-25%	29%	20%	26%

■ Totally against   ■ Don't care as long as it works   ■ Extremely keen

Figure 4

For example, for every job role bar one, more than 50% of respondents described them as either extremely keen or "don't care as long as the Intelligent Infrastructure works", i.e. they are optimists or pragmatists. The one exception? Security administrators. This means that vendors supplying 'intelligent' solutions may well be pushing against an open door, but that pushing, most likely in the form of continued education, is definitely still required.

While the number of roles who are seen as totally against Intelligent Infrastructure is very low, it is clear that some administrators have yet to be convinced. In particular one in four security administrators are reported to be totally against using such intelligent software. This could well be because they need very strong evidence not only that such tools will work, but also that they will not expose the organization to risk.

But a major concern here for the suppliers of Intelligent Infrastructure solutions, especially storage vendors offering solutions where machine learning is employed to help optimize systems in line with pre-defined policies, is how to convince the remaining 25 to 40% of respondents who are unsure or who have no idea about such solutions.

How do vendors make these respondents care more? Is it simply inertia that needs to be overcome? After all the "If it ain't broke, don't fix it" approach of many people, not just IT

professionals, is very firmly embedded. But in this instance a lot more education on the viability of ML in Intelligent Storage may once again be needed from vendors, analysts and the media.

Could time savings allow more focus elsewhere?

Two big selling points for the use of ML to automate routine tasks are that such solutions can save significant amounts of time for IT staff, and reduce the potential for the kind of manual errors that can cause service interruptions or create security flaws. The survey asked respondents how they thought any time saved by using Intelligent Infrastructure might be exploited (Figure 5).

As you implement intelligent infrastructure, do you expect time savings, and if so, which areas are most likely to benefit from such time savings?

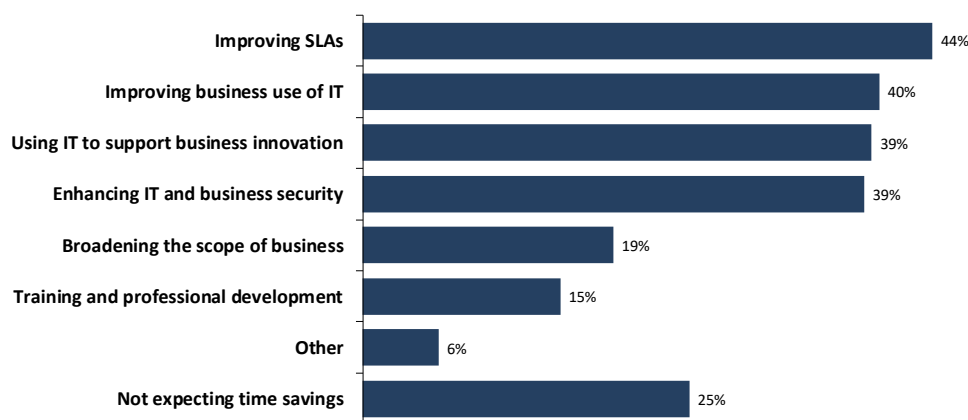|	
Improving SLAs	44%
Improving business use of IT	40%
Using IT to support business innovation	39%
Enhancing IT and business security	39%
Broadening the scope of business	19%
Training and professional development	15%
Other	6%
Not expecting time savings	25%

Figure 5

The top two expectations of how to make better use of time savings center on matters that have long been important in IT, namely improving IT service delivery and helping the business make more effective use of systems. Closely linked to this is the idea that any time saved could be spent supporting business innovation, something that becomes ever more important as digital transformation initiatives accelerate.

That makes it a little surprising to see even fewer respondents expect to use any time saved on working to broaden the scope of the business. This perhaps reflects the fact that IT's focus tends to be on improving the "here and now", and that it is rarely able to expend effort on looking at "blue sky" business opportunities, unless it is working very closely with business executives with the authority to shake things up.

It is interesting that significant numbers expect time savings to be used enhancing IT and business security. This is not so surprising, even given the skepticism of some security professionals seen in figure 4. These are matters that have come to dominate much C-level thinking, and with security skills in very short supply, further automation in this area clearly holds some attraction.

Lastly, we note that almost a quarter of survey respondents expect no time to be saved at all. It is again clear that many IT professionals continue to question the reality of Intelligent Infrastructure , and are uncertain that its capabilities are firmly established.

The potential value of Intelligent Infrastructure

How do our respondents see the use of Intelligent Infrastructure impacting IT and the broader business and, more importantly, is it expected to bring value? To understand this, we asked explicitly if such systems could help create significant business value, reduce IT costs significantly, stimulate incremental IT investment or provide no benefit at all to a range of different scenarios.

Organizational Value

We asked if Intelligent Infrastructure could enable faster response to requirements, improve support of applications or free IT to support business value creation (Figure 6a).

Does Intelligent Infrastructure bring benefit in any of the following?

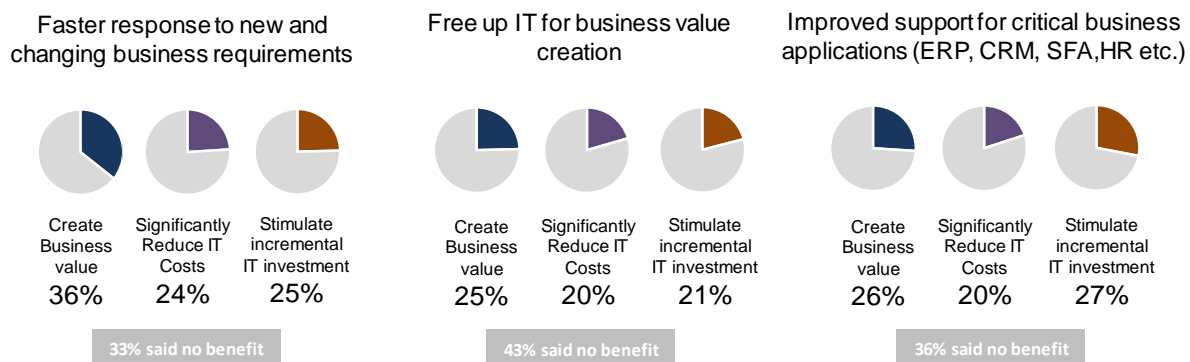| Faster response to new and changing business requirements			Free up IT for business value creation			Improved support for critical business applications (ERP, CRM, SFA,HR etc.)		
Create Business value	Significantly Reduce IT Costs	Stimulate incremental IT investment	Create Business value	Significantly Reduce IT Costs	Stimulate incremental IT investment	Create Business value	Significantly Reduce IT Costs	Stimulate incremental IT investment
36%	24%	25%	25%	20%	21%	26%	20%	27%
33% said no benefit			43% said no benefit			36% said no benefit		

Figure 6a

As we can see here, only a minority of those taking part think that Intelligent Infrastructure can improve support of the applications and services on which the organization relies. Slightly fewer believe that such systems will allow IT to spend more time on business value creation. Why is this so, given that these are often promoted as benefits that the use of AI and ML should bring?

The answer could lie in the fact that very few people have yet witnessed first-hand such systems in action in the enterprise. One consolation, at least to a degree, may be that the only area to attract over a third of positive responses was that Intelligent Infrastructure is expected to help IT respond quickly to rapidly changing environments, thereby enabling business value to be created.

But the most worrying aspect for advocates of Intelligent Infrastructure, and the vendors of such solutions in particular, is that in two of the three cases, the highest response was that such systems will deliver no benefit.

Optimization of IT resources and DevOps

A very similar state of affairs exists when looking at whether Intelligent Infrastructure will bring benefits to optimizing IT resources and DevOps (Figure 6b).

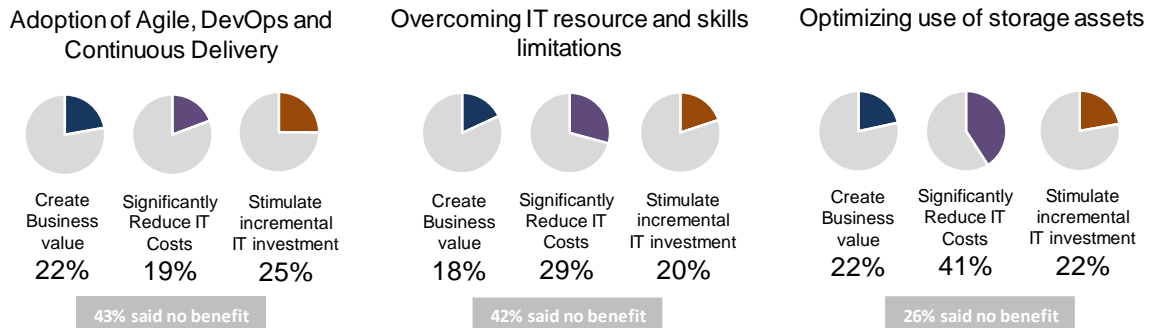### Does Intelligent Infrastructure bring benefit in any of the following?

Adoption of Agile, DevOps and Continuous Delivery	Overcoming IT resource and skills limitations	Optimizing use of storage assets

Create Business value	Significantly Reduce IT Costs	Stimulate incremental IT investment	Create Business value	Significantly Reduce IT Costs	Stimulate incremental IT investment	Create Business value	Significantly Reduce IT Costs	Stimulate incremental IT investment
22%	19%	25%	18%	29%	20%	22%	41%	22%

43% said no benefit   42% said no benefit   26% said no benefit

Figure 6b

This same reasoning may be at play with a lack of practical experience holding back the perception of potential benefits. A large minority of respondents think such systems could help reduce IT costs by optimizing storage assets and addressing skills. This may well be a result of the early work that has been embedded in systems to automate data placement to optimize resource usage.

Data / Information Access

When it comes to improving access to information and meeting the rapidly changing needs for real-time analytics, it is interesting to note that a third or more of respondents see Intelligent Infrastructure systems as helpful in the creation of business value (Figure 6c). This is very positive, and could reflect that some IT vendors have made efforts to position their solutions supporting these types of workloads.

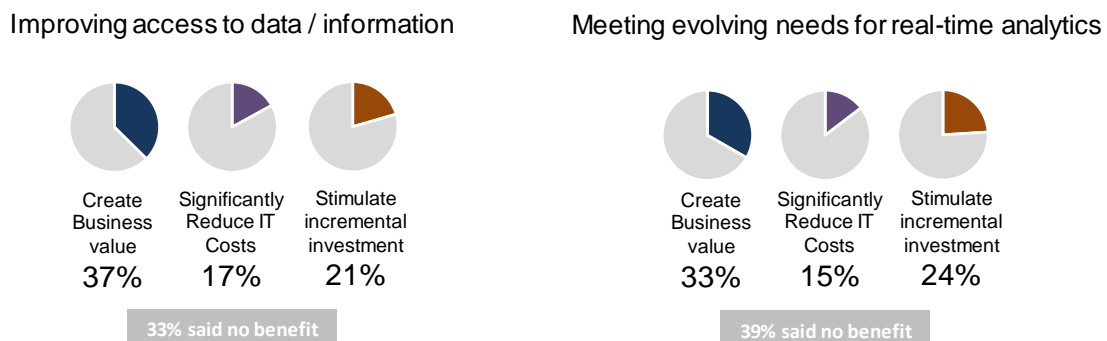## Does Intelligent Infrastructure bring benefit in any of the following?

Improving access to data / information	Meeting evolving needs for real-time analytics

Create Business value	Significantly Reduce IT Costs	Stimulate incremental investment	Create Business value	Significantly Reduce IT Costs	Stimulate incremental investment
37%	17%	21%	33%	15%	24%

33% said no benefit   39% said no benefit

Figure 6c

AIOps in general

So what do survey respondents think about Intelligent Infrastructure in and of itself, and is IT ready to adopt such systems as part of a general move to automate IT operations using AI and ML, often referred to as AIOps? This is perhaps the most distinct set of responses and, from the point of view of IT vendors offering such solutions, perhaps the most troubling (Figure 6d).

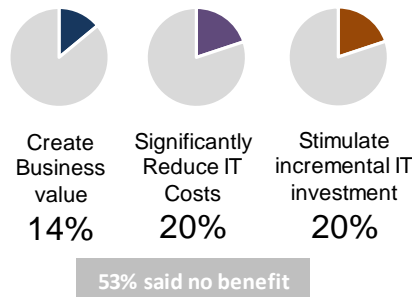## Does Intelligent Infrastructure bring benefit in…?

A general move to 'AIOps'

Create Business value	Significantly Reduce IT Costs	Stimulate incremental IT investment
14%	20%	20%

53% said no benefit

Figure 6d

As can be seen, there is little belief that a general move to AIOps via the use of Intelligent Infrastructure will deliver benefits, or even stimulate additional investment, on its own. This makes it very clear that any initiative to bring such systems into the business must not be based on a strategic initiative to make AIOps an integral part of IT service delivery. Instead, it can only be part of the enabling story behind a strong business case built around other, more measurable, business benefits.

But another reason people are not seeing benefits here could be because it is considered to be another one of those marketing terms - loaded with assumption, but at the same time essentially meaningless. This needs to change. For AIOps to become a reality, it needs to become something tangible, that Ops people can believe and get behind.

This should come as no surprise as IT professionals are, with very few exceptions, not known for blindly following the latest IT hype. Which leads us to ask, are there any other factors that might be inhibiting a more rapid adoption of Intelligent Infrastructure systems?

Intelligent Infrastructure inhibitors

So what factors are preventing Intelligent Infrastructure and AIOps from ramping up more quickly? For many respondents there are quite a few significant hurdles and issues to be worked around (Figure 7).

In your opinion, how much do the following inhibit the adoption of Intelligent Infrastructure?
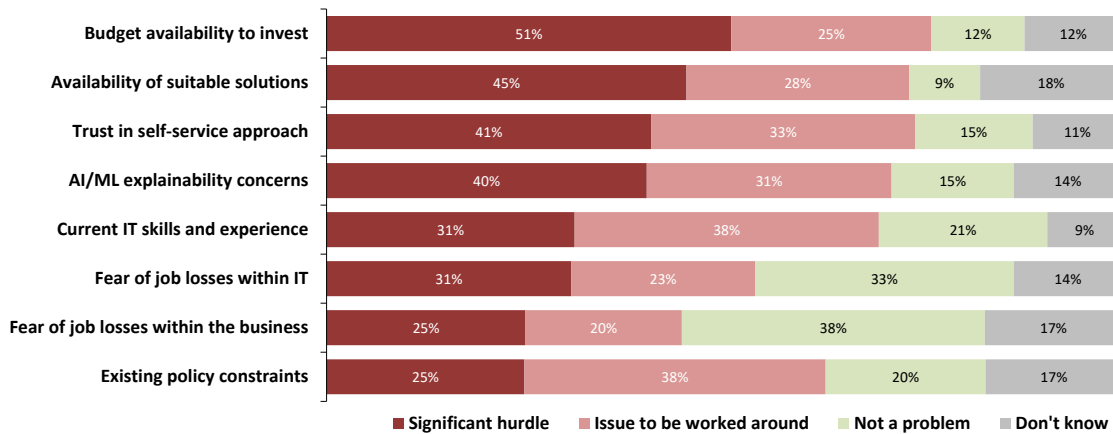
	Significant hurdle	Issue to be worked around	Not a problem	Don't know
Budget availability to invest	51%	25%	12%	12%
Availability of suitable solutions	45%	28%	9%	18%
Trust in self-service approach	41%	33%	15%	11%
AI/ML explainability concerns	40%	31%	15%	14%
Current IT skills and experience	31%	38%	21%	9%
Fear of job losses within IT	31%	23%	33%	14%
Fear of job losses within the business	25%	20%	38%	17%
Existing policy constraints	25%	38%	20%	17%

Figure 7

Budget

It is unlikely to surprise any reader that the top blocker is the age-old lack of investment budget. This is a challenge that IT, and almost every other area of business, has faced since computing solutions first had their own lines in enterprise account planning. For IT, this means that it will require considerable thought to make a business case for the use of Intelligent Infrastructure.

The next most frequently cited hurdle though is something that vendors must address to enable IT to accelerate the adoption of such systems. Almost three-quarters of respondents see notable problems in the availability – or rather, the lack of availability – of suitable solutions. This should be helped as new Intelligent solutions are now coming to market. In addition some of these have performance/capacity capabilities at similar price points to non-standard solutions.

Trust in AI

There is a major challenge for Intelligent Infrastructure in the fact that almost three-quarters of those surveyed report issues around their inability to explain just how AI/ML systems function. IT professionals need to be able to inform a user, an auditor or regulator how such systems operate and why they did what they did. The same applies to explaining to customers and shareholders why certain things happened. These challenges may also be congruent with the issues around existing policy constraints reported in the survey.

These are factors that the IT industry as a whole, including vendors, analysts and press, must address. Being able to easily explain complex mathematics is a challenge that civilization has not yet grappled with effectively. But until it is faced, take up will probably be inhibited.

People, skills, fear and policy

The final set of inhibitors all have people at their core. As in any new area, the perception that inadequate skills and experience could hold things back is nothing new, and neither is the fear of job losses. Both are significant hurdles that vendors need to address.

It is important too to be reminded that such fears are a fact of life within the IT professional community and in the broader business as a whole. It is therefore essential for vendors to stress the opportunities that can flow from the adoption of Intelligent Infrastructure , in terms of allowing IT to focus more on improving the business and supporting new initiatives, rather than just looking at automation in isolation.

In summary

There is little doubt that the use of AI and what we have described here as Intelligent Infrastructure will expand, both in storage and the wider area of IT systems. The questions are, when will IT professionals be confident that it can be trusted, and when will IT vendors get mature solutions broadly into the markets?

The results of the survey confirm that we are very early in the lifecycle of intelligent systems, but even so, the maturity of solutions is accelerating. What's needed next will be clearer, fuller, and of course more trustworthy, explanations of how such systems can be used and the benefits they could bring. It is clear the results show that there are knowledge gaps, partly due to the fact that some vendor hype can make it difficult to discern which products can actually deliver benefits now.

The good news is that given the number of optimists and pragmatists the survey shows exist, it is very probable that when these conditions are met there will be considerable pent-up demand for such systems. While automation today can be "bolted" onto almost any IT solution, the real value of Intelligent systems comes with the use of feedback from real-time analytics to make granular, near real-time actions executed by the infrastructure itself.

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