Assessing the Financial Impact of Downtime

Understand the factors that contribute to the cost of downtime and accurately calculate its total cost in your organization.

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Introduction

Fiduciary responsibility. Due diligence. Such are the key watchwords for businesses everywhere. Indeed, these simple phrases are in fact the core concepts underlying regulations that cover stockholder rights, contracts for merger and acquisition, and many other areas of business conduct.

With the ever-increasing reliance of businesses upon their IT systems and electronically stored business data comes an equivalent increase in management's duty to ensure due diligence and fiduciary responsibility with respect to protecting them against all causes of loss or damage. The potential costs of failing to do so can be enormous.

This white paper will address the assessment of threats to your IT operations, inclusive of systems, applications, and data, and will guide you through the process of developing solid numbers around the potential costs they represent.

Often, High Availability is considered only as "an insurance policy." But, like product quality, High Availability not only mitigates risk, it provides positive operational ROI

Hidden Financial Risk

According to Dunn & Bradstreet, 59% of Fortune 500 companies experience a minimum of 1.6 hours of downtime per week. To put this in perspective, assume that an average Fortune 500 company has 10,000 employees who are paid an average of $56 per hour, including benefits ($40 per hour salary + $16 per hour in benefits). Just the labor component of downtime costs for such a company would be $896,000 weekly, which translates into more than $46 million per year.

Of course, this assumes that everyone in the company would be forced to stop all work in a downtime scenario, and that may not be so. But, since the operations of many companies are increasingly knit together by their information technology, system downtime now hampers the productivity of almost everyone in the organization, and completely sidelines a significant and growing percentage of them.

While some insurance providers offer coverage to reimburse companies for sales revenue lost during unplanned server outages, typically, these policies do not cover any other expense besides lost sales. Facilities Management operations often hold these types of policies to lessen their exposure.

Insurers train underwriters to be experts at assessing risk and extrapolating potential losses. IT managers, on the other hand, typically do not have the tools and experience needed to assess the real risks involved. If your organization stands to lose money and goodwill if a core component of its information management system fails, or if it is difficult to find a window of time to bring the system down for upgrades or modifications, then the tools presented in this paper will help you understand and even quantify your costs attributable to the time that a critical IT system is offline.

With users of these systems having more tools and information available to them, overall demand for CPU ticks is increasing. Without time to spare, users tend to take uninterrupted access to these systems for granted. But periodic interruptions in availability are a fact of life, and therefore, the need to have systems continuously available is colliding with other business objectives that call for the conservancy of assets.

To be clear, the great majority of system and data unavailability is the result of planned downtime that occurs due to required maintenance. But although unplanned downtime accounts for only about 10% of all downtime, its unexpected nature means that any single downtime incident may be more damaging to the enterprise, physically and financially, than many occurrences of planned downtime. Understanding your cost of downtime is therefore critical in either case.

Did You Know?

As much as 90% of downtime results from planned or predictable events. Disaster planning is essential, but it is only the first step to High Availability

Downtime Threat Analysis

Before you can calculate downtime costs, you need to know its sources. And not all of them are strict IT issues. To begin with, it is important that you identify and understand both your internal and external downtime threats. What has the potential to take your business down? The threats to your business could include natural events as well as man-made events, "weather and wires."

Spend time thinking about what could actually happen and plan accordingly. There could be accidental as well as planned events that could cause or contribute to systems and business downtime. Some events may be within your control while others are not. Some events, like hurricanes, will give you ample warning; some events, like a server power supply burnout or RAID controller crash, may happen quickly and give you very little time to react. Sadly, you'll also need to consider extreme external events, including terrorism, or regional disasters, such as widespread power failures or the collapse of a key bridge in a metro area. Such events can impact employee availability and safety, power and data line availability, etc.

Once you catalog events and conditions that could affect you, be sure to set up processes for real-time monitoring and information gathering for external threats. This can be as simple as signing up for emails or alerts from local weather stations so that you are made aware of impending weather events. With some types of events, you will need to be able to determine with certainty the likelihood of the event as well as to consider the potential severity, in order to properly plan for response.

Also, be sure to consider and plan for "what happens next," in the days and weeks following an event. For example, if you must move locations when a disaster occurs, be sure to plan for how to establish and maintain proper security for users or for devices attaching to a new server while in a temporary environment.

Fast Track: Downtime Threat Analysis
1. Identify threats from both internal and external sources:
   - Natural, man-made, technological, or political disasters.
   - Accidental versus intentional.
   - Internal versus external.
   - Controllable risks versus those beyond the organization's control.
   - Events with prior warnings versus those with no prior warnings.

2. Determine the probability of each event:
   - Create methods of information gathering on each event.
   - Identify information sources.
   - Assess and assign a credibility factor to each information source.
   - Develop a suitable method to evaluate probability versus severity.

3. Identify the relevant key security, legislative or compliance issues.

4. Establish a cost to be associated with each compliance issue.

5. Establish processes to re-evaluate downtime threats on an ongoing basis.

Downtime Costs

IT outages, planned or unplanned, can unleash a procession of costs and consequences that are direct and indirect, tangible and intangible, short term and long term, immediate and far reaching. These costs include:

Tangible/Direct Costs
- Lost transaction revenue.
- Lost wages.
- Lost inventory.
- Remedial labor costs.
- Marketing costs.
- Bank fees.
- Legal penalties from not delivering on service level agreements.

Intangible/Indirect Costs
- Lost business opportunities.
- Loss of employees and/or employee morale.
- Decrease in stock value.
- Loss of customer/partner goodwill.
- Brand damage.
- Driving business to competitors.
- Bad publicity/press.

The cost that may be assignable to each hour of downtime varies widely depending upon the nature of your business, the size of your company, and the criticality of your IT systems to primary revenue generating processes. For instance, a global financial services firm may lose millions of dollars for every hour of downtime, whereas a small manufacturer that uses IT as an administrative tool would lose only a margin of productivity.

Exposure by Industry

On average, businesses lose between $84,000 and $108,000 (US) for every hour of IT system downtime, according to estimates from studies and surveys performed by IT industry analyst firms. In addition, financial services, telecommunications, manufacturing and energy lead the list of industries with a high rate of revenue loss during IT downtime.

Typical Hourly Cost of Downtime by Industry (in US Dollars)

Brokerage Service	6.48 million
Energy	2.8 million
Telecom	2.0 million
Manufacturing	1.6 million
Retail	1.1 million
Health Care	636,000
Media	90,000

Sources: Network Computing, the Meta Group and Contingency Planning Research.
All figures in U.S. dollars

The Opportunity Cost of Downtime

While idled labor and lower productivity costs may seem to be the most substantial cost of downtime, any true cost of downtime estimate should include the value of the opportunities that were lost when the applications were not available.

For example, consider a company that averages a gross profit margin of $100,000 per hour from web and telemarketing sales. If its order-processing systems crash for an hour, making it impossible to take orders, what is the cost of the outage? The easy, but erroneous, answer would be $100,000. Some customers will be persistent and call or click back at another time. Sales to them are not lost; cash flow is simply delayed. However, some prospects and customers will give up and go to a competitor.

Still, the value of the purchases that these customers would have made during the outage likely underestimates the loss to the company because a satisfied customer can become a loyal customer. Dissatisfied customers, or prospects that never become customers, do not. Consider a prospect who would have made an immediate $100 purchase and then repeated that purchase once a year. Using a standard discounted cash-flow rate of 15 percent, the present value of those purchases over a 20-year period is $719.82. In this example, the company's loss is more than seven times the value of the first lost sale. (A lower discount rate produces an even higher value.)

"Knowledge is Power." The more fully you explore your downtime vulnerabilities, the moreclearly you will see the value of managing both planned and unplanned downtime.

Downtime and Business Impact Analysis

A business impact analysis is a good framework within which to understand and calculate downtime costs. The central task is to identify your critical business functions, based upon data or application integrity and the sensitivity of each to downtime. You will want to determine the maximum outage time that each specific critical business function can sustain before the business is impacted. Considering the impacts of both long and short-term outages will help you determine what the recovery objective should be for each business function.

Once you have determined where your downtime vulnerabilities are, you will be better able to identify the costs associated with that downtime as well as its overall impact to the business. With that knowledge in hand, you will be better able to define the ROI of various solutions or tactics needed to reduce the costs incurred during business function outages or, preferably, to avoid them all together.

9 Steps to Business Impact Assessment
1. Identify critical business functions based on data/application integrity and time sensitivity to downtime.
2. Determine the maximum outage that a specific business function can sustain before it impacts the business.
3. Determine the costs associated with the various disruption scenarios.
4. Identify the financial (revenue), productivity (expenses) and personal impact (good-will) of a business function disruption.
5. Assess both long-term (permanent) and short-term outages or disruptions.
6. Determine the recovery priority of each business function.
7. Identify the most critical or vital data and the resources required to resume a business function.
8. Define alternatives to sustain continuity.
9. Define the various solutions/tactics that can be used to reduce or eliminate the costs of a business function outage.

Determining the Cost of Downtime

While it is difficult to precisely calculate a definitive cost of downtime, the following steps will help you develop a very close estimate.

Understand Your Current Reliability

One way to project the number of hours that a system may be down unexpectedly each year is to estimate the system's reliability. This does not equate to the reliability numbers provided by hardware vendors because a system depends on a combination of hardware, software and networking components. To use a network-based system, at a minimum, all of the following must work:

- Power supplies.
- Central processing units (in all relevant servers and client computers).
- Operating systems running all participating systems.
- Server disk drives.
- Database management system on the servers.
- Application software.
- Network switching and routing devices.
- Network connections.

For example, 99 percent CPU reliability does not necessarily mean that the system will experience 99 percent uptime. If the system depends on 10 components, each of which is 99 percent reliable, reliability for the whole system is 0.99 ^10, or about 90.44 percent, according to statistical probability.

Therefore, this system is expected to be unavailable about 9.56 percent of the time, which, in a 24-hour-a-day, 365-day-a-year environment, translates to almost 838 hours (35 days) of downtime each year.

Determine the Amount of Planned Downtime

While unplanned downtime may be significant, often more than 90 percent of downtime is planned due to system backups, maintenance, upgrades, etc. Estimates of yearly planned downtime are usually more accurate than estimates of the unplanned variety as maintenance activities typically either follow rigid schedules or their frequencies are, on an annual basis, reasonably predictable.

The first step in deriving an estimate of planned downtime is to perform a rigorous audit of all normal maintenance activities, such as database backups and reorganizations. For each such activity, multiply the historical average downtime per occurrence, adjusted for any growth trends, by the number of times the activity is performed per year. The timing of other planned activities, such as hardware and software updates, is less consistent, but historical averages provide a sufficient guide as to frequency and duration of the required downtime. These averages can be adjusted to incorporate any knowledge of upcoming upgrade requirements.

Calculate Hourly Costs

While it is impossible to predict the precise loss from an outage, it is important to derive reasonable estimates. Only then is it possible to evaluate the economically appropriate level of investment in data recovery or information availability software solutions. Losses in the areas of labor, revenue and service all contribute to the total cost of downtime. A good starting point for evaluating these factors is to collect statistics on both the duration and associated costs of past downtime as recorded by the accounting department. These include all of the tangible and intangible factors outlined at the beginning of this section and more. The following is a reasonably exhaustive list:

Labor Productivity
- Number of employees affected
- Duration of outage
- Average fully burdened labor rate
- Percent productivity loss during an outage

Revenue
- Direct loss
- Compensatory payments
- Lost future revenue
- Billing losses
- Investment losses

Damaged Reputation and Loyalty
- Customers
- Suppliers
- Financial Markets
- Banks
- Business Partners

Financial Performance
- Revenue recognition
- Cash flow
- Lost discounts (A/P)
- Payment guarantees
- Credit rating
- Stock price

Other Expenses
- Regulatory and legal obligations
- Temporary employees
- Equipment rental
- Overtime costs
- Extra shipping costs
- Travel expenses

Labor Productivity

Employees generally continue to receive full pay even if an out-of-service system cripples their productivity. A historical analysis usually provides a sufficient prediction of the cost of this lost time.

The first step is to examine which, how many, and to what extent employees were affected by past outages. Some employees can continue to do some productive work during a system outage, while others may be totally idled. Estimate each group of employees' decline in productivity as a percentage of normal output.

Next, estimate the value of an hour of lost productivity. A good surrogate measure is the total average salary, benefits and overhead costs for the affected group. The human resources department can usually provide this number. Since businesses try to earn profits, the value contributed by employees is usually greater than the cost of employing them.

Therefore, using salaries, benefits and overhead costs as an estimate of lost productivity yields a very conservative cost/benefit analysis.

The following equation can be used to calculate the average labor cost of downtime. Since labor costs and the impact of outages vary, to achieve a high degree of accuracy, this equation must be repeated for each department and employee classification. However, a shortcut that groups similar employees into a single class is usually sufficient.

LABOR COST = P x E x R x H

Where:
P = number of people affected
E = average percentage they are affected R = average employee cost per hour
H = number of hours of outage

Revenue

The simplest way to project the potential annual revenue loss from downtime is with the equation:

LOST REVENUE = (GR / TH) x I x H

Where:
GR = gross yearly revenue
TH = total yearly business hours I = percentage impact
H = number of hours of downtime

The first two elements of this equation provide an estimate of the revenue generated in an hour. The percentage impact is an adjustment that scales the hourly revenue number based on a best estimate of both the company's ability to recover business lost during an outage and the lifetime value of customers who are permanently lost to the competition.

Damaged Reputation and Loyalty

The sales-per-hour number does not include the value of customer loyalty. To more accurately assess total lost sales, the impact percentage must be increased to reflect the lifetime value of customers who permanently defect to a competitor. If a large percentage of customers typically become very loyal after a satisfactory buying experience, the impact factor may significantly exceed 100 percent, possibly by a high multiple. Since determining lifetime value requires a long history of data and assumes, often inaccurately, that the future will reflect the past, an educated guess must suffice.

Financial Performance and Intangible Costs

Establishing the true impact of downtime requires going beyond the IT team and into every operational area of the business.

The people "on the ground" are experts in the business pain that results in their area of responsibility if systems are unavailable.

This category covers some of the more intangible downtime costs and other miscellaneous costs that don't fall into any of the categories above. Questions that must be considered include, among others:

- Will there be any late delivery surcharges?
- Will overtime pay be required to make up for lost productivity?
- Will any critical financial filing deadlines be missed? If so, will penalties be assessed?
- Will frequent and/or long system outages tarnish the company's image in the minds of customers and investors, particularly if the media report on the problems?
- Will there be an adverse affect on the company's stock price?
- Will a loss of customer goodwill erode the company's ongoing revenue stream?
- Will it be necessary to plan and execute campaigns to explain and apologize for the lack of service?

Service costs are rarely zero. Downtime usually leads to a cascade of related costs. The accounting department can help to identify all such service costs incurred during or after a previous outage. The total of these costs must be divided by the total number of hours the systems were down to determine the cost per hour.

Time-Dependent Costs

The hourly cost of downtime varies depending on the time of day. In most companies, few employees work in the middle of the night, so a system shutdown then would have only minimal impact on corporate productivity. Likewise, even companies selling round-the-clock experience busy and slow periods. For instance, if a North America-focused retailer's web site is not available (for whatever reason) at 4 a.m., the impact would likely be significantly less than if it is down at 2 p.m. Similarly, downtime costs usually vary depending on whether an outage occurs on a weekday or on a weekend or holiday.

Because unplanned downtime can occur at any time, one approach to calculating its hourly cost is to use an average of all hourly costs across a whole week. However, since some problems result from system overloading, which occurs at the most costly times, a more conservative approach is to weight the average accordingly. Unlike unplanned downtime, planned downtime can be scheduled for the least costly times. However, if scheduling maintenance at night or on weekends necessitates the payment of overtime and/or shift premiums, these costs must be factored into the calculation.

Compliance Readiness and Downtime

Recent regulations require companies to support more stringent information availability standards. Several new acts and regulations, directed at specific industries or a broad cross section of companies, mandate the protection of business data and system availability.

Businesses may incur government penalties for failing to comply with these data or business availability requirements. Any downtime calculation should include an estimate of the financial penalties, legal liabilities, etc., of failure to provide the required data or responsiveness within the specified time period. Some of these compliance obligations include:

- **Health Insurance Portability and Accountability Act (HIPAA)**—ensures that only properly authorized individuals have access to confidential patient health data and provides long term guidelines to secure confidential information. It establishes a timeframe for providing requested information.

- **Sarbanes-Oxley Act of 2002**—stipulates that CEOs and CFOs attest to the truthfulness of financial reports and to the effectiveness of internal financial controls. Section 404 of this regulation requires that an audit trail be available for any financial data that are changed. Sarbanes-Oxley also requires a mandatory timeframe for reporting financial information.

- **New Basel Capital Accord (Basel II)**—requires financial institution capital reserves to include operational and credit risks and to include IT security risk as a principal operational risk.

- **Uniting and Strengthening America by Providing Appropriate Tools Required to Intercept and Obstruct Terrorism (USA PATRIOT) Act of 2001**—defines what information can be made available to Federal and local authorities for those suspected of terrorism or terrorist-related activities and requires reporting of this data within a specific timeframe.

- **Health Information Technology for Economic and Clinical Health (HITECH) Act of 2009**—provides incentives to healthcare providers to convert to electronic health records. Once health data is both captured and stored electronically, protecting the availability of those electronic health records becomes critical to patient care because paper backups are no longer available.

- **PCI Data Security Standard (PCI DSS)**—requires that issuers of and merchants that accept all of the major credit card brands protect the security and confidentiality of cardholder data at all times, which can be difficult if backup tapes are created and shipped offsite.

Total Costs

Totaling all of the above costs gives a reasonable forecast of the expected loss from an hour of downtime for a particular system. (Costs will vary depending on the nature of the application, so this calculation must be performed for each system.) To calculate the expected annual cost, multiply this number by the number of expected annual hours of downtime. When considering all factors, the potential loss from downtime shocks most people the first time they calculate it.

Information-Sharing Opportunity Costs

The above discussion considers only the cost of downtime for systems as they exist now. It does not estimate the value that could be derived by making data that is currently inaccessible due to isolated and/or incompatible systems available to those who could benefit from it. Nor does it calculate the costs that could be eliminated by automating or eliminating the manual transfer or re-entry of data that must be available in two or more incompatible systems. Some of these costs are relatively easy to calculate.

For example, an operator may manually extract data nightly from one system into a flat file and then load it into another. By automating such a transfer, the cost of that operator's time could be eliminated.

Other costs, particularly the value lost by not having ready access to enterprise data, are more difficult to estimate. For instance, consider a company that cannot give customers online access to billing information because that data currently resides on a platform that is incompatible with the systems that customers can access. It is impossible to determine conclusively how highly customers would value online access and, more importantly, how that would affect their purchase decisions and long-term loyalty. Yet, this value must be estimated in order to evaluate the potential return on a data recovery/ information availability software solution.

Presenting Your Findings to Management

Consider your audience. Every Manager, VP and CEO has a boss to answer to.

But ultimately, it is your customers who are demanding guaranteed availability.

Keeping your end-customer's viewpoint in mind will help you frame the case for HA in your business.

The ultimate goal of all your work to identify the sources of downtime and calculate their costs is to gain a business-centric understanding of the situation and then present it to all other necessary decision makers. Too often, the job of calculating the cost of downtime is approached as an actuarial exercise, like adding up risk factors in order to determine what level of insurance policy to buy. In fact, the elimination of downtime is a major opportunity to achieve real, tangible gains, in terms of both financial value and market advantage.

First and foremost, your business case should be based upon the elimination of planned downtime, the sources and causes of which can be definitively documented. Use all of the calculations outlined in this document: labor costs, operational costs, the value of unrecoverable business revenue or the loss resulting from delayed sales, based upon the time value of money.

Once a solid base of tangible costs is documented, then present the intangible costs (market reputation, legal exposure under regulations, etc.) as well as the positive effects of implementing availability, such as increased IT productivity, simplified compliance processes, and improved currency and accuracy of management reports. Remember, you can use that backup system to get the reports that management wants and needs faster, and with more current data!

The final touch is that all of the intangible cost avoidance, as well as all the positive market advantages of assuring continuous operations, is accrued at no additional cost when the investment is justified fully on eliminating the planned downtime and normal "predictable" unplanned business interruptions.

Implementing improved availability is a smart business investment with provable ROI, both in the short term, for capital investment recovery, and in the long term, as the benefits continue to accrue essentially forever.

Business Process Evaluation Worksheet

You and your IT executives should assess the following business processes for the potential impact downtime may cause to effectiveness and value:

- Go to market strategies—including the ability to eliminate or minimize delays and latency from information access, delivery or data accuracy; speed up analyses and decisions in the product development cycle; improve target marketing; serve sales channels more flexibly and effectively; as well as meet stringent service level agreements.

- Customer profitability—including the ability to protect customer activity information, make it accessible for a given customer or customer organization, eliminate delay from the analysis and action process, and ensure the availability of CRM applications and service centers.

- Sales force automation—including the ability to reduce or eliminate the effects and costs of downtime in driving sales processes, develop real-time analysis, share and deliver information across applications and the enterprise, launch rapid response marketing campaigns and gain real-time reporting analysis.

- ERP—including the ability to reduce or eliminate the effects and potential costs of downtime on production processes, supply chain, distribution network, warehouse, delivery and transportation processes (even RFID), especially how they impact service level agreements with customers.

- Front-middle-back office processes—including the elimination of latency from the exchange, use or analysis of electronic information interchange and electronic feeds to G/L, finance and accounting applications.

- Business intelligence—including the elimination or reduction of delays and costs associated with programming application interfaces, easy, real-time data sharing, assured availability and protection of data warehouse/data mart investments and the potential loss of critical data during unplanned interruptions.

- Workforce mobility—including the reduction or elimination of barriers to on-demand accessibility and availability of applications and data to enable off-site and off-hours work as well as unconventional working arrangements.

IT Process Evaluation Worksheet

To better align business strategies with information technology, ask your IT executives to evaluate the cost and impact of delays and barriers posed by non-value producing downtime in IT processes:

- Shrinking backup windows—including how eBusiness and supply-chain processes, ever growing data volumes and distributed applications affect backup time and lengthening downtime.

- Expanded internet dependence—including the current impact of downtime in fully exploiting internet channels to market, serve customers and reduce costs; in addition he impact of downtime and potential loss of email applications on business activity.

- Globalized computing—including the current barriers and impact downtime poses to world-wide access to data and applications for collaboration, financial exchange, remote or field employees and offshore/outsourced business functions.

- Mission critical "killer" applications—including the current impact of downtime on applications running across multiple servers and how planned or unplanned events affect access and availability as well as the ability of business users to make decisions or take action.

- Server consolidation—including how information availability solutions can help accomplish this cost-effective, profitability enhancing strategy without impacting users or customers with planned downtime; and how information availability can mitigate or eliminate added risks to data and applications running in a consolidated environment.

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15300 Barranca Parkway
Irvine, CA 92618
800.957.4511
888.674.9495
visionsolutions.com