A Practical Guide for Evaluating the Value of Dell EMC Converged Infrastructure for Data Center Modernization

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Forrester Consulting provides independent and objective research-based consulting to help leaders succeed in their organizations. Ranging in scope from a short strategy session to custom projects, Forrester's Consulting services connect you directly with research analysts who apply expert insight to your specific business challenges. For more information, visit forrester.com/consulting.

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Introduction — The Rationale For Private Clouds And Converged Infrastructure

Cloud computing is transforming IT in terms of how services are delivered, how infrastructure is deployed and managed, and how IT organizations structure themselves. For the purposes of this study, Forrester is defining a cloud solution as having three major characteristics: "self-service access, full automation of processes and policies, and metering and tracking of usage."[1] It then becomes a question of whether you manage your cloud(s) yourself, outsource it, or use a hybrid combination of private and public cloud resources.

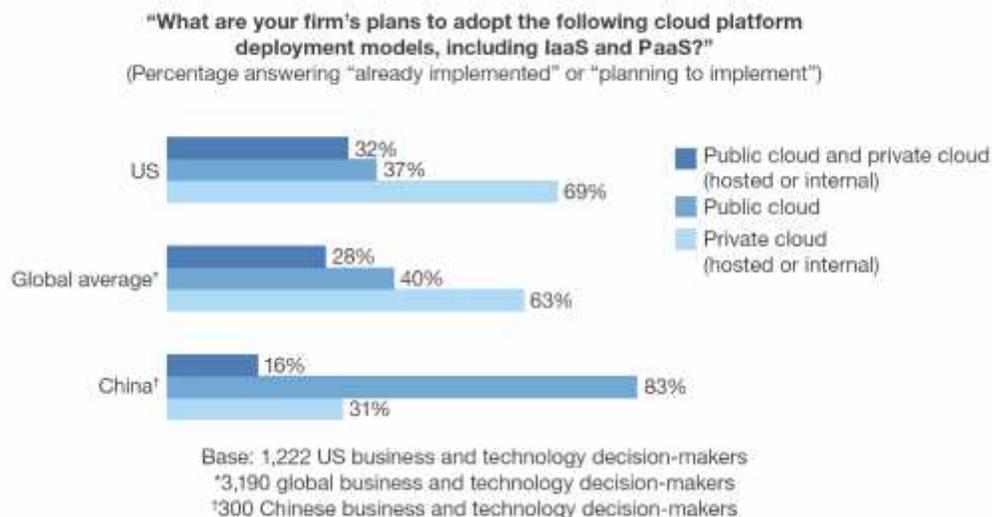The move to cloud computing is being driven by many factors. These include:

› Replacing aging infrastructure that has reliability issues and requires very high costs and efforts to keep it running.

› Simplifying overall infrastructure complexity and adopting greater virtualization.

› Supporting businesses' needs to reduce time-to-market and increase innovation.

› Deploying additional capacity in near real time to support business growth, launch new services/products, and/or streamline expansion into new geographies.

The IT professional is faced with an unprecedented number of alternative approaches to achieve these goals. At one end is using a large, public cloud for some applications such as websites and web apps, and at the other end is the DIY approach of building out their own internal private cloud by cobbling together traditional infrastructure components with cloud management software. Sitting in between these two extremes are converged infrastructure solutions, which are another approach to creating private clouds. Dell EMC is an example of a converged infrastructure private cloud solution. In practice, most companies will have a hybrid approach that combines public and private clouds.

In a 2014 survey (see Figure 1 below), Forrester found that approximately two-thirds of global companies plan to deploy some type of private cloud as part of their overall solution.[2]

FIGURE 1

Public And Private Cloud Adoption

"What are your firm's plans to adopt the following cloud platform deployment models, including IaaS and PaaS?"
(Percentage answering "already implemented" or "planning to implement")

Base: 1,222 US business and technology decision-makers
*3,190 global business and technology decision-makers
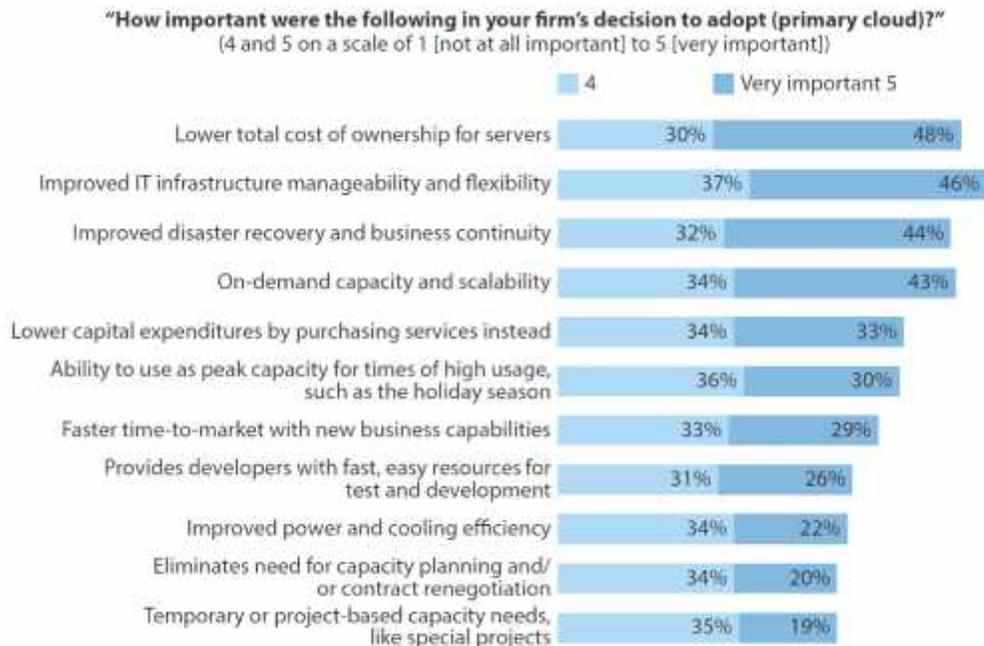†300 Chinese business and technology decision-makers

Source: Forrester Research, Inc.

As stated earlier, there are many reasons to move to the cloud and especially to adopt private clouds. Lower total cost of ownership (TCO) is often cited as the top reason. While this is a very important reason, and in some cases the most

important one, it is by no means the only reason why companies are deploying private clouds. In a Forrester study looking at four different private cloud strategies, a survey of 166 North American companies highlighted many of the benefits.[3]

FIGURE 2

Benefits Associated With Hybrid Clouds

"How important were the following in your firm's decision to adopt (primary cloud)?"
(4 and 5 on a scale of 1 [not at all important] to 5 [very important])

	4	Very important 5
Lower total cost of ownership for servers	30%	48%
Improved IT infrastructure manageability and flexibility	37%	46%
Improved disaster recovery and business continuity	32%	44%
On-demand capacity and scalability	34%	43%
Lower capital expenditures by purchasing services instead	34%	33%
Ability to use as peak capacity for times of high usage, such as the holiday season	36%	30%
Faster time-to-market with new business capabilities	33%	29%
Provides developers with fast, easy resources for test and development	31%	26%
Improved power and cooling efficiency	34%	22%
Eliminates need for capacity planning and/ or contract renegotiation	34%	20%
Temporary or project-based capacity needs, like special projects	35%	19%

Base: 166 IT decision-makers from North American companies with 1,000 or more employees

Source: Forrester Research, Inc.

Once a company has identified that private cloud will be part of its overall solution, it must make the decision to go the DIY route or buy a fully converged infrastructure solution such as Dell EMC. TCO and time-to-value are both major considerations here. In a 2015 study, Forrester wrote: "The fastest path to cloud for most organizations is a fully integrated solution from one of the vendors offering converged private cloud solutions. This approach fast-tracks your 'journey-to-cloud' from a technology standpoint and lets you focus on the organizational and process transformations required to support a true and efficient private cloud."[4]

A Framework For Evaluating Cloud Alternatives

The framework described below can also be used earlier in the cloud journey when making the public versus private versus hybrid cloud decision. Forrester has focused on the private cloud alternatives in this study because that was the analysis undertaken by the interviewed companies that ultimately deployed a Dell EMC converged infrastructure solution.

When moving to private cloud(s), it is very important to evaluate the alternatives and select the approach that best meets your organization's requirements. These needs will vary depending on what the private cloud will be used for. Forrester has identified four high-level use cases: enhanced virtualization, test/dev cloud, public cloud lite, and transformation cloud.[5] For the purposes of this study, we are assuming that the reader is looking to deploy a transformation cloud, which is what Dell EMC converged infrastructure solutions excel at.

FIGURE 3

Four Private Cloud Scenarios

	Enhanced virtualization	Test/dev cloud	Public-cloud-lite	Transformational cloud
Leading the charge:	VP, infrastructure and operations	VP, infrastructure and operations	Manager, application development	CTO, enterprise architect
Benefits:	Improved current state	Deter unauthorized public cloud platform use by providing an internal option for procuring resources quickly.	Quick time-to-market without delay of defining, optimizing, and automating existing processes	Holistically transform the IT organization into a more efficient service from the developer to the infrastructure
Challenges:	It's not a cloud.	Navigating through policies and processes to deliver the speed expectations required by the end user while abstracting complexity from their view	As this environment grows, it can start to make AD&D less effective since it's maintaining systems, etc.	It's expensive, far-reaching, and a tough political challenge.
Cost:	$300,000+	>$50,000	$0 to $100,000	$1M+
Size:	1,000+ VMs	50 to 200 VMs	50 to 200 VMs	1,000+ VMs
Keys to success:	Acknowledge it's a step along the journey to cloud.	Design with the business for the business while using public cloud as the comparison point.	Figure out the best time to hand off the solution to central IT and training of its admins.	Assess current state in order to understand the cost and time required. Automate everything.

Source: Forrester Research, Inc.

Once it is decided that your organization wants to take a transformation approach in order to realize all cloud benefits shown above, it is necessary to put in place a decision framework. As part of Forrester's research into these private cloud strategies, we identified four best practices that make up the first step in evaluating and selecting the best way forward:

› **Identify your priorities.** Begin by clearly articulating what the business objectives are that the private cloud solution will help achieve. Then look at additional technology objectives, such as a desire to consolidate infrastructure or eliminate rogue IT. Lastly, look at what other initiatives — both IT and business — are underway that need to be supported in the private cloud.

› **Define your scope.** Questions to answer include: Is the private cloud initiative being used as a catalyst for overall operational change within the IT organization? Does the IT organization have the depth and control necessary to achieve this, or must other parts of the organization be leveraged? How quickly are you looking to be up and running?

› **Define your budget.** This should be done as part of an overall cost benefit analysis (more on this later). Understanding what money is available for both capex and opex is important before going through a future, more detailed evaluation and selection effort.

› **Develop a short-term plan.** It is important to set early-stage goals and quick wins. This contributes to the ROI of the project and gives the IT and business organizations the proof points needed to continue down the path of full internal cloud adoption.

› **Develop a long-term vision.** Many of the options that will be evaluated can meet the most basic requirements of cloud management and provisioning of resources. It is important to look at the long-term vision and tie that back to the business objectives. A business case around this vision should be built. An important consideration is future flexibility, since these are still early days in the world of cloud computing, and many future initiatives will be built on top of this, such as big data

and machine learning; tighter collaboration with customers, suppliers, and partners; emerging technologies; and new business directions.

These steps set the foundation for an evaluation of the various infrastructure modernization alternatives. The next steps in evaluating alternative infrastructure modernization options include:

› Set a baseline for your existing environment.

› Identify and define the areas where improvements are desired/needed and the target improvements.

› Map each internal/private (and public) cloud modernization option to the desired improvements:

> o Ability to deliver against the overall objectives and priorities — short term and long term.

> o Ease of meeting improvement targets.

> o Alignment with overall IT strategy.

> o Time-to-value.

> o High-level cost/complexity/benefits comparison and budget constraints.

› In Appendix A, we have provided a sample template that you can use for gathering the baseline data, target improvement, and post-implementation data for major categories of the business rationale for new infrastructure.

Completing these activities should result in the top deployment alternative(s) being selected. At this point, it is important to complete a business case. An example of the post-implementation benefits portion of a business case, based on the experiences of Dell EMC Vblock users, is shown in the Real Life Example section of this study. The business case should include more than a TCO calculation since other areas — such as increased business and IT agility, reduced time-to-market, and freeing up IT resources to create more value — may deliver additional benefits that more than offset a pure TCO comparison between the top options. This paper provides guidance on a moderately intensive business-case approach that will be practical and suitable for many organizations and situations. At the other end of the spectrum, Forrester's Total Economic Impact™ (TEI) methodology for a comprehensive business case involves a much more intensive effort that includes:

› All benefits, including: technology savings on hardware, software, and labor (the TCO piece); improved IT security; increased productivity for application developers, business users, etc.; uptime and reliability; spare capacity; reducing future IT investments; and improved business outcomes such as reduced time-to-market.

› All costs, including: initial deployment for internal labor and professional services; ongoing support and maintenance; data center hosting and/or managed service contract costs; training; and other costs to the business such as reorganization efforts.

› All risks (see Appendix B for a definition), including: the cost of the project going over time/over budget; the solution not meeting business needs; and benefits not being as large as forecasted.

› All flexibility outcomes (see Appendix B for a definition) that can be realized and built upon the current solution and investment, including: reducing the time and effort to make system changes in the future; deploying new applications on top of the converged infrastructure; scaling the infrastructure as the business grows; integrating new technologies; and being able to quickly change business processes as market conditions, strategic initiatives, and priorities change.

Using The TEI Business Case Framework — A Real-Life Example

The findings below are based on a Forrester Total Economic Impact study (See Appendix B for methodology details) of Dell EMC Vblock as well as a survey of additional companies that have implemented a Vblock solution. The reader is

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encouraged to use this example, along with the framework outlined above, to quantify the value that Dell EMC converged infrastructure solutions can have on their organization.

INTERVIEWED ORGANIZATIONS

Forrester interviewed three organizations that implemented the Dell EMC solution.

› **Railroad operator.** This North America-based railroad operator, with approximately 15,000 employees. re-platformed its ERP solution onto Vblock Systems as part of a broader effort to bring all IT operations and systems back in-house. Previously, the outsourcing partner was running SAP in a traditional x86 environment. All major applications now run on Vblock Systems.

› **Government agency.** This US federal government agency migrated from an x86 environment to Vblock Systems. This was done as part of an initiative to strengthen shared IT services and significantly improve disaster recovery times. All major applications have been migrated to Vblock Systems. There are approximately 4,200 users.

"We have a long-term strategy to do as much as possible on converged infrastructure solutions. Vblock Systems have delivered better performance and cost savings."

~IT manager

› **IT services company.** This international IT services company has moved its SAP instances to Vblock Systems for internal usage as well as to create SAP hosting offerings for customers, including SAP Hana. The company has more than 70,000 employees around the world. More than 30 customers use the SAP hosted offering.

BENEFITS

The interviewed and surveyed organizations that decided to move their infrastructure and data operations to a private cloud through an investment in the Dell EMC converged infrastructure solution experienced the following benefits. The benefits are based on organizations that were maintaining the components of their network, storage, and server environments in-house.

Application Developer Productivity Increase By 25%

Developers at organizations that run large mixed workload applications benefited from the greater agility and flexibility. The IT teams were able to shift their focus to application delivery and were better able to ensure that business needs and requirements were being met, including rapid provisioning and performance improvements. This shift reduces the need to look externally for resources. Dell EMC converged infrastructure solutions provide a preconfigured and standardized platform that makes it easier and faster for developers to get their ideas to market. Development teams also benefited from both improved system performance and reduced provisioning time, which meant that there was reduced downtime that helped improve their productivity.

Dell EMC converged infrastructure let developers use self-service tools to quickly and easily deploy and configure infrastructure components, which reduces user developer downtime. Traditional DIY environments are not flexible enough to allow for frequent changes demanded by business- and customer-facing applications that require rapid and iterative updates. This resulted in developers spending more of their time on deploying applications and meeting their business user demands. Additionally, developer productivity increased with time savings to build applications with drag-and-drop graphical tools, allowing them to finish development much quicker than before. Interviewed and surveyed organizations estimated that over a three-year period, their application development and developer productivity increased by 25% by using the Dell EMC converged infrastructure solution.

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Infrastructure Cost Avoidance By 20%

A key priority for organizations is to reduce their infrastructure costs as they relate to software usage, storage, and networking. As seen in Figure 1, cost remains an important driver as organizations shift their IT focus to delivering business value while maintaining a check on their data center and infrastructure costs. Our interviews and survey of customers who have implemented Dell EMC converged infrastructure highlights the cost savings that they have achieved through the following benefits.

AVOIDED CAPITAL EXPENSES

A main challenge facing organizations is dealing with their constrained data centers with low asset utilization. With Dell EMC converged infrastructure, organizations can reduce spending on capex purchases of required physical servers and also reduce facility costs. Organizations are also better able to manage their server utilization, which, in turn, helps them make future purchases to meet their business requirements.

"We looked at building a traditional Linux-based solution. The cost of something that performed as well as Vblock would have been much higher."

~IT infrastructure manager

Similar to their efforts to increase utilization of server capacity, organizations were able to reduce the investment required in storage and networking assets as well as software usage. The networking cost savings are a result of organizations reducing their data center footprint and virtualizing networking assets, as well as through avoiding or reducing ISP network costs. Based on Forrester's interviews with Dell EMC customers, we estimated that organizations saved on their overall server, storage, and software spend by Year 3.

VIRTUALIZATION

Virtualization technology through Dell EMC converged infrastructure allows for multiple virtual machines on a single physical machine, which reduces the hardware and power costs experienced by organizations.

RESOURCE UTILIZATION

The ability to pool IT resources in a private cloud architecture and quickly provision resources to meet the demands of computing workloads results in cost savings. Additionally, the self-provisioning benefits of Dell EMC Vblock Systems reduce system administration costs associated with managing infrastructure and maintaining web servers, middleware software, and systems. Self-service capabilities combined with faster and easier provisioning of infrastructure resources enhances the cost savings realized by the organization.

Forrester interviews and surveys of Dell EMC customers highlight that organizations were able to save or avoid 20% in infrastructure costs related to servers, storage, networking, and ongoing maintenance that would have been required to purchase and maintain by a do-it-yourself equivalent solution.

IT Operation Efficiency Increase By 30%

Organizations that invested in the Dell EMC converged infrastructure solution experienced a much easier way for their IT operations, including developers, to consume resources. Prior to their investment, organizations claimed they had highly complex and constrained data centers that were managed in silos. This was a result of manual processes that caused delays and made business users often overlook their own IT department and seek
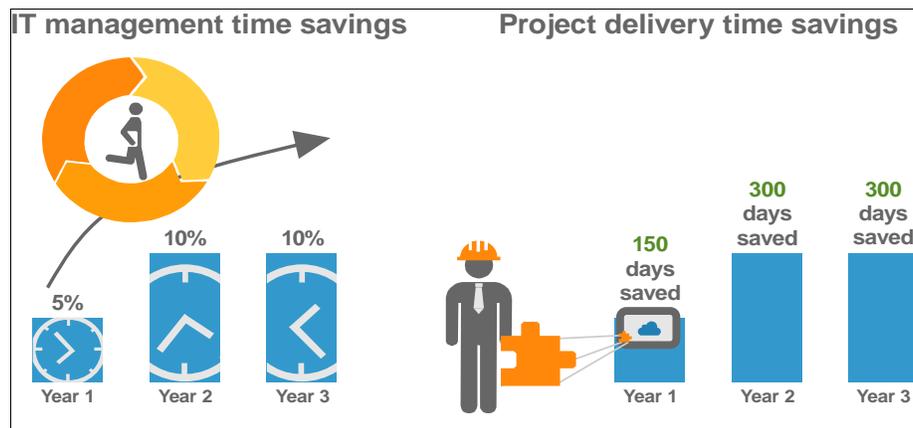
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external resources. With Dell EMC converged infrastructure, IT teams could meet their business needs by focusing on asset consolidation, virtualization, and resource pooling.

With Dell EMC converged infrastructure solutions, organizations were able to start automating IT processes associated with management and provisioning. Dell EMC converged infrastructure private cloud computing simplifies provisioning and scaling up and down resources through automation and easy-to-use web consoles and APIs. The efficiency of computing through an on-premises private cloud reduces the amount of time an IT systems administrator has to spend on managing and supporting infrastructure and increases the ratio of servers to administrators needed to provide support in your data center. Additionally, automation capabilities through Dell EMC converged infrastructure solutions allow for increased efficiency of requesting and provisioning resources to scale an existing application or build out a new functionality. Organizations estimated that over a three-year period, they saw overall time savings for their application owners and IT managers increase by 5% to 10%. Organizations were able to standardize platforms for application developers with additional services for the development and hosting of cloud applications. Organizations estimated that these additional improvements resulted in 300 days of savings per project by years 2 and 3 (see Figure 4.)

Forrester interviews and surveys of Dell EMC customers revealed that organizations increased their IT operating efficiencies by 30%.

FIGURE 4

IT Management And Project Delivery Efficiencies From Dell EMC Converged Infrastructure

Source: Forrester Research, Inc.

Business Productivity Increase By 5% To 10%

Interviewed and surveyed organizations claimed that improvements in IT performance and processes directly increase end user productivity and drive business value. Through the Dell EMC converged infrastructure solution, business requirements are met quickly, which reduces the burden of the organization to look for external resources. Business users benefit from having more reliable applications, faster time-to-market of new applications and projects, and reduced downtime that drives business value. Readers are encouraged to consider how system and process improvements will likely have an impact on their organization.

Forrester interviews and surveys of Dell EMC customers revealed that organizations increased their end user and business productivity between 5% and 10% over three years.

Security And Compliance Costs Reduction By 15% To 20%

Dell EMC converged infrastructure solutions make internal IT services easier to use and more reliable, which leads to business users adopting private cloud resources before looking externally. This allows for organizations to maintain greater control over the security of sensitive data. Applications where performance is critical or data needs to be extremely secure can be hosted in the private cloud behind the organization's firewall while still providing the benefits and usage model of a public cloud. This results in reduced security and compliance breaches for organizations.

Forrester interviews and surveys of Dell EMC customers revealed that organizations reduced their data security and compliance costs by 15% to 20% over three years through their investment in Dell EMC converged infrastructure solutions.

COSTS

The interviewed and surveyed organizations that decided to move their infrastructure and data operations to a private cloud through an investment in the Dell EMC converged infrastructure solution experienced the following costs. The costs are based on organizations that were maintaining the components of their network, storage, and server environments in-house.

The time to fully deploy your applications onto Vblock Systems can vary depending on the total size of deployment, such as the number of users and the number of IT resources available. Interviews and survey results of Dell EMC customers revealed that the time and cost of installing the Dell EMC converged infrastructure solution will still be less than the time and cost required to design and install a DIY server solution.

These represent the mix of internal and external costs experienced by the interviewed organizations for initial planning, implementation, and ongoing maintenance associated with the solution. There is no line-item cost for the IT operations team's ongoing support, since this is a lower cost than would be required with a traditional DIY upgrade that would include purchasing, installing, testing, and maintaining components of compute, network, and storage.

The following cost categories apply whether deploying a pre-assembled Dell EMC Vblock or deploying an in-house build of separate storage, compute, networking, and virtualization components.

Implementation Costs: Internal Labor

Internal labor is required to test and migrate current applications and platforms onto new infrastructure.

Professional Services

Professional services are often employed to update existing applications and migrate them onto new infrastructure. External consultants are also used to optimize organizations' business processes and train internal resources on the operation of new infrastructure.

Hardware And Site Costs

Organizations typically invest in hardware for both the primary data center and the disaster recovery location. There is a cost for annual maintenance and support and data center housing costs, including space, cooling, and power.

CONCLUSIONS

Moving to a Dell EMC Vblock converged infrastructure solution creates many benefits for organizations. IT costs are reduced, and the infrastructure and operations organization becomes more flexible and efficient. Application developers become more productive, and business users do as well. Figure 5 shows the key findings.

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Financial Summary Showing Three-Year Risk-Adjusted Results

App developer productivity: ↑25%	Infrastructure cost: ↓20%	IT operation efficiency: ↑30%	Business productivity: ↑5% to 10%	Security and compliance cost: ↓15% to 20%

Source: Forrester Research, Inc.

The Dell EMC Converged Infrastructure Solution: Overview

The following information is provided by Dell EMC. Forrester has not validated any claims and does not endorse Dell EMC or its offerings.

DESCRIPTION OF DELL EMC CONVERGED SYSTEMS

Custom-configured Dell EMC converged systems are typically delivered in 45 days from purchase order. Dell EMC systems are extensively engineered and tuned to optimize interoperability between components. They are delivered as a fully assembled, pre-tested, and pre-validated combination of compute, storage, network, and virtualization. With Dell EMC's onsite delivery and integration services, systems are typically ready for go-live operations within days after delivery to a customer site. Do-it-yourself in-house purchase, assembly, testing, and validation for comparable systems usually require many more months and the employment of substantially more internal staff hours and/or external resources. Dell EMC provides one-call support for the entire system. Dell EMC's release certification matrix process provides a step-by-step guide to sustain performance through software upgrades that are pre-tested for compatibility across the entire system. Vision system management software provides big picture and granular data on system health, compliance with policies and releases, and security settings.

Dell EMC offers the broadest portfolio of converged systems including converged infrastructure (Vblocks), hyper-converged rack systems (VxRack) and hyper-converged appliances (VxRail and XC Series). Dell EMC offers hybrid cloud solutions, big data solutions, platform-as-a-service solutions, end user computing solutions, hosted private cloud solutions (Virtustream, vCloudAir), and managed cloud options.

ABOUT DELL EMC

Dell EMC is the world market leader in converged infrastructure and converged solutions. Through Dell EMC Converged Infrastructure and Solutions, Dell EMC accelerates the adoption of converged infrastructure and cloud-based computing models that reduce IT costs while improving time to market. Dell EMC delivers the industry's only fully integrated and virtualized cloud infrastructure systems, allowing customers to focus on business innovation instead of integrating, validating, and managing IT infrastructure. Dell EMC solutions are available through an extensive partner network.

For more information, go to dellemc.com/ci.

To learn more, contact your local representative or authorized reseller.

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Appendix A: Value Capture Template

To define goals and evaluate results, the reader can use this template to gather baseline metrics, desired improvements, and actual results for categories of target improvement. Add columns to evaluate at six months and at years 1, 2, and 3.

Baseline, Target, and Actual Improvement From Infrastructure Modernization	Baseline Metric Existing System (As of: date here)	Target Improvement Percent From New System	New System Actual Metric (Indicate timeframe: six months, years 1, 2, 3)	Actual Percent Improvement Realized
IT staff dedicated to managing servers, storage, networks, and applications				
Total IT full-time equivalent (FTE)				
FTEs for server management, deployment				
FTEs for storage management, deployment				
FTEs for network-related management				
Total FTEs for server + storage + network				
Percentage of total IT staff time required to maintain systems, "keeping the lights on"				
FTEs for application development, deployment				
Unplanned downtime				
Number of downtime incidents/month				
Average time-to-downtime-resolution (hours)				
Average revenue loss ($) per downtime incident or per hour of downtime				
Development and deployment for external applications				
Application development team — number of FTEs				
Number of apps developed/deployed				
Average time in weeks to develop/deploy app				
Data center facilities-related costs				
Power costs ($/year)				
Cooling costs ($/year)				
Facilities costs ($/year)				
Security costs ($/year)				

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	Baseline Metric (As of: date here)	Target Improvement Percent From New System	New System Actual Metric (Indicate timeframe: six months, years 1, 2, 3)	Actual Percent Improvement Realized
Business benefits				
Time-to-market to build and deliver new services (e.g., cloud, mobility, big data) in months				
Scalability: time required to get additional storage, compute, or network into live operation				
Time to provision new development project in days				
Time to provision new application in production				
Customer satisfaction: percent with high rating				
Other: industry-specific business metrics				
Other: business-specific productivity metrics				

Initial Deployment	Dell EMC Converged Infrastructure Deployment	Deployment Of DIY (Purchase and assembly of storage, compute, network, virtualization)
Deployment time and investment		
Deployment time (months)		
Employees required for deployment/% of their time		
Other costs associated with deployment ($)		

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Appendix B: Total Economic Impact™ Overview

Total Economic Impact is a methodology developed by Forrester Research that enhances a company's technology decision-making processes and assists vendors in communicating the value proposition of their products and services to clients. The TEI methodology helps companies demonstrate, justify, and realize the tangible value of IT initiatives to both senior management and other key business stakeholders. TEI assists technology vendors in winning, serving, and retaining customers.

The TEI methodology consists of four components to evaluate investment value: benefits, costs, flexibility, and risks.

BENEFITS

Benefits represent the value delivered to the user organization — IT and/or business units — by the proposed product or project. Often, product or project justification exercises focus just on IT cost and cost reduction, leaving little room to analyze the effect of the technology on the entire organization. The TEI methodology and the resulting financial model place equal weight on the measure of benefits and the measure of costs, allowing for a full examination of the effect of the technology on the entire organization. Calculation of benefit estimates involves a clear dialogue with the user organization to understand the specific value that is created. In addition, Forrester also requires that there be a clear line of accountability established between the measurement and justification of benefit estimates after the project has been completed. This ensures that benefit estimates tie back directly to the bottom line.

COSTS

Costs represent the investment necessary to capture the value, or benefits, of the proposed project. IT or the business units may incur costs in the form of fully burdened labor, subcontractors, or materials. Costs consider all the investments and expenses necessary to deliver the proposed value. In addition, the cost category within TEI captures any incremental costs over the existing environment for ongoing costs associated with the solution. All costs must be tied to the benefits that are created.

FLEXIBILITY

Within the TEI methodology, direct benefits represent one part of the investment value. While direct benefits can typically be the primary way to justify a project, Forrester believes that organizations should be able to measure the strategic value of an investment. Flexibility represents the value that can be obtained for some future additional investment building on top of the initial investment already made. For instance, an investment in an enterprise wide upgrade of an office productivity suite can potentially increase standardization (to increase efficiency) and reduce licensing costs. However, an embedded collaboration feature may translate to greater worker productivity if activated. The collaboration can only be used with additional investment in training at some future point. However, having the ability to capture that benefit has a PV that can be estimated. The flexibility component of TEI captures that value.

RISKS

Risks measure the uncertainty of benefit and cost estimates contained within the investment. Uncertainty is measured in two ways: 1) the likelihood that the cost and benefit estimates will meet the original projections and 2) the likelihood that the estimates will be measured and tracked over time. TEI risk factors are based on a probability density function known as "triangular distribution" to the values entered. At a minimum, three values are calculated to estimate the risk factor around each cost and benefit.

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Appendix C: Disclosures And TEI Methodology

DISCLOSURES

The reader should be aware of the following:

› The study is commissioned by Dell EMC and delivered by Forrester Consulting. It is not meant to be used as a competitive analysis.

› Forrester makes no assumptions as to the potential return on investment that other organizations will receive. Forrester strongly advises that readers use their own estimates within the framework provided in the report to determine the appropriateness of an investment in Vblock Systems for SAP.

› Dell EMC reviewed and provided feedback to Forrester, but Forrester maintains editorial control over the study and its findings and does not accept changes to the study that contradict Forrester's findings or obscure the meaning of the study.

› The customer names for the interviews were provided by Dell EMC. Dell EMC did not participate in customer interviews.

TEI FRAMEWORK AND METHODOLOGY

From the information provided in the interviews, Forrester has constructed a TEI framework for those organizations considering implementing core SAP deployments on Vblock Systems. The objective of the framework is to identify the cost, benefit, flexibility, and risk factors that affect the investment decision.

Forrester took a multistep approach to evaluate the impact that physical-to-virtual (P2V) migrations of SAP to Vblock Systems can have on an organization. Specifically, we:

› Interviewed Dell EMC marketing personnel, along with Forrester analysts, to gather data relative to Vblock Systems and the marketplace for converged infrastructure solutions.

› Interviewed and surveyed large SAP footprint organizations currently using Vblock Systems to obtain data with respect to costs, benefits, and risks.

› Constructed a financial model representative of the interviews using the TEI methodology. The financial model is populated with the cost and benefit data obtained from the interviews.

Forrester employed four fundamental elements of TEI in modeling converging SAP landscapes on Vblock Systems: **benefits**, **costs**, **flexibility**, and **risks**.

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Appendix D: Forrester And The Age Of The Customer

Your technology-empowered customers now know more than you do about your products and services, pricing, and reputation. Your competitors can copy or undermine the moves you take to compete. The only way to win, serve, and retain customers is to become customer-obsessed.

A customer-obsessed enterprise focuses its strategy, energy, and budget on processes that enhance knowledge of and engagement with customers and prioritizes these over maintaining traditional competitive barriers.

CMOs and CIOs must work together to create this companywide transformation.
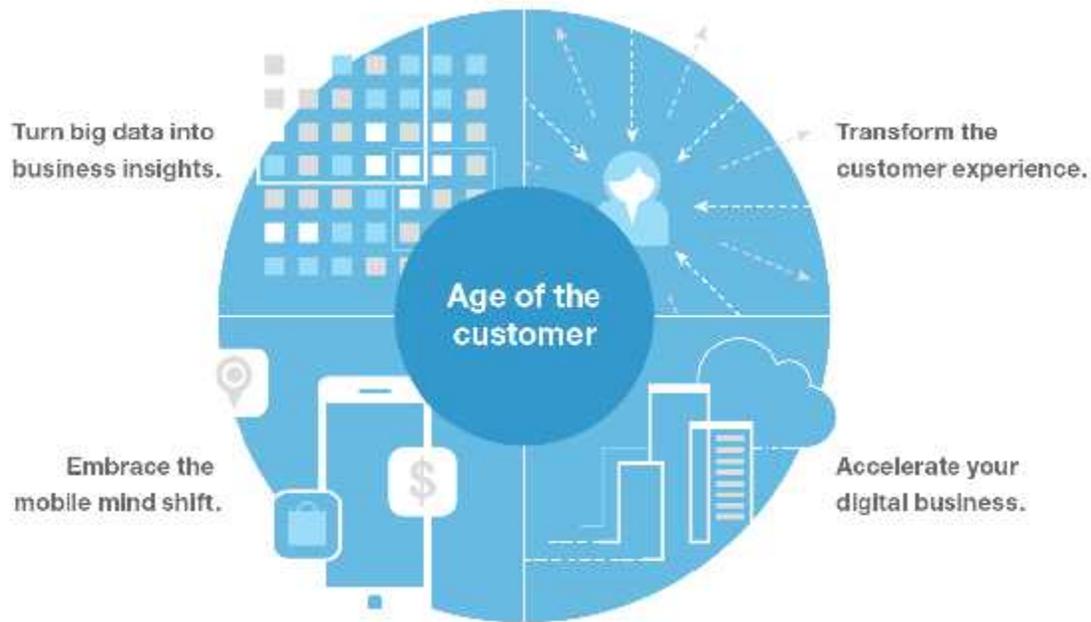
Forrester has a four-part blueprint for strategy in the age of the customer, including the following imperatives to help establish new competitive advantages:

Transform the customer experience to gain sustainable competitive advantage.

Accelerate your digital business with new technology strategies that fuel business growth.

Embrace the mobile mind shift by giving customers what they want, when they want it.

Turn (big) data into business insights through innovative analytics.

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Appendix E: Glossary

Discount rate: The interest rate used in cash flow analysis to take into account the time value of money. Companies set their own discount rate based on their business and investment environment. Forrester assumes a yearly discount rate of 10% for this analysis. Organizations typically use discount rates between 8% and 16% based on their current environment. Readers are urged to consult their respective organizations to determine the most appropriate discount rate to use in their own environment.

Net present value (NPV): The present or current value of (discounted) future net cash flows given an interest rate (the discount rate). A positive project NPV normally indicates that the investment should be made, unless other projects have higher NPVs.

Present value (PV): The present or current value of (discounted) cost and benefit estimates given at an interest rate (the discount rate). The PV of costs and benefits feed into the total NPV of cash flows.

Payback period: The breakeven point for an investment. This is the point in time at which net benefits (benefits minus costs) equal initial investment or cost.

Return on investment (ROI): A measure of a project's expected return in percentage terms. ROI is calculated by dividing net benefits (benefits minus costs) by costs.

Internal rate of return (IRR): The interest rate that will bring a series of cash flows (positive and negative) to an NPV of zero.

Appendix F: Endnotes

[1] Source: "Four Common Private Cloud Strategies," Forrester Research, Inc., October 28, 2013.

[2] Source: "Architect Hybrid Cloud Management To Boost Your Digital Business," Forrester Research, Inc., August 25, 2015.

[3] Source: "Four Common Private Cloud Strategies," Forrester Research, Inc., October 28, 2013.

[4] Source: "Vendor Landscape: Converged Infrastructure-Based Private Cloud Solutions," Forrester Research, Inc., June 10, 2015.

[5] Source: "Four Common Private Cloud Strategies," Forrester Research, Inc., October 28, 2013.

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