SOLITAIRE INTERGLOBAL

Does Your Virtualization Platform Matter?

Getting the Most Out of Your IT Platforms with Virtualization

1. Introduction

Virtualization is a very hot topic in today's technology discussions. Virtualization provides both an isolation and prioritization of resources that allows a single platform to function as if it were split into multiple machines. The concurrence of today's technology-driven business marketplace and the economic clime pushes organizations into a continual search for higher efficiencies and better leveraging of IT resources. Virtualization is one of the most powerful tools in the achievement of increased leverage and efficiency of those resources, while positioning organizations strategically for a cloud-computing model. The choice of virtualization method and tools can be a hard one, since the internal mechanisms that produce the efficiencies in the tool are not readily apparent to the people that are making the choices. Those decisions are being made on a business level, and benefit from business perspective. Since the impact of virtualization forms an underlying contribution to an organization that is a diffuse layer within the IT infrastructure, IBM engaged Solitaire Interglobal Ltd. (SIL) to conduct surveys, gather data and perform analysis to provide a clear understanding of the benefits and relative costs that can be seen when organizations implement IBM PowerVM as part of their IT architecture. This analysis has been primarily directed at the value of virtualization from a business perspective, so that those whose role it is to provide business leadership can understand the benefit of the IBM PowerVM virtualization offerings when evaluating its selection.

During this study, the main behavioral characteristics of software and hardware were examined closely, within a large number of actual customer sites (61,320+). All of these customers include organizations that have deployed virtualization as part of their production environments. This group has organizations that maintain both single virtualization standard and those that allow a heterogeneous mixture of virtualization methods and mechanisms. The information from these customer reports, and the accompanying mass of real-world details is invaluable, since it provides a realistic, rather than theoretical, understanding of how the use of different types of virtualization can affect the customer.

In the collection and analysis of this data, a series of characteristics were derived. These characteristics affect the overt capacity, efficiency and reliability of the environment and its affects on operational and business performance. The behavior represented by these characteristics has then been projected and modeled into possible options for deployment. In order to build this understanding more than sheer performance is required. Although the performance of the virtualized systems is an important metric, the translation of that performance into business terms is more germane to today's market. The business perspective encompasses a myriad of factors, including reliability,

staffing levels, time-to-market (agility) and other effects. This ties directly into the decisions that IT managers, CTOs, project managers and business leadership have to make daily.

2. Summary of Findings

The purpose of this analysis was to examine the real-world impact on businesses that deploy IBM's PowerVM virtualization produce, compared to those using Oracle VM for SPARC (OVM SPARC), Hyper-V, VMware or other competing products, such as Xen, KVM, Oracle VM for x86 (OVM) and others. The metrics used to analyze the differences in platforms were both objective and subjective. The objective metrics include reported data points on costs, run times, resource usages, and so on. The subjective metrics include responses on various levels and sources of customer satisfaction and perception. While overall customer satisfaction uses a variety of qualitative and quantitative measures, it still provides an end-result measurement of deployment success for the customer. A few of the highlighted findings can be seen in the quick summary below.

Quick Summary

Category	Commentary	Quick Byte
Customer Satisfaction	The more complex or volatile the environment, the more all aspects of customers reported high satisfaction with PowerVM.	PowerVM shows a strong support for changing customer needs.
Total Cost of Ownership (TCO)	While TCA can be more for AIX with PowerVM than some of the alternatives, the TCO rapidly changes that picture, especially when a multi-year view is taken.	PowerVM TCO can be as much as 71.4% less than other options.
Staffing	The normalized staffing levels for PowerVM are smaller than those for the competitive offerings by as much as 210.8%. Learning curve time is as much as 2.58 *times* faster than for other offerings.	Powerful scripting and workflow lets PowerVM leverage the efficiencies of scale.
Risk	The reported risk of deployment is considerably better for PowerVM users, by as much as 1/3rd less exposure.	Flexible and powerful functions to share resources greatly lower the risk of deployment.
Availability	The more virtualized the environment, the more critical the availability becomes. PowerVM requires fewer platform and VM reboots than competitive platforms. This results in downtime that can be 5.5 *times* less than the other options.	Industrial strength availability from PowerVM.
Agility	PowerVM users are reporting faster deployment times by as much as 170.9%.	A well-managed PowerVM system can be directly associated with faster time-to-market.
System Efficiency	Resource usage consumes as little as 42% of the resources need for other virtualization, due to lean VM overhead.	Do more with less with PowerVM.
Security	PowerVM supports all forms of control and isolation, including those required for highly secure implementations, separating resources for memory, network, I/O and access.	No reported successful VM hacking in PowerVM.

These key findings are all substantial reasons to consider PowerVM for an organization's virtualization choice.

2.1. Study Scope

In order to understand the impact of IBM PowerVM and virtualization as a key part of an organization's IT, a large number of deployments were examined. These deployments included situations where the virtualization choices were homogeneous within an organization and ones where a mixture of different methods, software tools and components existed. The relative degree of difference in operating behavior for each factor, i.e., total number of outages, etc., was then compared to understand the net affect of the respective combinations. The effects were observed in general performance and capacity consumption, as well as other business metrics.

2.2. Methodology

The approach taken by SIL uses a compilation and correlation of operational production behavior, using real systems and real business activities. For the purposes of this investigation, over 61,320 environments were observed, recorded and analyzed to substantiate the findings. Using a large mass of customer and industry experiential data, a more accurate understanding of real-world behavior can be achieved. The data from these systems was used to construct a meaningful perspective on current operational challenges and benefits. The reported behavior of the systems was analyzed to isolate characteristics of the architecture from both a raw performance and a net business effect perspective. This information was then projected on the production system performance of the non-PowerVM deployments to better understand the possible impact and effects. All input was restricted to those organizations using operating systems in versions that were current in calendar years 2010 and 2011. Since many of the components in this environment have releases at staggered points in time, only those components that were either the current version or a -1 version based on those calendar restrictions were included in the study. Additional information on the methodology and study diversity can be found in additional methodology notes at the end of this document.

In a situation such as that presented by this study, SIL uses an approach that incorporates the acquisition of operational data, including system activity information at a very detailed level. It should be noted that customers, running on their production platforms, provided all of the information. It is essential to understand that none of the data was captured from artificial benchmarks or constructed tests, since the value in this study comes from the understanding of the actual operational process within an organization, rather than the current perception of what is being done. Therefore, these sites have tuning that is representative of real-life situations, rather than an artificial benchmark configuration. Since the focus of this analysis was not to tightly define the differences among different minor variations of operating system or hardware, the various releases were combined to show overall architectural differences. This provides a more general view of architectural strategy.

The study was further restricted to organizations that have larger implementations. While this restriction is not intended to make a statement on suitability of any virtualization mechanism for small organizations, it is true that smaller processing

demands are more easily handled, and provide smaller differentiation in analysis. For these reasons, the smaller implementations[1] were filtered from the study.

The information in this study has been gathered as part of the ongoing data collection and system support in which SIL has been involved since 1978. Customer personnel executed all tests at SIL customer sites. The results of the tests were posted to SIL via the normal, secured data collection points that have been used by those customers since their SIL support relationship was initiated. As information was received at the secure data point, the standard SIL AI processing prepared the data in a standard format, removing all detailed customer references. This scrubbed data was then input to the analysis and findings.

The analysis of this data has produced findings in two groups of viewpoints – business management and technical. For a more concise summation, those findings have been discussed separately in the body of the paper.

2.3. Business Perspective

Ultimately, IT and technology are designed to support business functions. So one of the primary perspectives of the study was the view of the technology by an organization's business management, both executive and line-of-business. For the purposes of this part of the analysis, the patterns of operations from the study organizations have been grouped into similar categories and then compared to identify their affect on business metrics. These metrics are:

- Customer satisfaction
- Total cost of ownership
- Staffing
- IT stability and reliability
- Agility (time-to-market)

Each of these business metrics has measurable and significant differentiation when the projected IBM PowerVM deployment solution is viewed.

The more granular business metrics are those measurements that show how a specific measure of success is different in the general population of the implementers versus those that have deployed PowerVM. For further clarification, those situations where OVM for SPARC, Hyper-V, VMware, OVM, KVM or Xen was the virtualization mechanism of choice have also been broken out. These metrics are fairly broad in coverage and touch on areas of financial consideration, as well as organizational quality. The metrics are presented with short definitions and the focused net effect of IBM PowerVM deployment. In order to be meaningful across a variety of industries, all of the metrics have been normalized on a work-unit basis[2], and categorized by levels of organization size (medium, large and very large). The base measure has been set by the

---

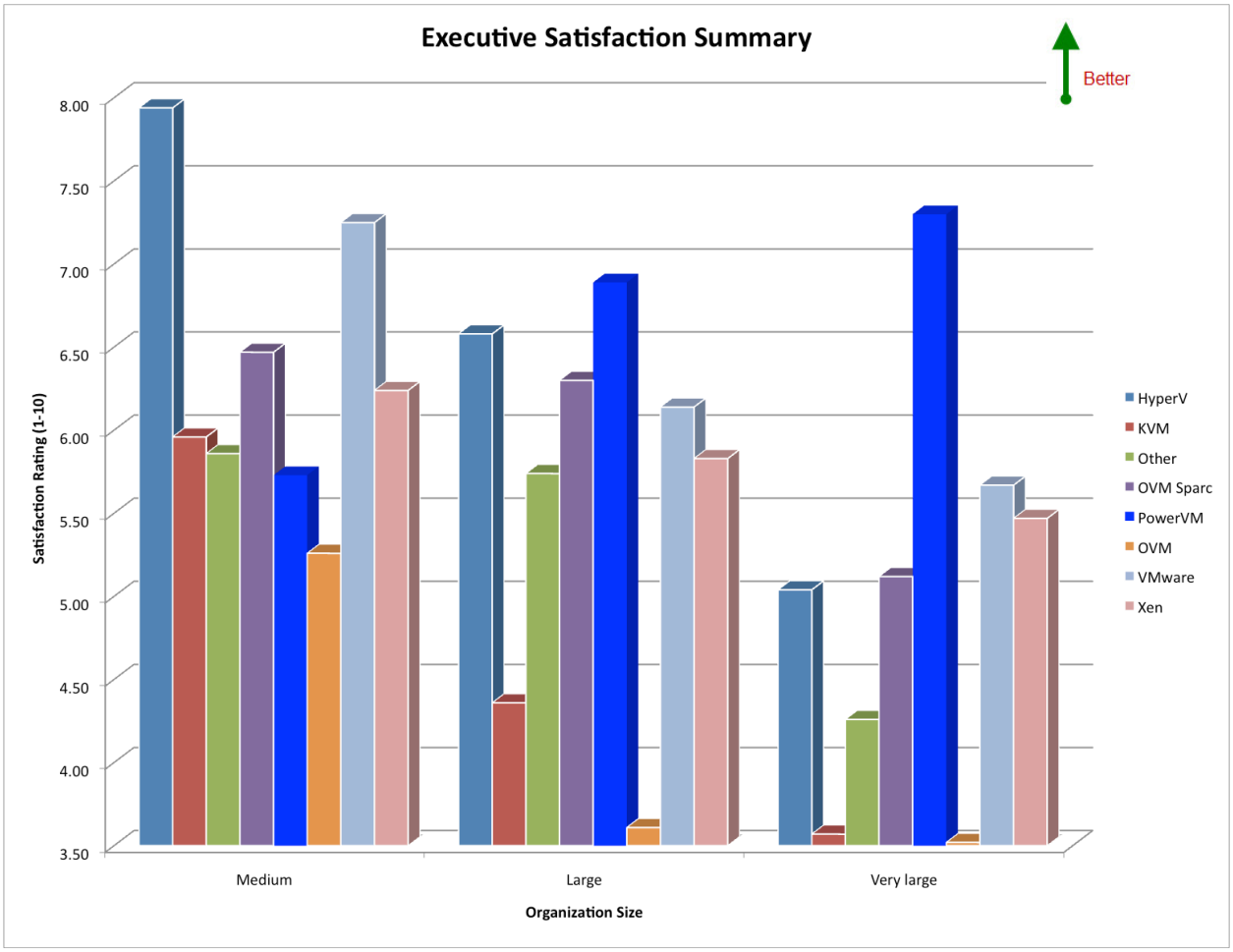
[1] The guidelines for organizational size classification that SIL uses are defined in the supplemental methodology notes at the end of this document.

[2] Work-unit basis has been defined using the published International Function Point User Group standards and are based on function point (FP) analysis.

medium company average, so that all other metrics are based on a variance from that standard set point. The implementations included in this study have been restricted to those implementations in production.

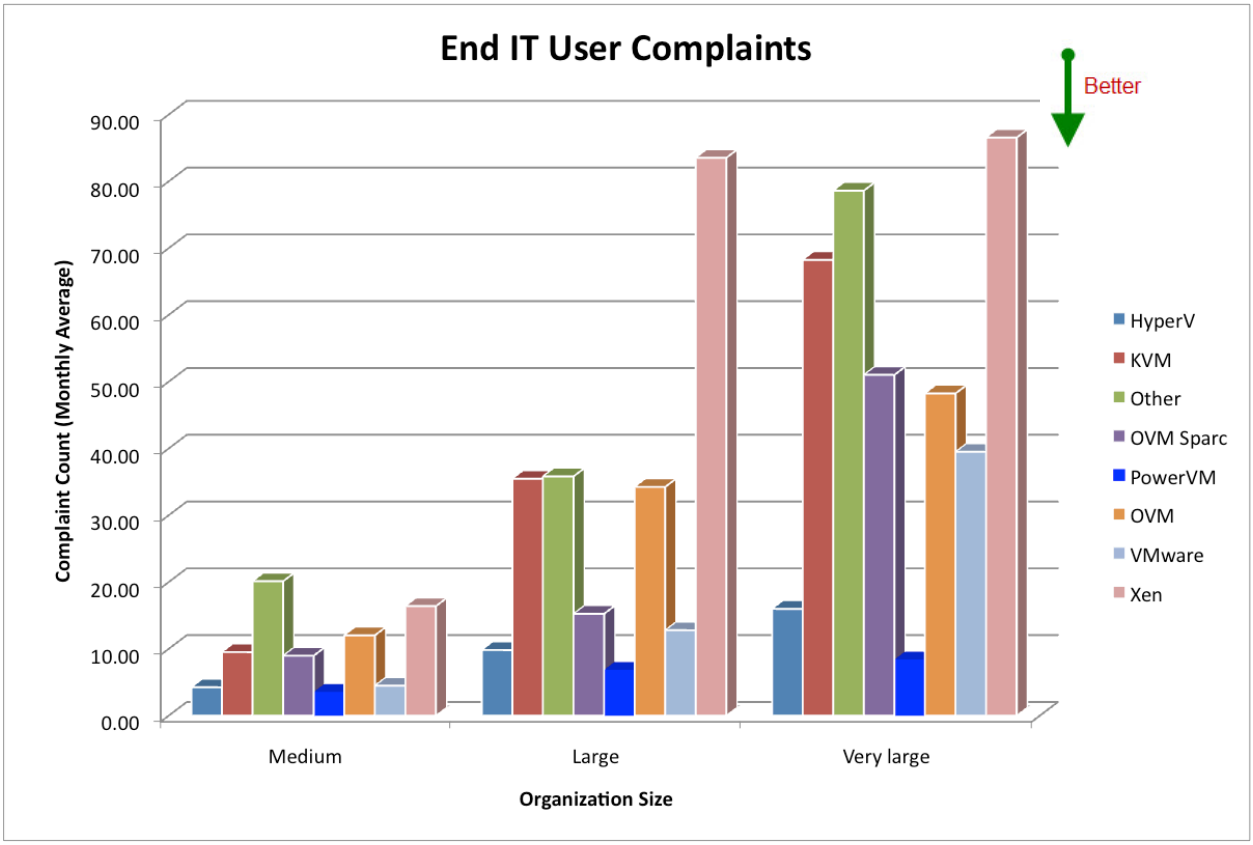
Customer Satisfaction – Executive Management

The ultimate metric on a successful implementation is *customer satisfaction*. SIL tracks this metric split out between the executive management and the operational input from a customer, since the perspective of the customer may radically differ between those two groups. The satisfaction of the customer executive management about their IT systems tends to focus on the application, rather than the virtualization, although no application can work as well with a poorly configured or fragile virtualization method. That being said, the satisfaction with IT implementation and operation provides the most general metric for evaluation. This satisfaction rating was obtained from a large group of customers and provides a singular perspective on the overall success of virtualization deployment. While this is a subjective rating provided by high-level organizational management, it does provide the business' actual perception of success.



The advantages seen by the reporting clients show increasing satisfaction in the applications run under PowerVM, much of which can be attributed to the number of complaints that the executives reported from their customers and users of those

systems. The following chart shows the reported average monthly complaint count for the different platform groups. These complaints have been restricted to continued operational issues, and exclude complaints associated with missing and desired application functionality.

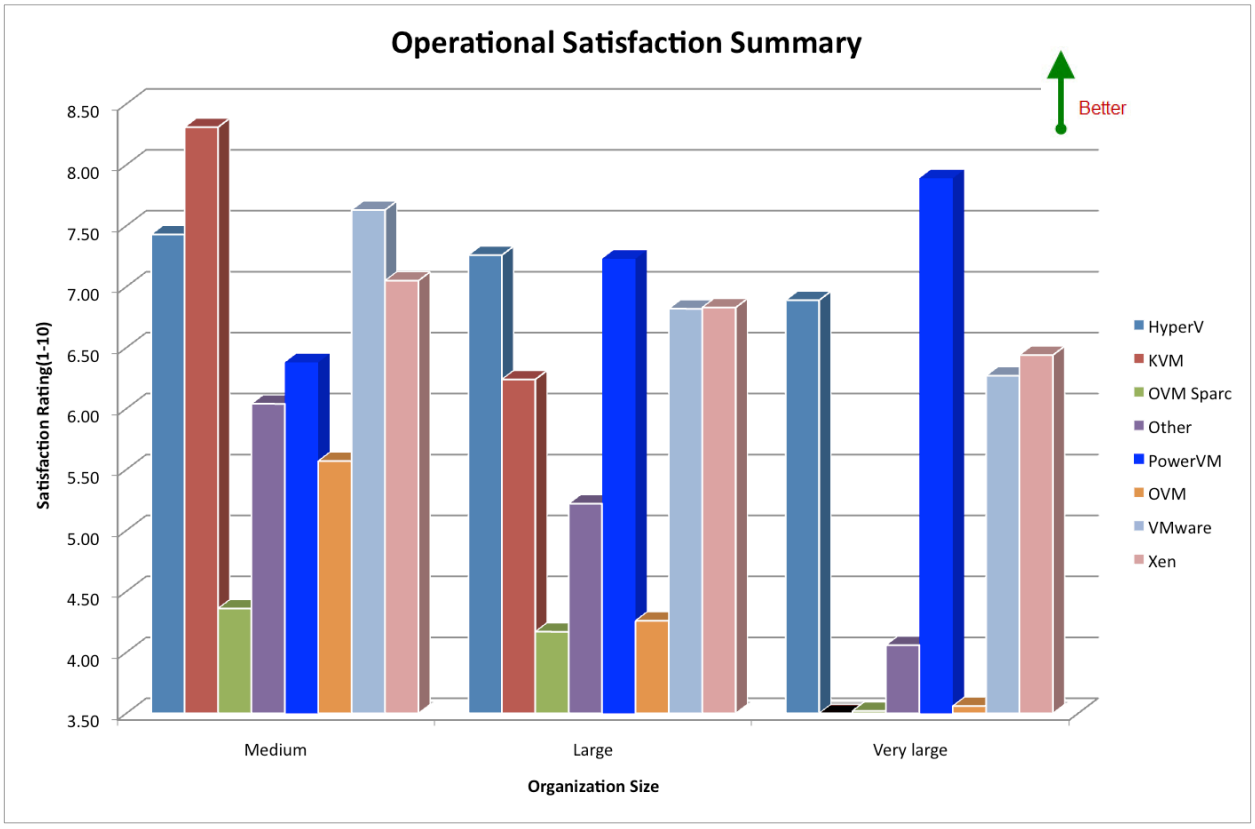


While the specific customer complaints can be affected by management techniques, application design and other factors, the relative comparison is a legitimate indicator of how well the operating system supports the processing at the organization. The three top reasons cited by reporting customers for the satisfaction were:

1. Smooth running operation with little downtime and complaints
2. Speed of implementation on AIX systems
3. Quality and responsiveness of the technical support

Customer Satisfaction - Operational

The operational perception of the customer, based on a variety of component metrics (e.g. support levels, communication, price, etc.), demonstrates satisfaction and success at the most generic level. This satisfaction metric is different from the overall satisfaction metric described earlier, in that the previous metric was gathered from the executive management level, while this metric examines the feedback from the operational side of the organization. This specific metric comes from information reported both by the IT departments and the line-of-business (LOB) groups.



The satisfaction of the IT operational staff and the LOB with the PowerVM deployments reflect the reliability and resiliency of the platform as a deployment choice, in addition to the previously mentioned integration benefits. The most highly cited reasons for the satisfaction were:

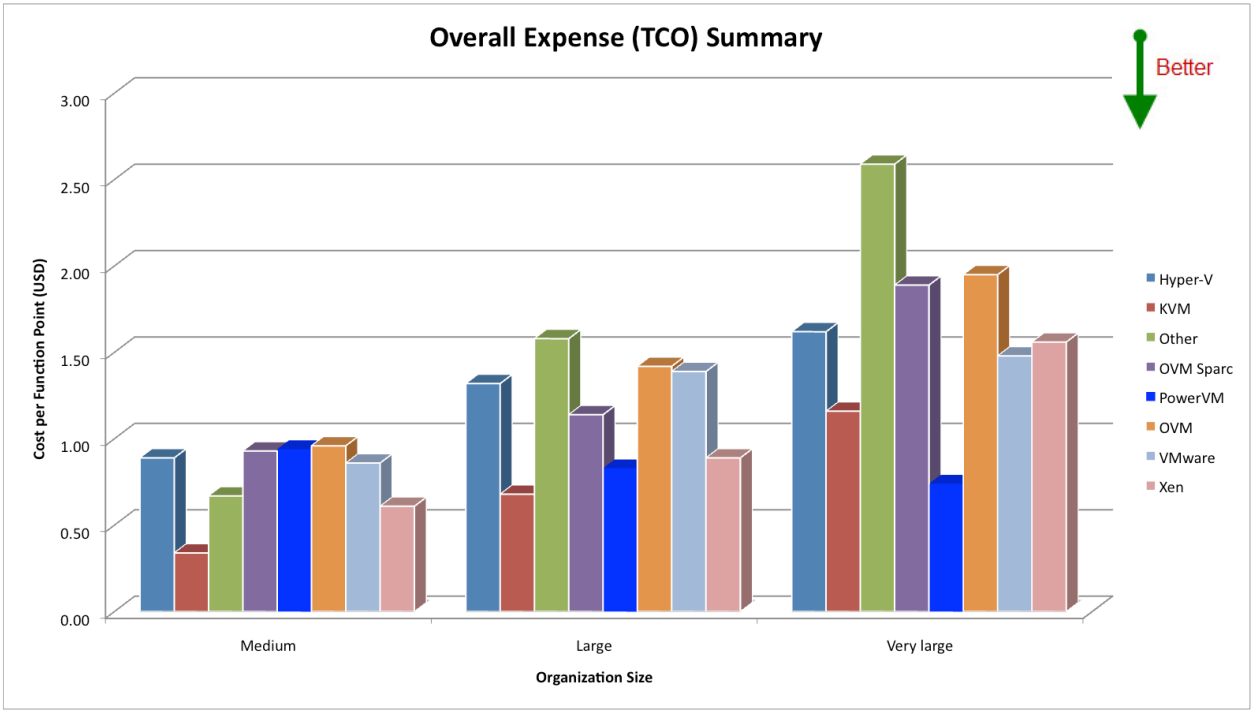
1. Smooth running operation with little downtime and complaints
2. Automated tools for management
3. User interface efficiency

More than 90% of the reporting customers cited one or more of these three reasons for their satisfaction.

Overall Expense (TCO)

This cost perspective looks at the total cost to the corporation during a specific time period. This is normalized on three bases: employee, sales revenue and legal entity count, and contains expenses associated with up to a 3-month deployment preparation phase. These expenses span all of those included in the operational cost metric and are supplemented by expense contributions for physical plant, corporate overhead, long-term investments, etc. The TCO financial metric is more comprehensive than a straight operational metric. This metric it should not be viewed in isolation, since extraordinary expense patterns for individual organizations may cause minor variance in the exact comparison values. For this reason, the comparison metric should be viewed as indicative and providing a general range rather that an exact value. However, with the

large number of contributing organizations, the data is sufficiently large that, combined with the other business metrics, this comparison helps to set an appropriate perspective.

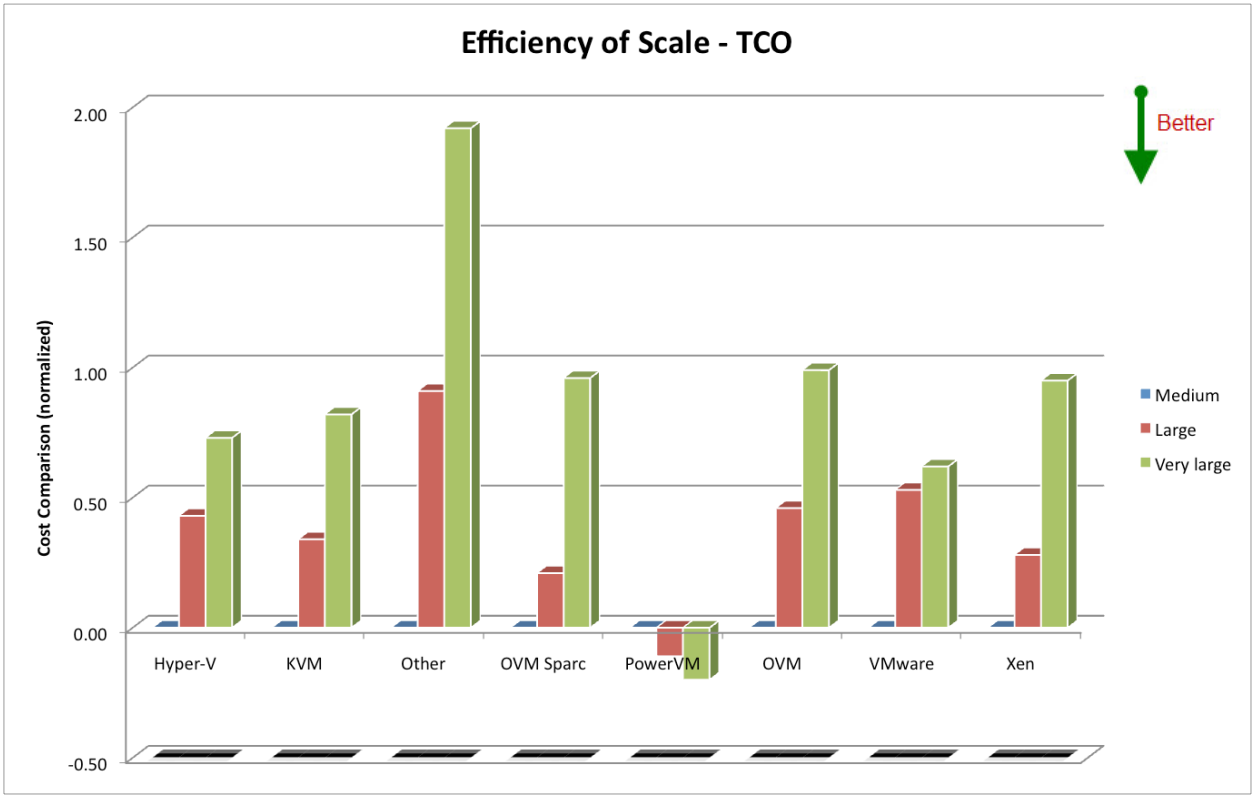


The IBM PowerVM application show lower overall expenses (as much as 71.43%) over a wide range of organization size, although the smaller organizations do not see the efficiencies of scale that the larger organizations see with the PowerVM product. It should be noted that this TCO comparison should be viewed in conjunction with availability and downtime metrics. Since no cost has been associated with unavailability, each organization should factor in its associated downtime cost to the TCO metric provided here. The downtime metric can be found later in this document.

Additionally, the cost of acquisition is higher with the AIX platforms than for the smaller Intel platforms. This disparity in cost levels is obviated when the level of virtualization and capacity demand increase. This switch in the defining metric from TCA to TCO happens in all situations eventually, but is more rapid in the larger deployments. Since the TCO holds true as a metric, well past the usefulness of the TCA, the TCO has been used as the defining cost metric. The differential among the solutions is based largely on the lower expenses for the efficient deployment and the lower overall cost of the solution, including staffing. This is affected strongly by the scope of the virtualization deployment, with increased expenditure efficiency present as the complexity and size of the virtualization deployment increases. Customers of all degrees of deployment reported a consistent pattern of differentiation in three main areas:

1. Lower staffing costs overall (due to tools, stability, etc.)
2. Lower datacenter costs (environmental, facility, etc.)
3. More highly-leveraged platforms

An interesting metric can be seen if the efficiency of scale (EOS) is examined for the virtualization options in this area. This measurement looks at the change in the normalized cost as the implementation increases in size and complexity in either the physical deployment or the number of VMs. It reflects any efficiency that tools and management flow provide in a specific virtualization mechanism. Using the organization size as the driving principal, the TCO EOS trend can be summarized as shown in the graph below:



It is notable that the PowerVM data shows a clear implementation of the efficiencies of scale, which is counter to the competitive offerings. The top three sources of this advantage were reported as:

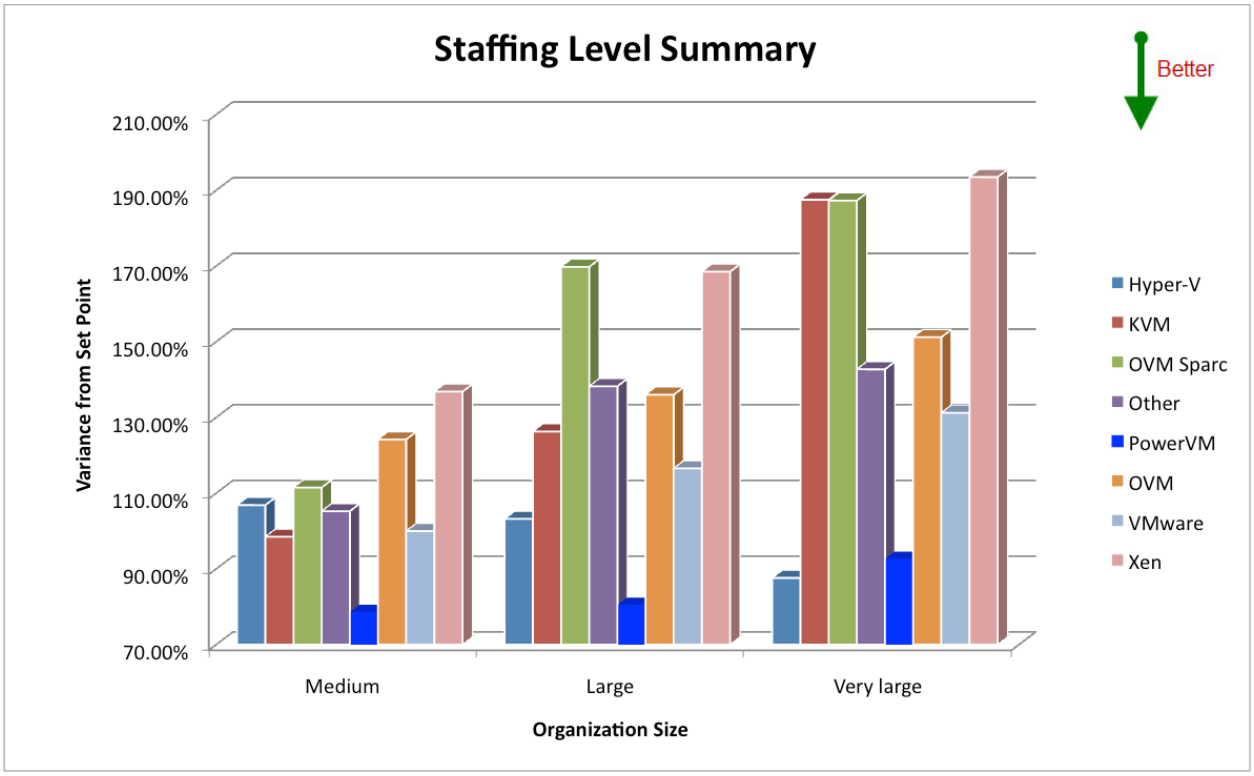
1. Scripting capabilities of the software
2. Efficient resource sharing
3. Advantageous licensing structure

These factors have produced a realized savings in the cost per VM of about 19.3% for PowerVM, when the complexity and size of the virtualized environment moves from medium to very large, while the competitive offering actually grow in cost per VM, up to 1.92 *times*.

Staffing

An underlying factor that shows itself in many other areas is the effectiveness of the interface between the technical user and the infrastructure, including software, hardware and operating system components, and the subsequent effect on staffing. The efficiency of any of the specific components that provide that influence on the user

experience are difficult to break down into metrics other than in overly-detailed comparisons that lose their effectiveness by virtue of the degree of detail. Therefore, a general view of the full-time staff position equivalents was reviewed to provide a general metric for the platform comparison. These levels are those required to maintain a "gold standard" environment for each operating system group. Once again, in order to provide a level comparison field, the workload on the systems was normalized to identical levels. The set point for comparison was selected as the staff level for a medium-sized organization using VMware.



Since different virtualization methodologies have varying sets of implementation standards, it is important to keep the rigor of those standards in mind when reviewing the staffing. The noticeably lower staffing level for PowerVM deployment and use is directly attributable to an efficient unified workflow, as well as a substantially different mechanism to handle the allocation of virtualized resources. This is of special note as the organization increases in size or if an organization is on the path to a cloud service delivery model. The normalized staffing levels for PowerVM are smaller than those for the competitive offerings by as much as 210.8%.

Another way to examine the staffing requirements is to look at which areas of activity consume the staff hours. For the purposes of this analysis a subset of the reporting organizations allowed SIL full time-motion data. This data was then analyzed to build a list of the top activities that the staff supporting virtualization performed. This occurrence analysis uses the frequency of the action to determine the weighting.

Task Frequency Summary

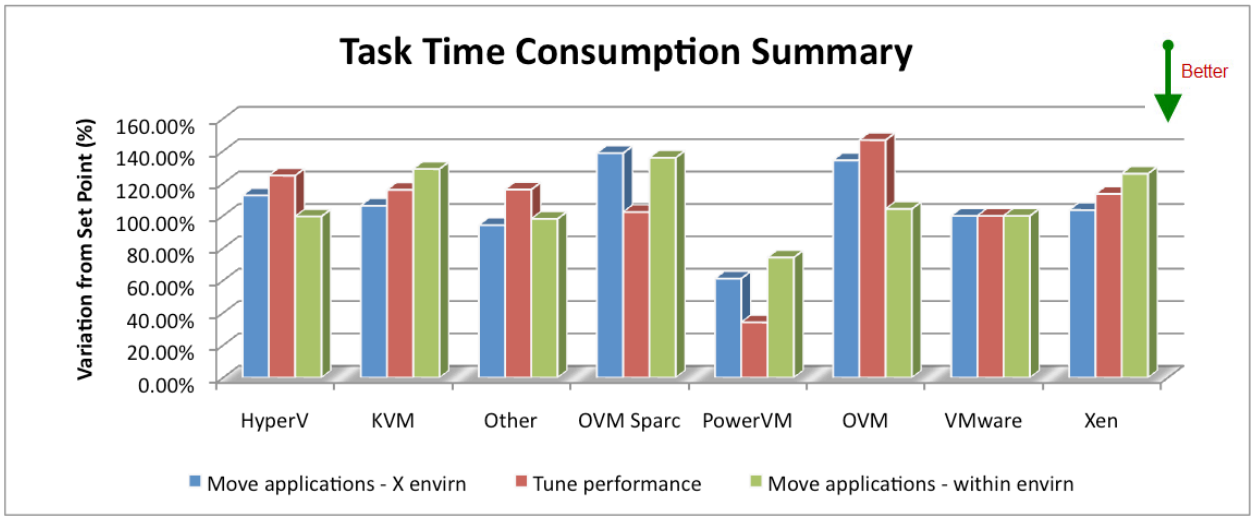
Rank	Description
1	Check resources levels
2	Reallocate and prioritize
3	Setup VM
4	Tune performance
5	Move applications - across environment types
6	Setup new server and VM
7	Move applications - within environment type
8	Install patches and fixes

From a time perspective, the task list order changes, since some of the frequently performed tasks are simple and quick, while some of the other tasks take a considerably longer time. The ranking in this table is in order with the most time-consumptive task first, the second next, and so on.

Task Duration Summary

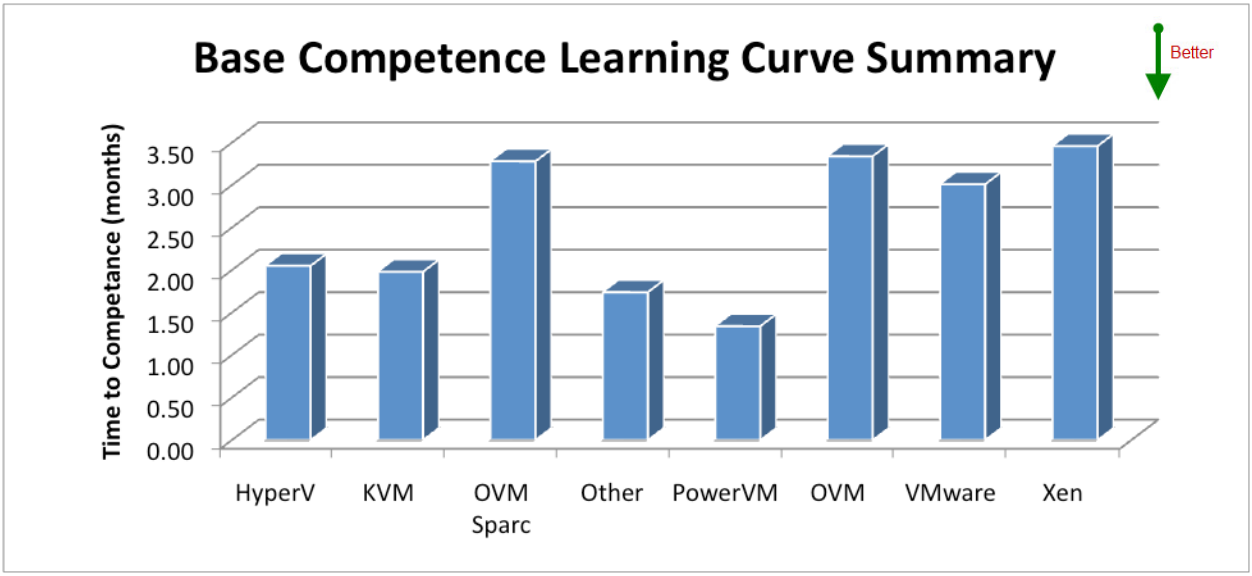
Rank	Description
1	Move applications - across environment types
2	Tune performance
3	Move applications - within environment type
4	Setup VM
5	Reallocate and prioritize
6	Setup new server and VM
7	Install patches and fixes
8	Check resources levels

If the top three task areas are examined from a relative time consumption perspective among the virtualization options, an interesting pattern appears. This summary compares a normalized environment against the set point, which in this case is the one set by VMware at a medium-sized organization.



There is a radical difference in the amount of time spent on the top three staff time usage tasks when PowerVM is included in the analysis. The PowerVM advantage is as much as 65% in these most heavily performed staff tasks. Part of this difference can be correlated to the workflow design within the PowerVM management tools. The overall context switching was significantly smaller (81.3% less frequent) than the average. What this means is that an IT support person performing virtualization tasks has to switch workflow direction, opening additional screens or recording information to then change the open action on their screen 4/5 less frequently. This makes for fewer mistakes and faster task completion.

This can also be seen in the reported learning curve timeframes. The data from the reporting organizations included the interval of time that a staff member needed to be fully functional in each of the virtualization products. This was not a timeframe for expertise, which has many different metrics, but the base one of adequate performance, obviating the need for training supervision. This information is shown in graphic form below.



The learning curve on PowerVM takes a significantly shorter time to competence, with the most frequently stated reasons of:

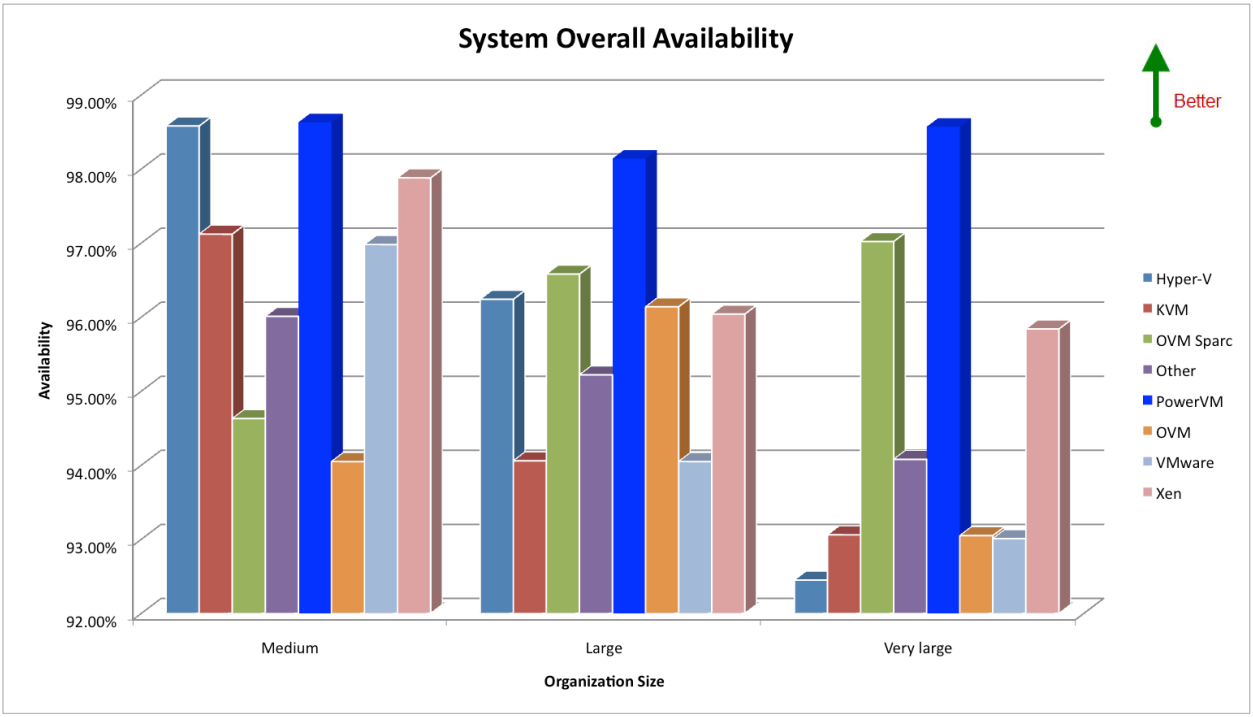
1. Quality of education and training
2. Robust management tools
3. Optimized workflow

The faster ramp-up time of the PowerVM virtualization method is as much as 2.58 *times* faster than the others in this study. This faster time to competence can be critical for organizations, as they deploy new virtualization efforts.

IT Stability, Risk and Reliability

Risk is composed of many factors. It includes the stability and reliability of the platform, as well as the chances of platform failure. IT stability and reliability metrics include all downtime, both planned and unplanned. The dependability of the implementation is a

combination of the individual reliability of each component, along with the quality and effectiveness of the actual implementation. As such, both the planned and unplanned outages affect the overall usability of the total system. SIL views availability as a combination of all outages, i.e., network, hardware, OS, DBMS, etc. The number of outages has been normalized for a 10-platform operation, with both planned and unplanned outages included. Where virtualization has been included in the architecture, each of the virtualized environments has been considered as a separate platform. Each of these outages takes valuable access time away from the corporate resources. The following chart shows the percentage of time that those outages represent and includes all forms of unavailability, irrespective of source.



As shown above, there is a substantial indication of how the PowerVM virtualization contributes to both stability and reliability of an organization's implementation, due to the combination of high performance and native resilience. The three most cited sources of the high availability from customers are:

1. Limited need to reboot the full platform
2. Fewer system patches and updates required
3. Responsiveness of technical support

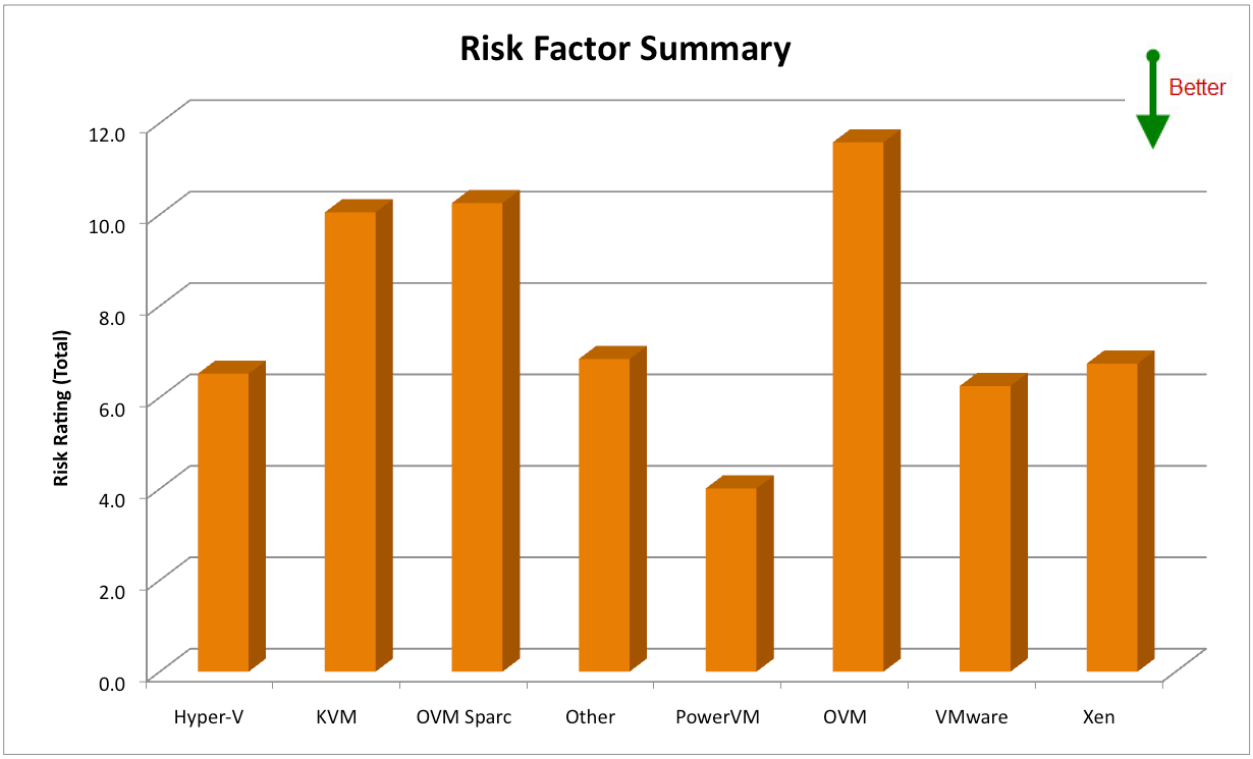
It should be noted that the practices of the individual organization when viewed from a best practices perspective makes a difference in the amount of planned downtime. However, the overall trend in availability is a definite indicator of platform stability.

The cost of that availability is difficult to articulate, primarily because such a cost estimate has significant subjective components. However, a quick analysis of the customer-reported financial impact of outages yields a general metric that provides some interesting insights.

SIL considers risk to be comprised of three components:

- Percentage chance of component failure
- Percentage chance of budget or timeframe overrun
- Potential exposure, expressed as a percentage amount of overall budget or timeframe overrun

These three percentages are added to form the overall risk factor for a scenario. The risk factor summary for the platform scenarios is shown below.

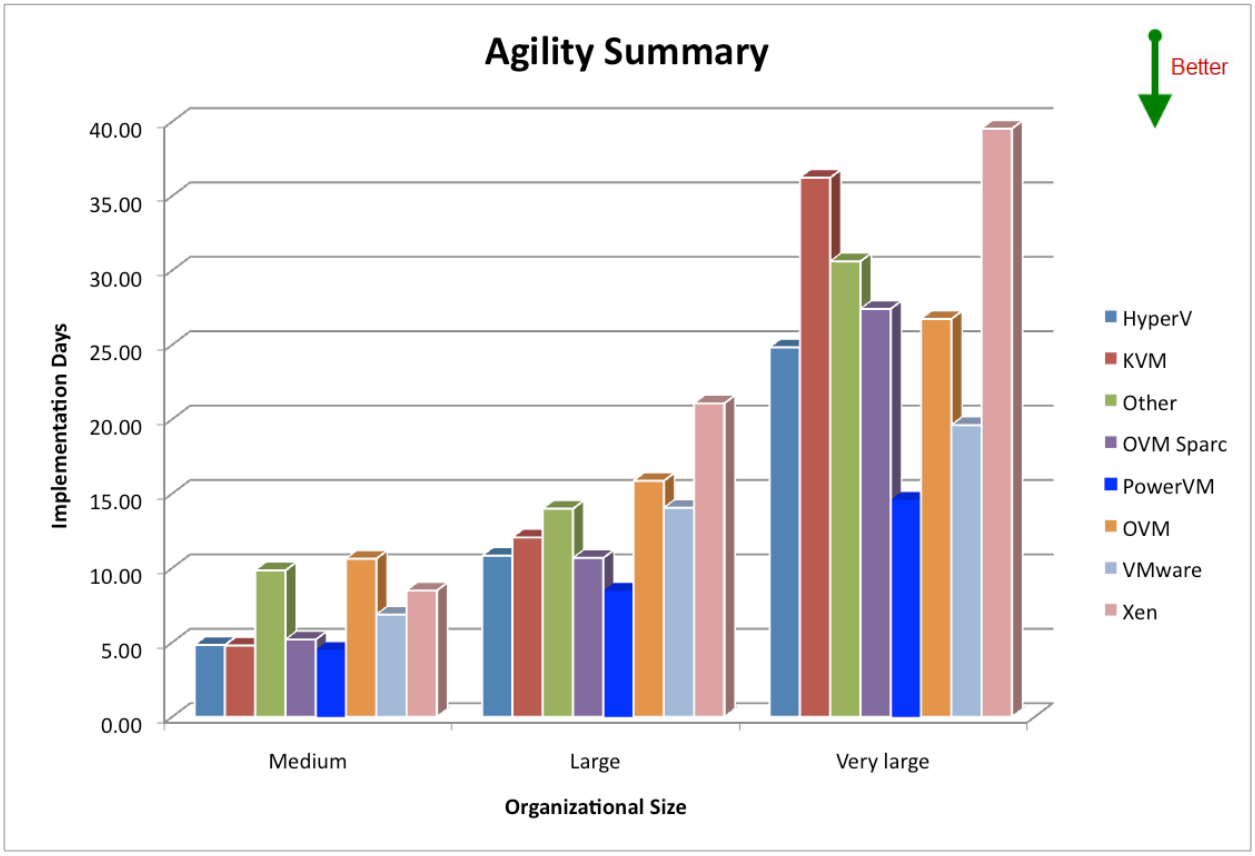


This graph shows that there is demonstrated risk mitigation from the general operations experience when using PowerVM. The risk exposure for PowerVM is significantly smaller than the competition, with PowerVM deployments showing only 1/3rd of the risk that has been reported for other virtualization methods. Much of this lower risk can be attributed to the high resiliency of the deployment and increased efficiency of the resource allocation within the virtualization component itself, which significantly lowers the risk of component failure.

Agility

Agility is defined as the average number of calendar days from the start of an initiative to the start of full production operations for a project. This is NOT staff days or hours, but the actual calendar span, including all weekends, holidays, etc. All of the contributory factors, such as staffing and reliability, radically affect the speed in which a company can move a business concept from inception to market. This nimbleness is a key element of increasing market share and continued corporate viability. While the performance metrics were gathered on the production systems, additional measurements were also collected to track the amount of time that the systems took to

move from initial conception to full production implementation. The results demonstrate a significant increase in agility when platforms running PowerVM virtualized environments were used. This increase in agility has been reported to be as much as 58% faster for the PowerVM systems when compared against the overall study group. This translates into a faster time-to-market for business initiatives. The comparison is intended to be evocative and not quantitative, since other critical success factors, such as management methodology, resource availability, etc., can enter into this picture.



It is apparent from the reported data that there is a definite agility advantage to using PowerVM-deployed systems as compared to the overall experience, especially when organization standards for production system promotion are comprehensive. When asked for specific sources of the agility, the most frequently cited reasons from customers were:

1. Ability to easily shift resources to accommodate new implementations
2. Robust tools set for management over multiple instances
3. Speed of movement from non-production to production environments

The differences in agility can be substantial, with the PowerVM showing faster deployment times by as much as 170.9%. This means literally that a well managed and

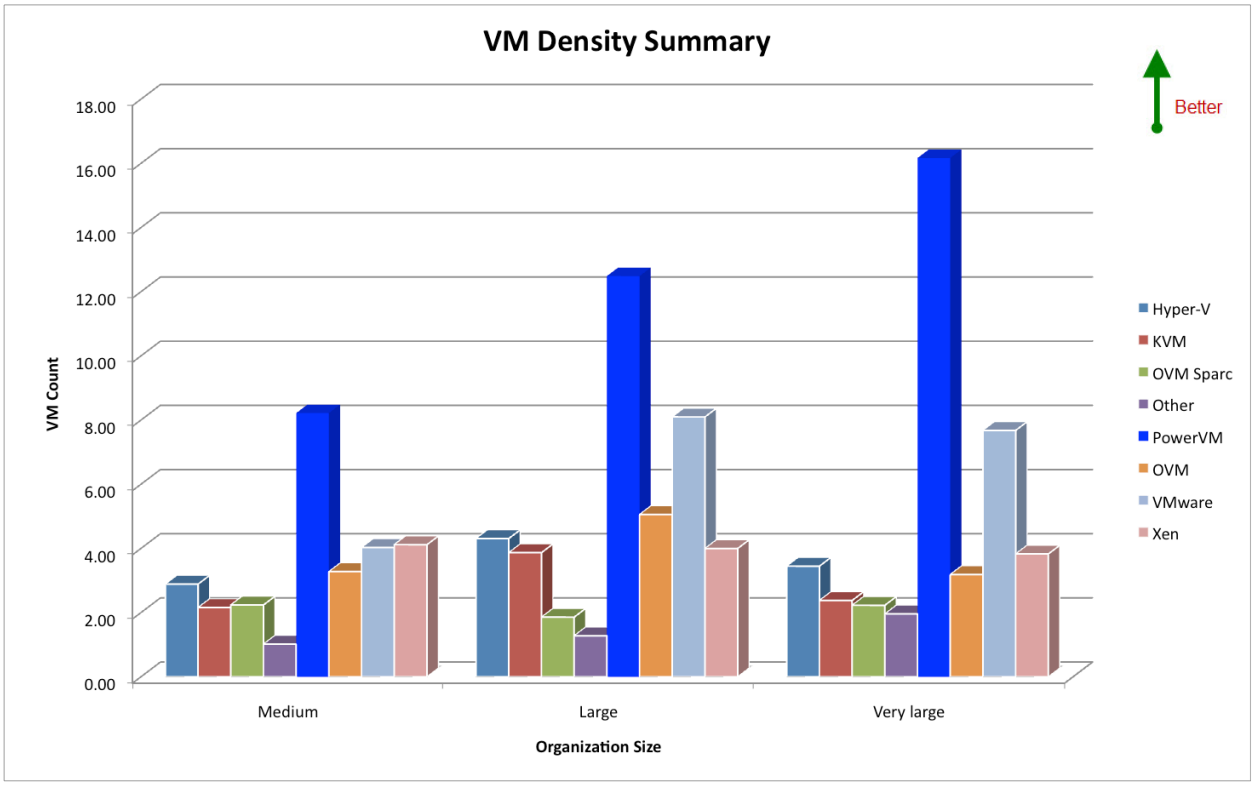
optimally configured IBM PowerVM system is directly associated with faster time-to-market and more rapid response.

2.4. Technical Perspective

One of the main perspectives for this analysis is from the viewpoint of the IT professional. Since IT needs to understand the underlying architecture and important characteristics of any technology, this perspective tends to focus primarily on the objective understanding of what a PowerVM deployment can contribute and will require. This understanding encompasses some basic performance characteristics and operational challenges.

System Efficiency

The ability of the system to fully utilize its resources is a significant technical metric of the value of a particular component in the infrastructure. While one of the key points of virtualization is the amount of efficient usage that can be applied to the extant organizational platforms, an examination of the actual production deployment patterns shows some interesting practices. The density of implementation is shown in the graph below.



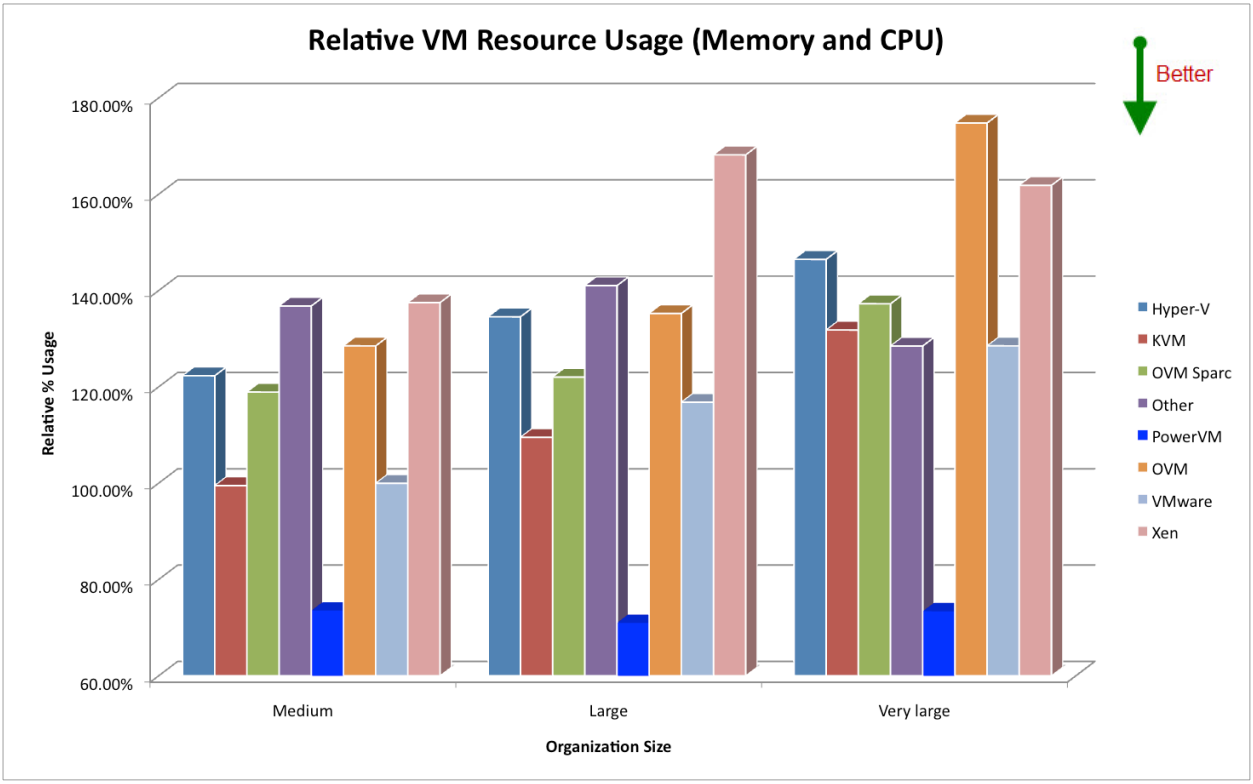
The density of the PowerVM deployments is as much as *6 times* the other platforms. When the reasons for setting the VM density were analyzed, the top three were:

1. Acceptable risk levels (71.3%)
2. Platform performance constraints (70.2%)
3. Organization politics (11.5%)

While the organizational politics are not really pertinent as a technical reason, the first two are especially important for the consideration of a virtualization choice.

The resource utilization per VM provides an interesting view into the technical considerations in this area. The ability of the virtualization method to move resources from one VM to another also comes into play. Effective sharing of resources intra-VM allows the virtualization method to achieve higher levels of overall utilization and load.

In comparisons for this type of metric, the average system utilization is normalized based on the work executed inside of a VM and the cost of a normalized work unit is derived. The cost of this work is then normalized against the set point of a VMware medium-sized implementation.

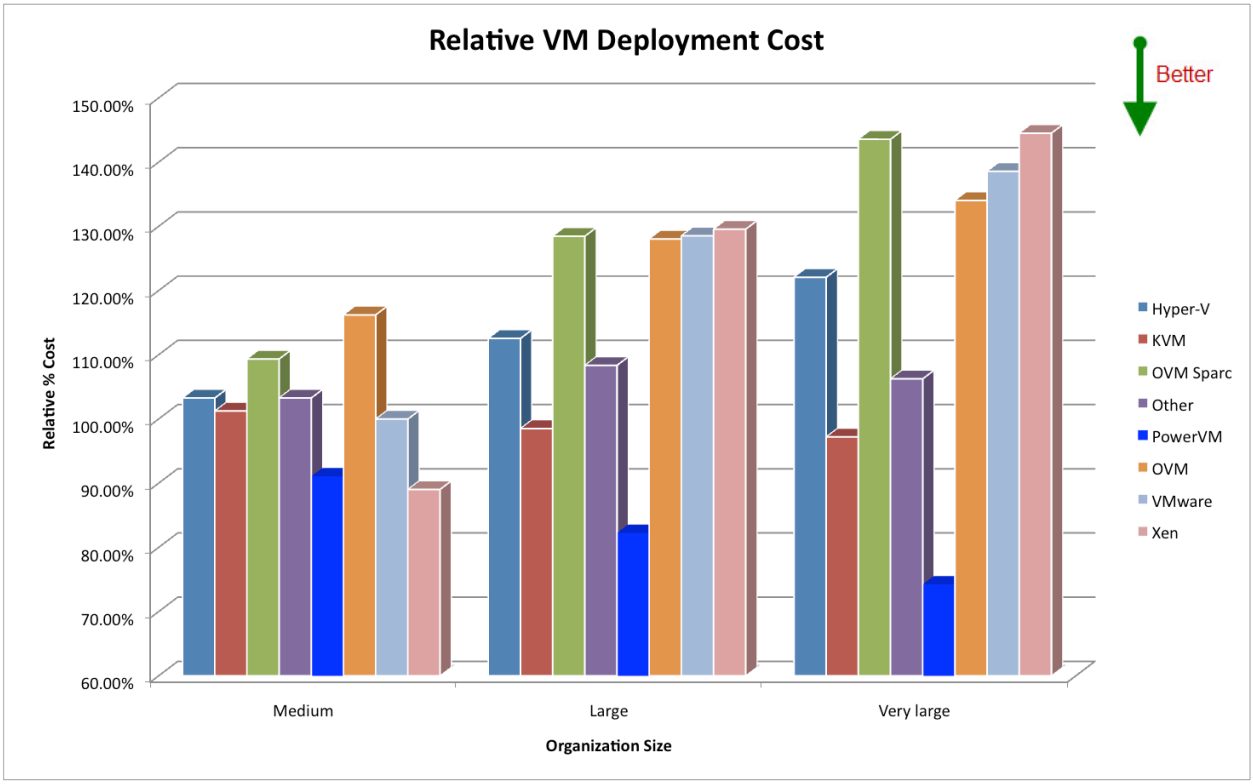


The usage levels of each VM show clear efficiencies for PowerVM in resource utilization – an important consideration if fully leveraged platforms are desired. This advantage is as much as 105% over the competitive offerings.

The cost per work unit for virtualized environments is an indicative metric for those planning a fairly complex environment. In this situation, the resiliency of the underlying architecture is also a substantial contributor to the efficiency of the virtualization methodology.

The cost of deploying each VM is another metric that seems to span both business and technical. These costs include the average cost of platform resource and staff time, but exclude the actual application cost. This is especially important for organizations that have active and volatile non-production environments, since the change in those environments is far higher than that of normal production. When the deployment cost is examined, the comparison is extremely interesting, as can be seen in the chart below.

Once again, these costs are normalized against the set point of a medium-sized VMware deployment.



The cost per work unit for virtualized environments is an indicative metric for those planning a fairly complex environment. In this area, the PowerVM advantage is as much as 2.2 *times* cheaper than other options.

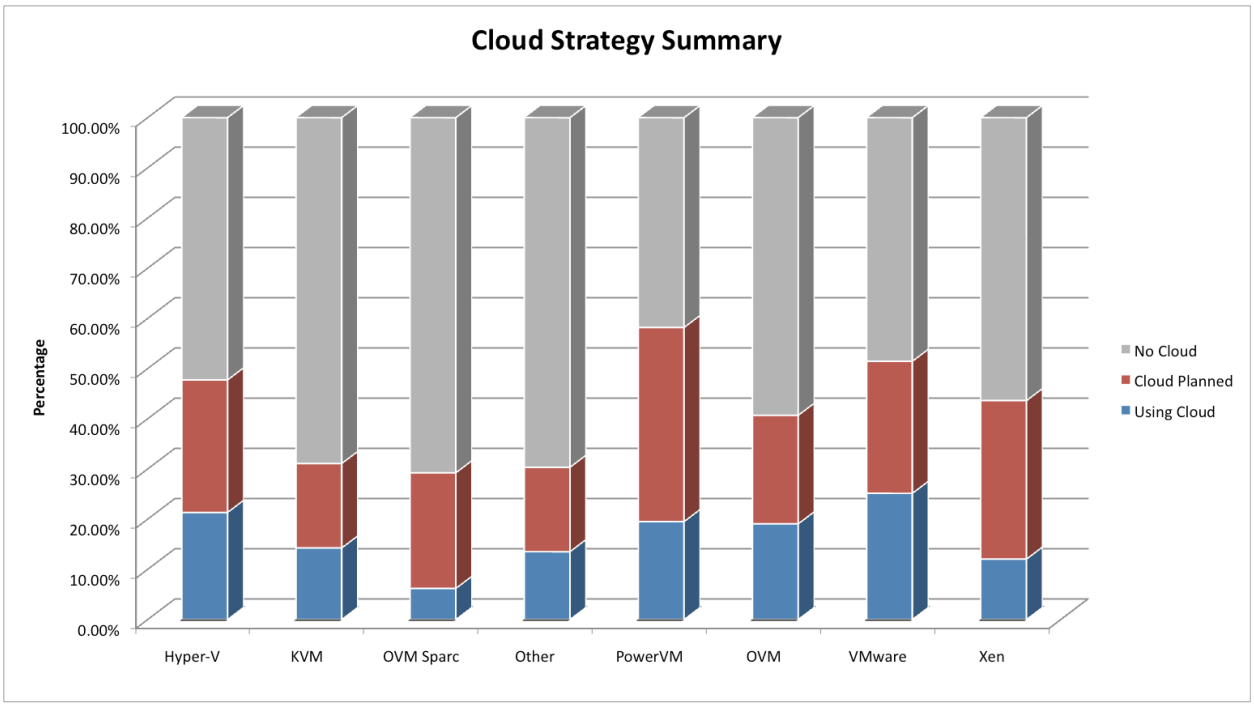
Security

Security is an important part of any virtualization solution, since virtualization concentrates security topology more densely. With the ability to create virtual machines within the same physical platform, the definition of IT security starts to evolve into more than simple access security. The concept of sidewise hacking, where access from one VM to another is broken, like blasting through the walls of an apartment to another within the same building, has started to be a topic of discussion for security personnel everywhere. The protections that the VM software provides have to cover a wider variety of access points than are necessary for security at a whole platform level. In this situation, control over all aspects of processing need to be in place. Many government and secure installations require protection for the allocation and handling of the main IT spheres: I/O, network access, memory management and overall normal execution access. PowerVM has currently no reported incidences of a break in any of the VM security access points, making it unique in the industry.

Cloud Integration

The integration with cloud services is a very common initiative in today's marketplace. With that in mind, part of the study looked at organization deployment on the cloud and

the link the virtualization strategy. In this area there were several points of analysis. The first of these is the customer use of cloud, split out by virtualization method.



The second perspective is which customers have selected their virtualization with cloud deployment (either current or planned) in mind. Of those responding, more than 73% said that cloud was a consideration in selecting their virtualization method.

Both of these perspectives have created an interesting viewpoint into the cloud movement. Since cloud architecture is really a further form of virtualization, the selection of the architectural strategy says a lot about which technology has the robustness to position an organization for the future. In this area, PowerVM clearly has a strong presence.

2.5. Conclusion

The Solitaire Interglobal Ltd. analysis of operating systems shows that there is a substantial advantage to incorporating the IBM PowerVM offering within an organization's IT architecture, based on a broad set of business and performance metrics. The advantages that accompany this inclusion increase the effectiveness of application deployment and translate to real-world positive results experienced and reported by the businesses in this study.

While success can be measured in different ways and looked at from varying perspectives, it could be said that the bottom-line measurement of deployment success is overall customer satisfaction. Customer satisfaction incorporates a wide variety of qualitative and quantitative components, yet it is the simplest summary of how well a deployed system has met organizational expectations. As outlined in the analysis, the customer satisfaction with the PowerVM choice is high in more complex environments, both from a business and from a technical perspective.

The economic benefits of the virtualization choice are also apparent in the control of overall expense. This study has identified critical business and performance metrics that can be used to understand the advantages and key strategies that will help an organization to choose the optimal operating system.

The strong virtualization functions included in the PowerVM offering make a measurable difference. These functions provide the ability to sweep capacity resources to targeted processes, and result in the need for fewer overall system cycles. Coupled with the allocation automation, personnel time, hardware, software, and personnel costs can all be minimized. This produces efficient application deployment and cost-effective expenditures, while displaying a risk profile that is substantially lower than the other solutions examined in this study.

The extensive SIL analysis shows that there is a notable advantage to incorporating the IBM PowerVM virtualization software as part of the IT architecture, based on a broad set of business metrics. The study metrics show an increase in the effectiveness of the IT deployment and translate to real-world positive results experienced and reported by the businesses in this study. Overall, critical effects on staffing, security, integration and satisfaction, as well as impressive reliability makes PowerVM a strong contender for an organization's virtualization choice.

About Solitaire Interglobal Ltd.

Solitaire Interglobal Ltd. (SIL) is an expert services provider that specializes in applied predictive performance modeling. Established in 1978, SIL leverages extensive AI technology and proprietary chaos mathematics to analyze prophetic or forensic scenarios. SIL analysis provides over 4,100 customers worldwide with ongoing risk profiling, performance root cause analysis, environmental impact, capacity management, market trending, defect analysis, application Fourdham efficiency analysis, organizational dynamic leverage identification, as well as cost and expense dissection. SIL also provides RFP certification for vendor responses to government organizations around the world and many commercial firms.

A wide range of commercial and governmental hardware and software providers work with SIL to obtain certification for the performance capabilities and limitations of their offerings. SIL also works with these vendors to improve throughput and scalability for customer deployments and to provide risk profiles and other risk mitigation strategies. SIL has been involved deeply in the establishment of industrial standards and performance certification for the last several decades and has been conducting active information gathering for the Operational Characterization Master Study (OPMS) – chartered to develop better understanding of IT-centric organizational costs and behavioral characteristics. The OPMS has continued to build SIL's heuristic database, currently exceeding 75 PB of information. The increased statistical base has continued to improve SIL accuracy and analytical turnaround to unmatched levels in the industry. Overall, SIL runs over 38,000 models per year in support of both ongoing subscription customers and ad hoc inquiries.

Further Methodology Notes

In order to support the comprehensive nature of this analysis, information from diverse deployments, industries, geographies, and vendors were obtained. In any collection of this type, there is some overlap that occurs, such as when multiple vendors are present at an organization. In such cases, the total of the discrete percentages may exceed 100%. Those organizations with a multi-layered deployment, such as multiple geographical locations or industrial classifications, have been analyzed with discrete breakouts of their feedback for all metrics. Additional filtering was performed to eliminate those implementations that substantially failed to meet best practices. Since the failure rates, poor performance and high costs that appear in a large number of those implementations have little to do with the actual hardware and software choices, these projects were removed from the analytical base of this study.

The industry representation covers manufacturing (20.97%), distribution (18.51%), healthcare (13.96%), retail (5.72%), financial (12.65%), public sector (15.42%), communications (9.54%) and a miscellaneous group (3.24%).

The geographies are also well represented with North and South America providing 40.51% of the reporting organizations, Europe 32.59%, Pacific Rim and Asia 23.13%, Africa 1.12%, and those organizations that do not fit into those geographic divisions reporting 2.65% of the information.

Since strategies and benefits tend to vary by organization size, SIL further groups the organizations by the categories of small, medium, large and extra large. These categories combine the number of employees and the gross annual revenue of the organization. This staff count multiplied by gross revenue creates a metric for definition that is used throughout the analysis. In this definition, a small organization could be expected to have fewer than 100 employees and gross less than $20 million, or a value of 2,000, e.g., 100 (employees) X 20 (million dollars of gross revenue). An organization with 50 employees and gross revenue of $40 million would have the same size rating, and would be grouped in the analysis with the first company. The classifications used by SIL use thresholds of 2,000 (small), 10,000 (medium), 100,000 (large) and 1,000,000 (extra large).

Attributions and Disclaimers

This document was developed with IBM funding. Although the document may utilize publicly available material from various vendors, including IBM, it does not necessarily reflect the positions of such vendors on the issues addressed in this document.