HP Virtualization Study

Research Summary

August 2008

Research Objectives

The research:

- Compared **perceptions** of how and why virtualization would benefit them
- Clarified how respondents **develop and implement plans** for virtualization (i.e. when, how and to what degree they intend to implement)
- Determined the **key decision drivers** in selecting vendors to facilitate virtualization
- Identified perceived **business benefits and challenges** as they relate to virtualization
- Expanded understanding of how respondents anticipate virtualization **impacting their technology infrastructure and business processes**

Methodology

Hewlett-Packard (HP) commissioned Penn, Schoen & Berland (PSB) to conduct 150 in-depth interviews internationally, with 150 technology respondents: CIOs, Presidents of IT (and related job titles), and other senior level Technology Decision Makers. Approximately 75% of the respondents were from Enterprise level companies and 25% were from Midsize companies. Regions included: North America (United States and Canada), Western Europe (UK, France, Germany), Eastern Europe (Russia, Czech Republic), Asia-Pacific (India, China, Japan, Australia), and Latin America (Brazil, Mexico).

Respondents included Implementers who have or are planning to implement virtualization, Failed Implementers who tried virtualization but felt it was unsuccessful, and Non Implementers who do not intend to implement virtualization.

n-size	All	North America	Western Europe	Eastern Europe	Asia Pacific	Latin America
CIO/TDM	150	50	40	10	40	10

n-size	All	North America	Western Europe	Eastern Europe	Asia Pacific	Latin America
Implementers	129	46	37	7	33	6
Failed Implementers	2	1	0	1	0	0
Non Implementers	19	3	3	2	7	4

* Due to the small n-size, these numbers should be used for directional purposes only
All numbers shown in this deck represent percentages unless otherwise noted
Columns that do not add up to 100 may be due to removal of don't know responses or inclusion of multiple responses

Summary of Interview Results

While most senior Technology Decision Makers (TDMs) see how virtualization delivers on individual business outcomes such as cutting costs and increasing efficiency, far fewer recognize its true potential as a competitive weapon. The majority of respondents do not seem to associate implementing a more efficient, cost effective infrastructure that is designed to adapt to changing business needs with stronger overall business performance.

Half of TDMs interviewed say virtualization is simply a technology that allows the Technology Department to deliver services already being delivered in a more effective way. Many of these individuals specified that the anticipated benefits from virtualization such as managing costs, more effectively using technology resources, and making technology management easier were, in the words of one respondent, *"all about IT, not business."*

Only 1/3 of the senior TDMs interviewed identify virtualization as a business tool. These individuals recognize virtualization's potential to help maintain business continuity and allow the Technology Department to adapt to the company's growing and changing technology needs while reducing overhead. As one respondent from China put it, *"Having invested in virtualization now, we need not add further hardware for a period of time in the future, and we can adapt to the changes in business and its demand."*

The majority of respondents say the primary business technology priorities their CEOs have tasked them with revolve around lowering costs, improving performance, maintaining stability and ensuring security. Almost two-thirds (64%) feel that the shared services model of virtualization is well aligned with their company's technology vision. Some specify that it would allow them to improve the way they do business by reducing costs and increasing flexibility in how resources are allocated to meet business demands. **However, 55% say culture change around management or line of business buy-in and an increased investment in technology staff training is needed for virtualization to be a success.**

Despite these cultural challenges, 60% are in the process of implementing virtualization while another 26% have already successfully implemented. Reducing cost and improving performance are the overall motivators in the decision to adopt a virtual environment. The key decision drivers for 50% of Implementers were cost related (e.g. lowest total cost of ownership, reduced operational costs, cost savings). Non Implementers see both cost and a variety of performance related attributes (e.g. increased business agility, business continuity, and increased productivity) as equally compelling.

Six in ten Implementers are "Very confident" that their current virtualization strategy will deliver key business outcomes most associated with virtualization. **The two business outcomes senior Technology Decision Makers most associate with virtualization are reduced costs (80%) and increased efficiency (70%).** As one French respondent pointed out, *"Server consolidation*

by means of virtualization provides an excellent solution as it is easy to administer and generates lower IT operating costs. At the same time, your IT systems are better used and provide high availability."

However, senior TDMs indicate that while virtualization delivers a wide range of financial and operational benefits those benefits are often linked to the Technology Department's performance within the company rather than company-wide business results. **Respondents were least likely to associate virtualization with accelerated growth (37%) and competitive advantage (35%).** One respondent in the UK clarified these feelings saying, *"[V]irtualization is just a technology and not a tool, so it underpins other strategies in the firm rather than changing the effectiveness of the organization."*

The biggest barriers or inhibitors to virtualization are upfront costs, staff training/experience, infrastructure planning and gaining approval from corporate management. **For Implementers "staff training/experience" tops the list of inhibitors,** though it is not seen as an insurmountable challenge, but rather a concern to be addressed as part of the virtualization process. **Non Implementers and Failed Implementers consider "upfront costs" the biggest barrier.** When coupled with the additional barriers of staff training, infrastructure planning and management buy-in, virtualization may present more of a challenge then some TDMs are willing to undertake.

Among those who have implemented 89% anticipate having at least one-fourth of their environment virtualized by 2010. Many anticipate that eventually more than three-fourths of their environment will be virtualized. **The majority of Implementers indicate that they are "very confident" that they can manage across the physical and virtual environments, citing hiring, training, or bringing in contract staff who understand the technology as well as careful planning as supporting evidence.** Implementers say, 46% of the time, that they expect to see a return on their investment in the form of cost savings or improved ability for the Technology Department to meet their goals within a year, while an additional 33% expect to see it within two years.

Detailed Findings

Virtualization: Tool or Technology?

Approximately 50% of senior Technology Decision Makers say they view virtualization as simply a technology that allows the Technology Department to deliver services already being delivered in a more effective way. Many of these individuals specified that the anticipated benefits from virtualization such as managing costs, more effectively using technology resources, and making technology management easier were *"all about IT, not business."*

1/3 of the respondents recognize that virtualization is a business tool. This view is closely linked to virtualization's potential to help maintain business continuity and allow the

Technology Department to adapt to the company's growing and changing technology needs while reducing overhead.

The remaining 10% of senior TDMs see virtualization as both a technology and a business tool. Many qualified this saying that during the early stages of implementation it is a simply a technology that supports core Technology Department competencies such as servers and data centers but as more line of business and customer facing areas are virtualized it becomes a tool that impacts the business as a whole.

For your business, is virtualization a business tool or is it simply a technology?

Technology

- *"A technology because we are serving the business now through largely non-virtualized technology. If you look at virtualization as giving the potential for dramatic cost reductions then it's a business tool, but we're not cost driven." – TDM, UK*
- *"Technology that helps us save costs and optimally utilize resources." – TDM, DE*
- *"Virtualization is technology from which anyone in the company who uses a computer can benefit. The aim is to reduce IT costs and improve efficiency, utilization and flexibility of the existing computer hardware." – TDM, FR*
- *"Technology. What comes into my thoughts first is the running of the most important servers, which would be the biggest impact. Virtualization ensures smoother running of the system so it lowers the risk of failures and problems." – CIO, CZ*
- *"We only take virtualization as a technology. This is the current situation in our organization. We utilize this technology to integrate IT resources, make our management more convenient. However, it is all about IT, not business." – TDM, CN*
- *"It is simply a technology. Virtualization is not to be used as a tool, but as a means to make best use of limited resources. It is a way to reduce cost. It is not going to replace such current practices as sales. Its aim is to bring efficiency to business by this technology..." – CIO, JP*
- *"Technology. [W]e will have the information when it's happening in real time." – CIO, MX*

Business Tool

- *"Business tool, because it will support business continuity in particular. It allows us to recover series on remote sites without a huge investment so we are protecting the business and protecting the tools of the business by using virtualization technologies to deliver that guaranteed continuity." – TDM, UK*
- *"It is a business tool. It allows us to make savings on the hardware and increase its reliability. In our case virtualization has affected network services, which has made them more effective. We have specific projects to do it. For example to transfer part of business applications into virtual servers which allows us to increase the accessibility of the service, reliability and reduce hardware overhead." – TDM, RU*
- *"A business tool. As the business develops more operation platforms and servers are needed. Having invested in virtualization now, we need not add further hardware for a period of time in the future, and we can adapt to the changes in business and its demand." – TDM, CN*

Both a Business Tool and Technology

- *"I would say right now it's simply a technology but we see it moving towards a business tool. Today we're virtualizing the back office -- the server and the data center but probably by this time next year we'll be moving towards the desktop." – CIO, US*
- *"[A]s we move forward it will be both. It's mostly in our IT department's ability to provide products and services to our customers. It improves the way IT does business internally and how we provide*

support for our customers. However, virtualization will never change the way we do business as a company, only how we provide services from a technology standpoint." – CIO, US

- *"We think it is both, because it is fascinating technology that is going to help drive down costs. It is a business tool, because it is going to enhance availability and reliability of the information I have." – CIO, US*
- *"At the beginning it is a technology, but further down the line it will become a business tool. It will affect all aspects of business from economical figures to technological processes. Any automation of the process benefits the business. It will increase data search operatives, make it easier, quicker. Also, the economic aspect such as cost or price decrease." – CIO, Russia*
- *"It's both. We're using virtualization techniques to provide solutions in disaster recovery areas. We're also using virtualization to provide speed of service and increased implementation speed and ease of implementation, so in that sense it has an impact on the business as well as just the technology." – CIO, AU*
- *"Actually it's the combination of both. I would say ultimately what business demands from IT. First thing is agility, second thing is availability from the business perspective…" – CIO, India*

Virtualization and Business Issues

CIOs and other senior level TDMs say the top business technology priorities that they have been tasked with by their CEOs include lowering costs, ensuring technology system security, improving performance, and maintaining stability/reliability. Roughly 7% of respondents indicated that virtualization was among the explicit priorities they have been tasked with.

What are your top three priorities for business technology at your company that your CEO has tasked you with?

Lowering Costs

- *"Saving money is the number one task, so reduction of expenses. That falls in line with doing more with less." – CIO, US*
- *"[T]he CFO or CEO don't view it in those terms -- they simply say they want to save money on the infrastructure, so the top priority for them is to save money and reduce our infrastructure footprint, which from my view is translated into virtualization…" – CIO, US*
- *"Cost reduction; expand the infrastructure, security in the IT environment." – TDM, DE*
- *"Cost, quality & profitability." – CIO, India*

Ensuring Security

- *"The first and most important task is to secure and oversee the flow of information technologies in the company…" – CIO, CZ*
- *"The 1st important task is to guarantee the security of the system…." – TDM, CN*
- *"Security of the information, availability of the environment, confidence of the data." – TDM, BR*

Improving Performance

- *"Delivery of products and services that support our clients' or customers' needs. An efficient use of information technology and finally, I would say leading edge thinking on how to serve internal customers, as well as external." – CIO, US*
- *"Increase performance, reduce operating costs, and optimize security (against outage)." – TDM, FR*
- *"Processes efficiency, knock out jobs faster, and accessible information." – CIO, MX*

Maintaining Stability/Reliability

- *"The main task is to make sure that the company's infrastructure is working properly, including telecommunications, local and network service connections, and basic software." – TDM, RUS*
- *"Stability is the main point we are keen to provide to our company. When our system is down, we will be in big trouble as we are dealing with finance." – CIO, JP*
- *"The reliability of it, access at all times because we run a lot remote places all over the state…" – CIO, AU*

Virtualization

- *"We are working on a virtualization strategy. We're also working on a mobilization empowerment strategy. There's really not a third initiative. I guess you could say business continuity but that's sort of the same strategy as number one." – CIO, US*
- *"Virtualization and any other power related topics so anything that can save power which is the first priority…" – TDM, US*

On a scale of 1-5 where one means "Aligns completely" and 5 means "Does not align at all" how well does a shared services model such as virtualization align with your organization's business technology vision?	All
1 – Aligns completely	28
2	36
3	22
4	10
5 – Does not align at all	3
Don't Know	1

Almost two thirds (64%) of senior TDMs say that the shared services model of virtualization is aligned with their organizations' business technology vision. Some respondents indicated virtualization can improve the way they do business by reducing costs and increasing flexibility in how resources are allocated to meet business demands. In keeping with perceptions of virtualization as a technology rather than a business tool, a few respondents indicated that virtualization is simply a way for the Technology Department to optimize existing resources to meet business needs and would have no direct impact on the business.

How would virtualization improve the way you do business?

Reduce Costs

- *"Drive down cost and it is all about money. There is a lot that goes into that. You reuse stuff, you don't over buy things, but the bottom line is that it drives down cost." – CIO, US*
- *"It's reducing cost, standardizing the way we can do things, providing support opportunities both locally and remotely so we can keep the business going, deliver services to end users remotely." – CIO, UK*
- *"First, it saves resources. Second, it improves efficiency of hardware, therefore reducing our investment on hardware." – CIO, CN*

Increase Flexibility

- *"It makes it easier to dynamically allocate resources in the event of failure." – CIO, US*
- *"It improves us by allowing us to rapidly respond to any changes in demand. So if something happens where you need to very quickly get something up and going, we can…" – CIO, AU*

No Change

- *"[I]t may not have any direct impact. It will be more from the availability perspective and if business demands the optimum utilization of the resources that's what IT will provide but then if you talk about the direct impact on business I don't see any." – CIO, IN*

Virtualization Definition

For the remainder of the conversation we will be focusing on a specific model for business technology operations called virtualization. Virtualization is the pooling and sharing of business technology resources, including servers, storage and networking. Through virtualization resources can be allocated dynamically across your organizations applications and processes transforming your business technology environment into a flexible, adaptive infrastructure that allows business technology to quickly adapt to the changing demands of your business.

Thinking about the definition you just heard, is business culture change required in your organization for virtualization to be successful?	All
Yes	55
No	45

Senior TDMs are relatively split when discussing whether culture change is required for successful virtualization. Among the 55% who say change is required, the most common concern is overcoming management and line of business preconceptions about technology and encouraging them to think about technology in a new way. Respondents also state that internally the Technology Department will need to invest in staff training so employees can increase their skill sets to work with the new technology. Also mentioned were adoption of new business models focused on shared services with centralized management and decision making and the need to initiate major changes in how infrastructure is designed.

What change is required?

Management and LOB rethinking technology

- *"The change is that technology is no longer simply a box approach. The management and the other business leaders here have to realize that it is a complex integrated system, not simply just a platform." – CIO, US*
- *"The biggest change would be a perception issue from senior management. That might be the biggest one. Once that's overcome, the rest, you know, the technology portion of it is very simple." – TDM, US*
- *"[I]f you are able to hit the right people at the right time, virtualization technology will surely be adopted in every organization… It's more about desensitizing the people. Once people understand that these are long term benefits they will automatically adopt it…" – CIO, IN*
- *"After all, the virtualization is a relatively new technology. The IT professionals understand it, but there is resistance from the business staff. Many of them are doubtful about this technology. Therefore some long term adjustment may be needed before business staff gets used to this relatively new technology." – TDM, CN*

- *"Culture changing/users have to trust what they are using to know and adopt everything that virtualization gives." – TDM, BR*

Technology Department Staff Training and Investment

- *"[I]n my opinion we have to develop the skills and knowledge of our designers and engineers who are not very proficient with the IT programs. To make their work more effective we need to invest in their training." – TDM, RU*
- *"It is not necessary for our company as a whole, yet as far as IT department is concerned it is in need of change. They need to improve their skills to handle new technology, and they would need to receive training from outside of company, such as ones provided by vendors." – CIO, JP*
- *"You need the training of your techs, your staff and your hardware. You need people to learn your hardware, your software and your product all together. Other training is required." – CIO, AU*
- *"That we are more conscious of what it is, that it is not only seen as equipment or machines, that importance would be given to the information that it contains." – CIO, MX*

Adoption of a Centralized Approach/Shared Model

- *"At the moment each unit is autonomous and it would need a centralized strategy. At the moment each company within our group works as an independent. For it to work across the whole group it would require something centrally to be decided and managed that would take away the philosophy to work independently, so that would be a change away from how we currently work." – TDM, UK*
- *"If our business culture is more flexible, we can use more virtualization to other areas of IT." – CIO, JP*

Adapting the Infrastructure

- *"Readiness to convert from physical to virtual server." – TDM, DE*
- *"A change in the server structure in the individual departments and in the server landscape." – TDM, FR*

Implementing Virtualization

Which of the following statements most closely aligns with your company's approach to virtualization?	All
Our company has successfully implemented virtualization and is using a shared services model for some or all of our business technology	26
Our company is currently implementing virtualization and plans to use a shared services model for some or all of our business technology	35
Our company is planning to implement virtualization within our business technology infrastructure within the next 18 months	25
Our company experimented with virtualization but felt the challenges outweighed the benefits and have chosen not to continue with that model for business technology	1
Our company considered virtualization but decided not to take that approach to business technology at this time	7
Our company has not considered virtualization since it is not a good fit for our business model	5
I am not aware of or familiar with any discussions of virtualization as a potential model for business technology within my company	1

Almost all of the senior TDMs interviewed are adopting a virtualized environment at their companies. 60% are in the process of implementing and another 26% say they have already successfully implemented virtualization.

What [was/would be] the MOST influential key decision driver in your organization's decision to initiate virtualization?	Imp. n=129	Failed n=2	Non n=19
Reduced operational costs	25	0	5
Lowest total cost of ownership	20	0	5
Cost Savings/Costs (unspecific to TCO or operational costs)	5	0	5
Increasing business agility	4	0	5
Consolidation/Centralizing back office infrastructure/Common databases	4	0	0
Flexibility	4	0	0
Reduced space requirements	3	50	0
Improving the quality of business technology delivery	2	50	5
Sustainability i.e. Green business technology	2	0	0
Scalability	2	0	0
Disaster Recovery	2	0	0
Ease of installation/deployment	2	0	0
Reliability	1	0	0
Business continuity	1	0	5
Reduced power consumption	1	0	0
Business technology as a competitive advantage	1	0	0
Existing trusted virtualization technology and providers	1	0	5
Increased availability	0	0	0
Increased productivity	0	0	5
Other	21	0	47

Reducing cost and improving performance are the overall motivations in the decision to adopt a virtual environment. Implementers list reducing costs in some way 50% of the time as their key decision driver. Non Implementers see both cost and a variety of performance related attributes (e.g. "increased business agility", "business continuity", and "increased productivity") as equally compelling while the few Failed Implementers were focused on "improving the quality of business technology delivery" and "reduced space requirements."

Respondents see a wide variety of potential applications for virtualization in their business environments. Virtualization of servers was by far the most common, though respondents also mentioned desktops, web services and applications frequently. Also receiving specific mentions were: file and print, transactional applications, e-mail, databases, testing and development, disaster recovery, ERP and CRM, and in Germany VMM (Virtual Machine Monitors).

What applications for virtualization do you see within your business?

Servers

- *"[S]erver consolidation is the top priority with regards to virtualization at the moment. We're not talking about application virtualization at the moment. We do have certain internal applications that*

are server based that are sometimes busy and sometimes not able to utilize virtualization. We have a document management system that could use virtualization." – TDM, UK

- *"We've got almost 70 physical servers, some of them are shared and some are single purpose. Those are getting consolidated down into 7 physical boxes over three sites. We have three main sites on the network and a fiber ring that connects us, so if one goes down the other two will pick up the slack and the user will never really know that they're out. We're doing that on the storage side as well. All the application servers, web servers, email services will remain their own box, storage will be virtual with two sites acting as one SAN units. It's everything. The only things that are going to remain physical boxes are the SQL servers, the Exchange boxes and there are other filtering appliances that will remain their own box. Everything else will be in a virtual environment." – CIO, US*
- *"Virtualization of servers. We have not reached the stage of virtualizing the application. Our current priority is to reduce the number of physical servers. It must lead to cost reduction…For us; infrastructure virtualization is the top priority, rather than strategic virtualization. Another reason is that our company mainly does mainframes and not open systems." – CIO, JP*

Desktops

- *"[W]e have also started to do virtual desktops so we are no longer using PCs. We are using virtual devices on the desktop that gives me greater control and lowers my cost of ownership." – CIO, US*
- *"Take off machines and include terminals to generate a virtual desk , to do it on a daily basis to avoid wasting time when reformatting equipment due to viruses or because the user has moved it, I am viewing this for the future, implementing it through Citrix." – CIO, MX*

Web Services

- *"[F]or the moment we are using it for web services, we are using it for internal applications, not many in the case of customer applications because on many occasions it's driven by the customer. It's not that the technology prevents it but as I said few of the development environments would be a replica of what our customers' environment is, so we are not allowed to play around largely with that…" – CIO, IN*

Applications

- *"All kinds of applications we can do in Virtualization. PRP, ERM PEM, Document amendment system. All can be put in Virtualization…" – TDM, IN*

File & Print

- *"Primarily internal applications, file and print would be the focus, but not so much on customer facing." – CIO, US*
- *"Internal applications, you know, then file & print mainly..." – TDM, IN*

Transactional

- *"It is mainly going to be the transactional application side of things." – TDM, UK*

Email

- *"[I]nternal portals such as internal MSN and mail systems are virtualized." – CIO, CN*

Databases

- *"Virtualization related to databases in our company. When we have to process a huge amount of data, I expect to improve searching speed or data capacity efficiency applying virtualization to them." – CIO, JP*

Testing & Development

- *"We're using it in development and test environments and we expect it to filter through into production environments." – TDM, UK*

Disaster Recovery

- *"I'm looking into it for the use of disaster recovery and to virtualize machines in a disaster mode. That's really my big push for it. The other situation would be if I used it for a virtual desktop environment… You're not sending out PCs, you're just giving them a desktop from a server farm in a datacenter. You're decreasing your chances for failure in the field because the devices don't have any moving parts." – TDM, US*

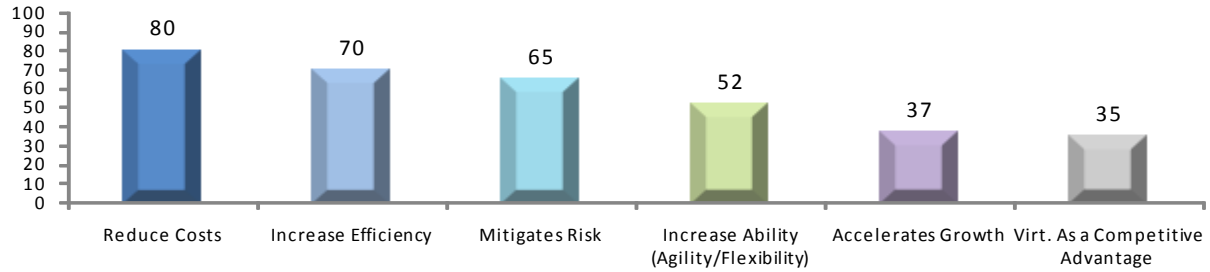
ERP/CRM

- *"[T]hen on other business applications, document management in terms of EDRM, there is a huge virtualization opportunity there and also virtualization of the ERP." – CIO, UK*

VMM (Specific)

- *"Virtualization on an operating system level and by means of Virtual Machine Monitors (VMM)." – TDM, DE*

Key Business Outcomes of Virtualization



The two business outcomes senior TDMs most associate with virtualization are reduced costs (80%) and increased efficiency (70%). Respondents cite the smaller upfront investment in servers and lower operational costs in terms of space and energy as key benefits of virtualization. Ease of use coupled with improved performance, lower staffing requirements, and more efficient "green" power credentials contribute to their perceptions of increased efficiency.

Senior TDMs are least likely to associate virtualization with accelerated growth (37%) and competitive advantage (35%). Respondents typically indicate that while virtualization delivers a wide range of financial and operational benefits those benefits are linked to the Technology Department's performance within the company rather than company-wide business results. While virtualization can aid LOB through quicker performance and increased efficiency, most respondents put accelerating growth solely on the shoulders of LOB and not an outcome of virtualization. Similarly, respondents see virtualization as beneficial, but make a clear distinction that it is not a competitive advantage.

TOP 2 Virtualization Outcomes

Reduce Costs

What about this makes it a business outcome of virtualization?

Investment – Less Servers Needed/Space Consolidation

- *"I'm buying bigger servers but I'm buying less. We're shooting of a minimum of 4 to 1 so when I buy a virtual server I'm going to replace 4 physical servers." – CIO, US*
- *"You do not have as much hardware so there is a reduction in cost and you don't have to have your hardware over spec to be able to take the peaks when it can cross over the platforms and can drag resources when it needs it." – TDM, UK*
- *"Server consolidation by means of virtualization provides an excellent solution as it is easy to administer and generates lower IT operating costs. At the same time, your IT systems are better used and provide high availability." – CIO, FR*
- *"Well I do not have to buy any more servers, only update them, and our administration is easier." – CIO, CZ*
- *"After the virtualization, the number of servers did not need to be expanded so much; then it helped in cost reduction." – CIO, JP*
- *"It decreases the physical space and optimizes the use of our employees." – TDM, BR*
- *"[W]e have always had growth problems with the equipment on site and the ideal for me is to reduce the amount of hardware and therefore not to build another site for the equipment." – TDM, MX*

Savings – Lower Operational Costs

- *"By lowering our costs, it becomes one of those things that is easier to sell. Obviously, in the economy today, the cost is a very key part of things. To justify something financially, if you eliminate some of your costs and reduce your ROI, it is easier to sell. So lowering costs is key." – TDM, US*
- *"Lower electricity costs, lower maintenance costs, lower services, lower hardware costs = cost reduction." – TDM, DE*
- *"Virtualization is cost-saving. Although it is costly in the beginning stages, the maintenance cost will be lower after utilization. Our maintenance cost is higher than IT staff's labor costs. When virtualized, our maintenance cost could be lower, and total cost could be lower." – TDM, CN*
- *"We have discussed it so many times using of space, power which see actually ultimately what is the profit for an organization. My total revenues - my expenditure. If I look at power that's my expenditure if I am reducing that, my profit will be going higher. So yes it is a business outcome…" – CIO, IN*

Increase Efficiency

What about this makes it a business outcome of virtualization?

Quicker Performance/Ease of Use

- *"Once again, it's the ease in which you can bring up the new application server." – CIO, US*
- *"The quickness of being able to implement a server and application based on what the business need at the time is could be a benefit." – CIO, US*
- *"Quicker, not dependent on hardware requirements." – TDM, DE*
- *"Greater performance - higher data throughput - faster connectivity." – CIO, FR*
- *"In order to give answers more quickly - give answers to our suppliers in any case." – TDM, BR*
- *"We can control quickly the variables to have information when needed, we can be checking at any short-term, at the start of the shift, at the beginning of the day, to know what action to take at time being and start correcting it." – CIO, MX*

Less Staffing Needed

- *"Efficiency as a result of cost and it's a result of staffing…" – CIO, US*
- *"Clearly we are seeing efficiencies for the IT staff using this. We get a lot more done with less people and our end user environment; we believe people are being able to work more productively." – CIO, US*
- *"It goes back to the downtime thing. It increases my efficiency because I don't have to have so many people maintaining systems because they're not distributed servers and in the instance of disaster or failure I can get the systems up and running again in a more efficient manner than before." – TDM, UK*

Green Benefits

- *"Power- the green credentials around virtualization are already out there and quite powerful. By virtue of the fact that you can optimize your platform and utilize more of it, there is efficiency there, and cost of course is an efficiency in itself." – CIO, UK*

BOTTOM 2 Virtualization Outcomes

Accelerates growth

Why don't you see this as a business outcome of virtualization?

Not a Contributing Factor to Growth

- *"From our focus it's primarily infrastructure oriented and non-business related in terms of our growth model. We're a financial institution so virtualization wouldn't enable us to go out and attract more business at this point." – CIO, US*
- *"The tools make it easier to do things to make us grow but if we can't make a business grow with a normal server we can't make it grow with a virtualized server. It might make life easier but it's not a direct contributor to our growth." – TDM, US*
- *"Virtualization doesn't really impact that area. Other things drive that and virtualization is just a technology and not a tool, so it underpins other strategies in the firm rather than changing the effectiveness of the organization." – TDM, UK*
- *"Because virtualization is driven by IT initiatives and by IT imperatives. Only in a minor way is it driven by business need." – TDM, UK*
- *"The company probably benefits from virtualization in this way but I don't know how significantly." – CIO, CZ*
- *"Business growth is the responsibility of the business departments. Virtualization is not related to business." – CIO, CN*
- *"This part is not very crucial element for growth in our business model. The virtualization itself does not lead to our business growth, but the virtualization will be a factor to accelerate our differentiation from competitors due to virtualization." – CIO, JP*
- *"Because we don't see it accelerating growth except in number of servers. I'm talking about business growth." – CIO, AU*
- *"Our business depends very little on the virtualization to grow up. The factors that lead to growth do not deal with this topic." – TDM, BR*

Virtualization as a competitive advantage

Why don't you see this as a business outcome of virtualization?

Not Seen as a Competitive Advantage

- *"It is not very much, because other than just saving money I don't see a competitive advantage to, because the end user and the end result are not going to change. It is just going to make it easier and cheaper for IT, but I am not sure it would give us much of an advantage…" – TDM, US*

- *"I don't think virtualization plays into that competitive part. I can do the same thing in a physical environment versus a virtual environment. I think the virtual environment plays more to the other aspects than the competitive standpoint." – TDM, US*
- *"I don't think it is a business outcome. It doesn't give us a competitive advantage. We are treating it more like a commodity in the current market. It is a tool we use to help improve services, but that doesn't allow us any advantages over competitors." – TDM, UK*
- *"Virtualization only solves the IT aspects of our problems, but it does not solve our business problems." – CIO, CN*
- *"The way it works isn't really a high priority it is the services provided which would give us the advantages. So how we provide those services is of lower priority as to actually providing the services." – TDM, AU*
- *"No, competitive advantages should be in our product & services not in IT because the major shell comes from our products and services." – CIO, IN*

In addition to the list provided, other business benefits of virtualization senior Technology Decision Makers felt were worth noting are being green, business continuity, improved manageability, and demonstrating industry leadership through possession of advanced technology.

Are there any other key business benefits you anticipate receiving from virtualization that were not mentioned?

Business Continuity

- *"Again, business continuity is a large part of it specifically. It just allows us to be able to bring up systems on what I call a warm site or a hot site in a much more elegant way than if it were physical." – CIO, US*
- *"Reliability, increased speed, accuracy." – TDM, RU*

Improved Manageability

- *"One of the key benefits we're looking at now is management. We're finding it's easier to manage massive amounts of servers in a virtual environment than it is in a regular, rack mounted environment. It's managed from one console, no matter if it's 100 or 10,000 servers." – CIO, US*

Industry Leadership

- *"Pride. Not being the last person to jump in, and when you have sister hospitals that are the exact same size, and they have better technology than you do, it starts to rankle a little bit…" – TDM, US*
- *"I'd like to become a leader in our industry through implementing new technologies like virtualization." – TDM, CN*

Being Green

- *"[R]educed cost and lower carbon footprint." – CIO, US*
- *"[P]ossibly the green issue -- it's nice to mention that ..." – TDM, UK*
- *"Space-saving, and eco-friendliness, which is a trendy word in the recent world. The more servers used the more CO2 emission it will make…" – CIO, JP*
- *"A warm fuzzy feeling of reducing carbon dioxide emissions." – CIO, AU*

IMPLEMENTER ONLY

How confident are you that your current virtualization strategy will deliver these outcomes?	All n = 129
Very confident	61
Somewhat confident	36
Not very confident	3
Not at all confident	0

Six in ten Implementers are "Very confident" that their current virtualization strategy will deliver the key business outcomes most associated with virtualization.

Barriers to Implementation

What do you believe are the top three barriers or inhibitors in adopting a virtualized environment at your company and why?	Imp. n=129	Failed n=2	Non n=19
Upfront costs	39	100	58
Staff training/experience	50	0	32
Increased business technology management workload	14	50	11
Management of multiple hypervisors	12	0	5
Infrastructure planning	26	0	21
Capacity planning	19	0	5
Constantly optimizing the environment	13	0	0
Line of Business/Business department buy-in	12	0	5
Gaining approval from corporate management	13	50	26
Other	33	0	58

Overall, the biggest barriers or inhibitors to virtualization are upfront costs, staff training/experience, gaining approval from corporate management and infrastructure planning. However, within each of the individual audiences, there are different perspectives on the importance of each of these barriers.

With Implementers, the top barrier is "staff training/experience" at 50%. Although this is a sizeable inhibitor, respondents indicate that it is not insurmountable. They recognize staff training as necessary and are willing to invest money and spend the time to solve it. Following staff training/experience are costs (39%) and infrastructure planning (26%), both of which are inhibitors that must be overcome for successful execution of virtualization.

Non-Implementers and Failed Implementers consider "upfront costs" as the main barrier to implementing virtualization, with staff training and infrastructure planning also raising concerns. Coupled with difficulty in getting management buy-in, these barriers may make virtualization a larger challenge than some senior TDMs are willing to undertake.

TOP 3 Barriers for Implementers

Why do you say that?

Staff Training/Experience

- *"Staff training and experience is definitely not a hard barrier, but it is certainly a barrier we have to deal with because it does require training and you have to be oriented with the virtual environment. It is not something that you can just say here go virtualize this. There is a very significant amount of training that has to take place. So how to apply and manage the technology." – CIO, US*
- *"Training is extremely important and needs to be taken seriously by those that are going and the fact that they don't have the experience -- I just can't run out and hire someone who has experience…" – CIO, US*
- *"Because training on the topic is necessary. And where necessary, further education and certification are needed." – TDM, DE*
- *"Optimally trained employees are the driving forces of the company especially in an IT conversion phase. For this reason all IT employees must be confident with this area." – CIO, FR*
- *"The technology is relatively new therefore we have to invest in personnel training. There is not enough experience and business solutions for this process on the Russian market…" – CIO, RU*
- *"I say staff training, because it's something new. I don't think it is a huge barrier but I think it is something we have to take in. We would probably need some training on how to manage virtualization." – CIO, AU*

Upfront Costs

- *"I would say up-front cost, because the cost of purchasing blades that are sufficient to handle multiple virtual servers is more than the cost of buying a single, individual sever." – CIO, US*
- *"I say upfront costs, because if you do virtualization there is a high level of costs and consultation fees as well. It is quite expensive, because of the amount of configuration required, the amount of planning and testing. Also, with quite a high consultant fee it is not very easy for your internal staff to pick up and go if they have not done it." – TDM, UK*
- *"It is the question of finances. If we wanted to further implement it means we need to invest technologically and into training. The results are visible months later on and you cannot predict them so for the time being we leave it like that." – TDM, CZ*
- *"Because it will be a heavy investment at the beginning, long-medium term, to start with it is seen as a heavy investment but when justified it is feasible…" – TDM, MX*

Infrastructure Planning

- *"I chose infrastructure planning because just the amount of time it takes to plan the implementation and execution of these projects is just a lot more daunting than we thought." – CIO, US*
- *"The lack of proper infrastructure is a huge barrier -- planning is a very big part. The inability for change -- change management is a huge part. Basically skill sets. You have lazy IT people that don't understand the technology." – CIO, US*
- *"[B]ecause we are sharing that same resources so you want use this optimally so we are using different applications or different jaws for the same thing and it may create some problem when there is a crisis." – TDM, IN*

TOP 3 Barriers for Failed and Non-Implementers

Why do you say that?

Upfront Costs

- *"I would say cost because unless you show that virtualization is somehow going to make your plant more efficient, which I'm skeptical about, why would I want to invest a huge cost to make my environment quite a bit more complex?" – CIO, US*
- *"[T]he first and most important is the Initial Price – this money for making processes automated is not given very freely. We are part of a holding, so there are people above that have to give their agreement…" – TDM, RU*
- *"We are currently in a situation where we invest in other things than IT. The problem is that we are currently buying new technology in order to be capable of competing so we cannot invest into virtualization right now." – CIO, CZ*
- *"I estimate that the cost of virtualization is not low. Because virtualization is running on multiple operating systems. Nowadays setting up a system with one operation system, in an IBM minicomputer (midrange computer), and backup equipment, costs several millions RMB Yuan. Adding virtualization technology to it, I estimate the initial cost will double." – CIO, CN*

Management Approval

- *"Gaining approval from corporate management, the technology has to be proven before we can go ahead with it. Business department buy-in would be a barrier for the same reason. Cost of optimizing environment as well, cost can be inhibitive. It ties up resources in doing the virtualization." – TDM, UK*
- *"We have recently procured all servers actually we cannot immediately try to convince the management." – TDM, IN*
- *"[T]he top management don't know the benefits of virtualization…" – CIO, CN*
- *"[T]he directors of the company also have to take shareholder's interests into account." – TDM, RU*

Staff Training

- *"This is a huge barrier, because I haven't found the people in my company yet that know how to do it." – CIO, US*
- *"Training would be… and is always a challenge..." – CIO, US*
- *"Because we are a medium company, we will have to design positions for virtualization, train those people…" – TDM, MX*
- *"The technology is relatively new therefore we have to invest in personnel training. There are not enough experience and business solutions for this process on the Russian market. It is likely to slow the process. We are a very big corporation and there is a set of policies and regulations within the company which have to be followed. That's why the process of virtualization of any service requires the coordination of all the sides." – TDM, RU*

After Virtualization is Implemented

IMPLEMENTER ONLY

By 2010 how much of your environment will be physical/virtual?	Physical	Virtual
10-25%	40	11
25-50%	30	36
50-75%	22	28
75-100%	6	25

By 2010, 89% of Implementers anticipate having at least 25% of their environment virtualized. Many anticipate that eventually more than 75% of their environment will be virtual. A

substantial number of Implementers say they are virtualizing small areas of technology at a time often starting with back office/Technology Department specific functions then moving towards specialized line of business or customer facing areas of technology.

How much of your environment have you, or do you, plan on virtualizing?

Over 75%

- *"Right now, we have probably virtualized eighty percent. We are continuing to virtualize on a daily basis. We have found some industry information on cost savings by going virtualization. A physical server costs you about eight hundred dollars a year and electricity. In the last week, we have probably virtualized nine servers." – TDM, US*
- *"At the moment, we have virtualized 80% of the servers and already around 10% of the desktop systems." – TDM, FR*
- *"[E]conomical part has been completed so far by 90%. Our NC machine production line is in the last stages of implementation to be tied up with the other services. By today all designed and planning for it is completed." – TDM, RU*
- *"I would say 20% of it is already virtualized. See for example our services which are the intranet services they are virtualized. Now if I look at my Email service that is also on a virtualized environment, so that was easy for us. That was the first phase and now probably we will start on the application environment which possibly covers another 50-60% and leftovers would be customers environment which we probably would like to address last [since] there will be lot of convincing required, a lot of interaction, coordination with the customers…" – CIO, IN*

Around Half

- *"Planned at this point is probably fifty percent of the IT department. Virtualization application probably about sixty percent of those. I mean in hospital virtualization could mean virtualization in the Operating Room too…" – CIO, US*
- *"Our current plan will virtualize roughly half of our servers." – CIO, UK*
- *"I would say half of our applications can be virtualized." – CIO, AU*

Less than Half

- *"35-40%, also there are a number of servers so the bigger the server the less likely to virtualize it." – TDM, US*
- *"I think we're probably talking in the region of 30% in terms of what we're aiming for and 5%-10% of actual implementation but that's a huge guess." – TDM, UK*
- *"Only servers and storage facilities has been virtualized. If the technology can be improved, we will find more application." – CIO, CN*

The majority of Implementers indicate that they are "Very confident" that they can manage across the physical and virtual environments. Many mention hiring, training staff, or outsourcing to understand the technology and having the process carefully planned and tested as contributing factors in this confidence. Those who are less confident frequently mention lack of familiarity and comfort with virtualization technology as key factors they are concerned about.

How confident are you in managing across the physical and virtualized environments?

Very Confident

- *"Very confident. Here we have really improved performance from physical to virtual, and that is going from their hardware to a virtual environment. From an economy of scales perspective and cost, we could cost justify spending the extra money in the virtual environment to support x-number of physical and virtual conversions." – TDM, US*
- *"I think I have staff on board right now that are real comfortable handling virtualization technologies… we have done a good job training our people and they know that is the direction we are heading in and they are constantly looking for opportunities where they can continue to virtualize the server infrastructure. I am very, very confident I have the appropriate people on board to move this most rapidly and practically." – CIO, US*
- *"As a concept I am fairly confident we can manage both types of environments as long as it is properly documented and everyone understands what it is." – TDM, UK*
- *"Very confident as the collaboration in the test environment ran very smoothly." – TDM, DE*
- *"Certain that it will go smoothly." – CIO, FR*
- *"Well if it is purposeful and sensible then I am 100% confident. It is just a great way of ensuring the flow of the information after all so there is no reason to doubt it." – CIO, CZ*
- *"Confidence is in the affirmative. I have engaged in IT work for so many years, so there are no new things that I can't accept. If our firm really needs to implement virtualization technology, I am definitely able to grasp it." – CIO, CN*
- *"I do not believe there would be much problem in having both. The problem, if any, may be the fact you would need to prepare a personnel with technological expertise for each architecture, as they are very different. If the company has a profit constitution strong enough to absorb such extra cost of hiring such people, it should not be a problem." – CIO, JP*
- *"Very confident. I've taken many years to know what I want and I haven't rushed it yet. I think the long term planning with our vendors and many consultant hours and meetings and we're just about there now." – CIO, AU*
- *"No problem at all because local talent will be available all the time. In case of shortage of local talent then definitely global help will always available to you." – CIO, IN*

Not Confident

- *"I wouldn't be comfortable at this time. I'm still feeling it's a relatively new technology. I'd like to see it mature a bit more and be used more specifically with our health information system." – CIO, US*
- *"At the moment we're not. The physical ones we're ok but the virtual ones have been we haven't exposed ourselves to." – TDM, UK*
- *"At the moment not very confident. But I hope that those software solutions and business technologies that we are trying to implement will help us in the future to solve our problems, tasks." – TDM, RU*
- *"We certainly manage, but the confidence level is not where I would like it to be. We certainly get by, but it is not as foolproof as the traditional management approach. We can find servers that we don't know anything about that have been set up by other departments." – CIO, AU*

While some Implementers feel that there are no significant challenges involved in having both physical and virtual servers, others voiced concerns about managing both saying that the costs, troubleshooting, downtime needs, and staff skill sets needed are very different. Additionally, some specified that getting other business units and management on board and the demands of completing implementation were the biggest challenges.

What are the challenges of having both physical and virtual servers?

No Challenges

- *"I don't think there are any challenges. It is the best of both worlds so you have less physical… but in our world we are not going to go completely virtual. So we are going to go virtual where it makes sense and then stay physical where it makes sense so we get the best of both worlds." – CIO, US*
- *"There is no challenge. It is easier than just having all physical. It is not going to affect the way we do business at all. It would be nice to have all stuff virtualized, but virtual technology is not right for it yet." – TDM, UK*
- *"We have got no problems regarding reliability of working virtual servers along physical ones." – TDM, RU*

Managing Both

- *"They are managed slightly differently. It is more difficult to schedule down time on a virtual environment, because you will spread your computing load across the system so you balance it a little more gracefully so you don't have that same issue with one box. So down time is an issue. On a virtualized server you have the additional software that you have to be familiar with so you have more training and support cost sets are different. The level of skill that is required to manage the two boxes I think is very different." – CIO, US*
- *"I think there are issues around managing the environment. For example, we have a problem at the moment we can't isolate. So one of our options is to virtualize one of the servers in the environment, but if we do that then it negates all of the statistical information we have collected over the last eight or nine months, because once you move to a virtual environment everything is different…" – TDM, UK*
- *"The interaction of both versions. Optimized performance." – TDM, DE*

Selling Virtualization / Actually Implementing

- *"From the end-user standpoint, it would be selling the end-user on the technology. Demonstrating that it is a good, the benefits are significant enough for them to accept the potential performance that they may experience. That may not be the case. A … lot of times you might have less than adequate server hardware in place because it is cost prohibitive to buy the next greatest piece of hardware. In a virtual environment, I can virtualize that environment and maybe get close to the same kind of performance…" – CIO, US*
- *"It is a challenge in itself to finish it, technically and technologically demanding." – CIO, CZ*

IMPLEMENTER ONLY

How quickly do you expect to see Return on Investment on virtualization?	All n=129
0-6 months	20
6-12 months	26
1-2 years	33
3-4 years	16
5-7 years	1
8-10 years	0
More than 10 years	0
Don't Know	4

Implementers say 46% of the time that they expect to see return on their investment in virtualization within a year, while an additional 33% expect to see it within two years. The most common way to measure ROI is in dollars saved on capital and operating costs going forward. Other concrete measures include improved delivery of services and staff reduction. However, other respondents who are implementing indicate that the decision to virtualize was made

based on an overall "gut" feeling that it would help the business and they were not relying on concrete measures to confirm this perspective.

How do you measure Return on Investment for virtualization?

Dollars Saved (Cost Savings)

- *"The bottom line is hard. The efficiency is part of it but at the end of the day those are a last ditch effort. There are true cash flow reductions to cost and the sweeteners on top. Those are the efficiencies that we get. While those are quite tangible the economic evaluation we can place on those are generally minimal because we're not locking up business productivity with our procurement process -- it's adapted around that. It'll be hard cash flow that will be measured. What we save on utilities, etc." – TDM, US*
- *"Dollars saved is one of the areas you can measure it. I think reducing the footprint size of your data centers…" – CIO, US*
- *"I probably would be looking at the current running costs and capital investment over a period of time and compare that to those costs in a virtualized environment and they will do a projection based on the standard method of additional servers state single application/ single server and then they will put those costs in, which then they compare that to the cost of running a virtualized environment…" – TDM, UK*
- *"By reducing costs whilst at the same time increasing performance, a clear advantage develops for the company." – CIO, FR*
- *"We regard virtualization as an investment project. And as any project it has to be judged on ROI including money saved, increased efficiency, reduced man hours and so on." – TDM, RU*
- *"We measure both the margin assuming if it was not virtualized and the actual margin of the past two years with virtualization; and try to increase business efficiency by seeing this data." – CIO, JP*

Staff Reduction

- *"Less need for IT employees and third party companies." – TDM, DE*
- *"Proper use of virtualization can reduce 30% of IT staffs and 30% (approximately 2-3 millions RMB Yuan) of IT spending. With the same facilities there is a 20% output enhancement after virtualization." – CIO, CN*
- *"[T]o have more operatives than administrators, makes the job more efficient. Job reduction." – CIO, MX*

Improved Services

- *"The measurement for us is in the improvement of offered services and increased reliability." – CIO, CZ*
- *"Improved delivery of services and increased efficiency." – TDM, BR*

No Clear ROI Identified

- *"I am going to say it is more of a value proposition for us. We have not measured it in dollars." – CIO, US*
- *"We don't. We are not going to measure it at all. We went virtual because we instinctively knew there would be some benefit there in terms of reliance and flexibility. It is not something we have to justify to the rest of the business so we are not measuring it, we are just doing it." – TDM, UK*
- *"In order to enhance the efficiency of servers, we have advanced virtualization under the pressure of necessity; accordingly we just installed it without considering return on investment. Therefore, we do not have accurate data; and return on investment has not been measured." – CIO, JP*

- *"At the moment, it is being evaluated in a couple of different places, but with virtualization…We don't measure it as something to measure it is something that contributes to other benchmarks we want to measure. It is not a strategic goal. It is something that just happens in the background." – TDM, AU*
- *"[W]e only go by gut feeling that this helpful for the business and for ROI this is not there…." – CIO, IN*

Appendix

What parts of your business would virtualization affect?

Everything

- *"It would affect the entire business, because all the software we run is virtualized and all the hardware we have is virtualized." – CIO, US*
- *"Just about everything we do. It gives a lot of resilience, which is vital in a business like ours. The other thing that it does is that it gives us a lot of flexibility in terms of rapid growth, geographically and also in terms of rate of change." – TDM, UK*
- *"Primarily those that are-- well it affects everything because there's not much that's not virtualized today in one way or another...and it would affect everything. So, it allows us to basically manage our resources really well, and for those hard to deal with organizations that need to be flexible in how they do things, it allows them to be very flexible." – CIO, AU*
- *"[W]e do multiple projects which will have their own environments which essentially means that they will have their own sets of servers, network switches which in some cases are replicated to the customers environment ok. So I look at this two environments they are pushing virtualization in both and that's the reason I am telling you that it will have an impact on the entire organization." – CIO, IN*

Technology Department Only

- *"Well ideally it will only affect IT. I would say only IT, because the users should not know that they are on a virtualized platform or not. They should request I need this type of environment and we hand them that environment." – CIO, US*

IMPLEMENTER

What percentage of each of the following is or will be virtualized within the next 18 months?

Storage	All n=129
0-25%	24
26-50%	25
51-75%	16
76-100%	28
Don't Know	7

I/O (Input/Output)	All n=129
0-25%	30
26-50%	30
51-75%	10
76-100%	17

Don't Know	12

Clients	All n=129
0-25%	30
26-50%	26
51-75%	14
76-100%	23
Don't Know	8

Servers	All n=129
0-25%	18
26-50%	31
51-75%	19
76-100%	30
Don't Know	2

Virtualization Outcomes - Detailed Scores

Reduce Costs

Using a 1-5 scale where 1 equals "Is a business outcome" and 5 equals "Is not a business outcome" Please indicate whether you consider this attribute a business outcome of virtualization?	All
1 – Is a business outcome of virtualization	49
2	31
3	16
4	2
5 – Is not a business outcome of virtualization	1

Increase ability for business to respond to market opportunities (agility/flexibility)

Using a 1-5 scale where 1 equals "Is a business outcome" and 5 equals "Is not a business outcome" Please indicate whether you consider this attribute a business outcome of virtualization?	All
1 – Is a business outcome of virtualization	22
2	30
3	26
4	7
5 – Is not a business outcome of virtualization	12
Don't Know	3

Increase Efficiency

Using a 1-5 scale where 1 equals "Is a business outcome" and 5 equals "Is not a business outcome" Please indicate whether you consider this attribute a business outcome of virtualization?	All

1 – Is a business outcome of virtualization	37
2	33
3	21
4	6
5 – Is not a business outcome of virtualization	2
Don't Know	1

Mitigates Risk

Using a 1-5 scale where 1 equals "Is a business outcome" and 5 equals "Is not a business outcome" Please indicate whether you consider this attribute a business outcome of virtualization?	All
1 – Is a business outcome of virtualization	30
2	35
3	16
4	17
5 – Is not a business outcome of virtualization	1
Don't Know	1

Accelerates Growth

Using a 1-5 scale where 1 equals "Is a business outcome" and 5 equals "Is not a business outcome" Please indicate whether you consider this attribute a business outcome of virtualization?	All
1 – Is a business outcome of virtualization	11
2	26
3	33
4	15
5 – Is not a business outcome of virtualization	14
Don't Know	1

Virtualization as a competitive advantage

Using a 1-5 scale where 1 equals "Is a business outcome" and 5 equals "Is not a business outcome" Please indicate whether you consider this attribute a business outcome of virtualization?	All
1 – Is a business outcome of virtualization	9
2	26
3	34
4	17
5 – Is not a business outcome of virtualization	12
Don't Know	2