

STRATEGY&PLANNING

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About this research note:

Strategy & Planning notes define the critical decisions and actions surrounding successful adoption of a specific technology, tool, or process.

Data Center Facility Requirements Estimations At-a-Glance

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When building or refreshing the data center, IT must have a high level understanding of requirements and potential budget. Facility requirements for power, cooling, standby power, fire protection, sizing, and architectural space layout should be estimated before entertaining a build versus buy decision, as well as providing decision makers with a 360-degree view of requirements and costs. Use Info-Tech's research to aid in the facility requirements gathering process and strategy.

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Executive Summary

Enterprises that are building or refreshing their data centers must first estimate the facility requirements to determine a high level budget. Although requirements gathering can often be a time consuming task, it is crucial in determining estimations for the present and future data center and is helpful in making decisions related to data center facility management.

This At-a-Glance research note will aid in navigating Info-Tech research on the following aspects of facility requirements planning for the data center:

- Estimating power requirements.
- Estimating cooling requirements.
- Estimating standby power requirements.
- Fire protection requirements.
- Data center sizing.
- Data center and support room layout and design.

Refer to Info-Tech research when estimating data center facility requirements to aid in determining a high level budget during the build versus buy decision.



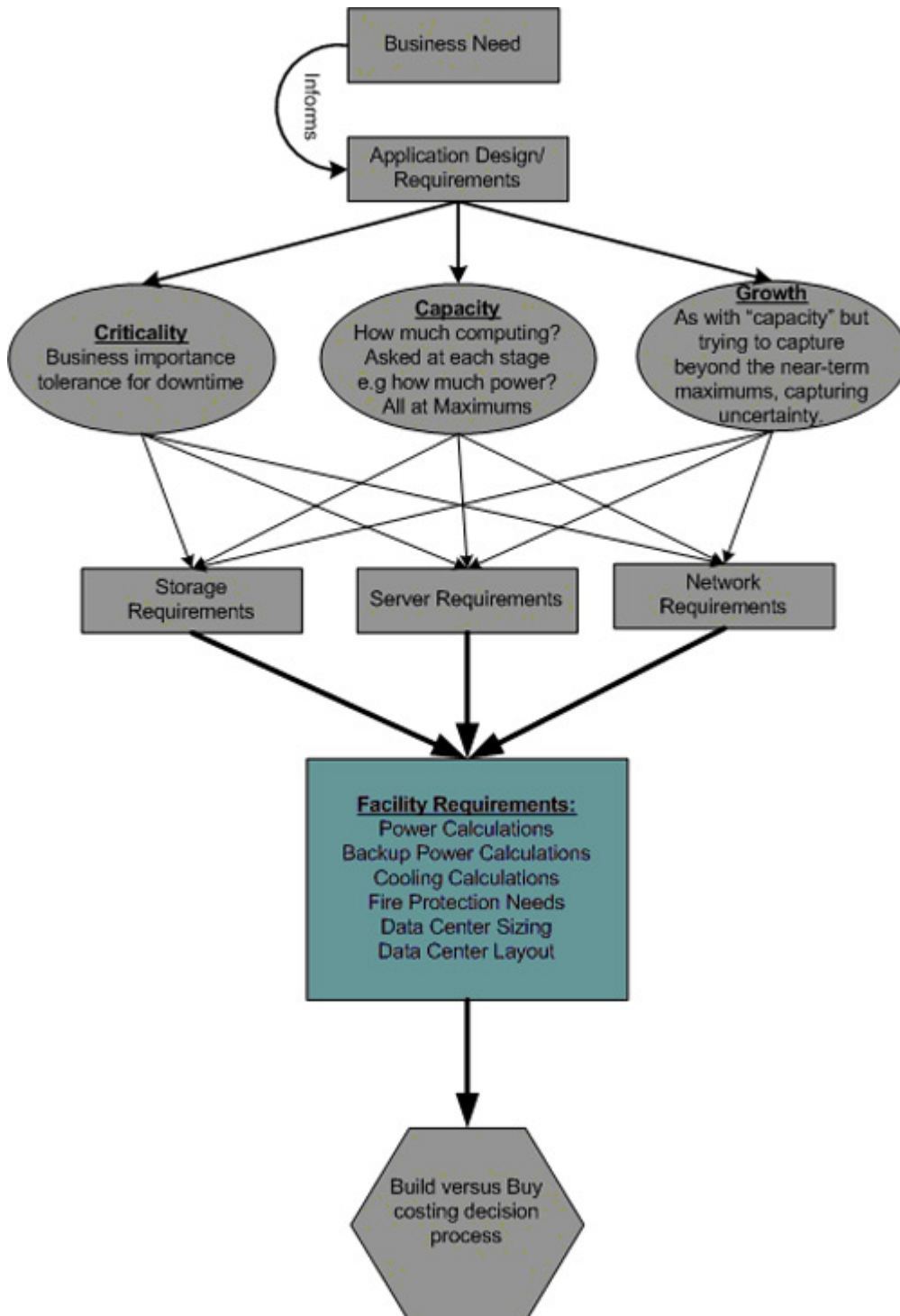
Strategy Point

Building or refreshing the data center is a large, time consuming, and expensive project. For these reasons, it is critical that IT addresses all steps in the process carefully and thoroughly to ensure that planning is done right the first time.

Changes in plans, requirements, and construction in later stages of the project can severely increase the costs of the project and extend the timeline, which may ultimately disrupt business activity. When planning a strategy for building the data center, consider the steps outlined in Figure 1 and their explanations which follow.

Figure 1. Data Center Planning Flow Chart

Source: Info-Tech Research Group





Discover business needs. The first step in the planning and design of the data center is to evaluate the current and future needs of the business. IT should involve key stakeholders such as executives, managers, and a sample of end users from various user groups in the organization to present a full picture of current and upcoming projects that the data center must support.

Application design and requirements. The business needs assessment will inform and educate IT on the design and requirements of applications. This step will involve gathering an inventory of current and future applications which are assessed in the following step. For assistance in creating inventory documents and tools, refer to the Info-Tech [OptimizeIT](#) programs for [IT Strategy](#) and [IT Continuity Planning](#).

Criticality, capacity, and growth. Using the applications requirements inventory, IT should determine the criticality, capacity, and growth potential of each application. Planning for the specific characteristics of each application can help to determine how many servers, how much storage, and how much support the network must provide to run the applications throughout the lifespan of the data center.

Criticality of applications will examine the business importance of each application and address how much downtime is tolerable in order to provide the optimal support. Applications that are less critical may be housed on servers outside of the data center or may be grouped in a different area of the data center, while critical applications may require additional standby power or backup.

Capacity planning will help to determine how many servers are required to support the organization's applications. It will examine the amount of computing required at each stage and aid in determining the associated power requirements.

Growth estimations should address all of the issues in capacity planning but should also consider future needs of the business and account for uncertainties. Often, IT will oversize capacity to encompass future growth by looking at past growth statistics in the business or assessing the projects gathered in the business needs assessment. IT must be careful and thorough in its estimates for oversizing. Oversizing for future requirements is essential for the longevity of the data center; however, overestimating can be expensive and wasteful.

Storage, server, and network requirements. By assessing the criticality, capacity, and growth of application design and requirements, IT can develop a better understanding of storage, server, and network requirements on which to base the facility requirements. This will also help to develop the final budget for the project. Typically, structured data will grow at the same rate that the organization grows. For example, if the organization experiences 6% growth in business, then data will generally grow around 6% as well. Unstructured data can be expected to grow anywhere from 50%-100% per year depending



on the nature of the business. IT must account for both types of data growth when assessing requirements.

Facilities requirements. Estimating the facility requirements can present IT with a full picture of what is required to build or refresh the data center in order to develop a high level budget and timeline for the project.

IT must gather information for power, cooling, standby power, fire protection, sizing, and architectural space layout in order to obtain a complete view of what the data center needs. It is these aspects of data center planning and design that will be discussed and outlined in this research note. The steps preceding this area are simply inputs from other process steps.

This note will focus on the facility requirements section of Figure 1 for estimating power, cooling, standby power, fire protection, sizing, and space layout needs of the data center. Navigate through ITA Premium research and tools to aid in the facility requirements process.

The build versus buy decision. Once all requirements for the data center have been established and estimated, IT can create a high level budget to compare the costs, time, and effort of building a data center versus outsourcing or just outright buying the data center. When completing this process, some organizations may find that after gathering all requirements and putting a cost figure to each, outsourcing is more cost efficient and beneficial in the long run.

Key Considerations

Whether the enterprise is building or refreshing the data center, insight into the facility's requirements for power, cooling, and standby power should be thoroughly estimated. IT must also consider structural aspects, such as data center size estimations, along with building space allocations and layout in order to complete a full picture of what the data center will look like and what the costs will be. When requirements have been gathered for the facility, a high level budget may be determined to aid in the decision making process and analysis of the build versus buy decision. Estimating requirements upfront can also save on costs of external expertise and consultation if the enterprise decides to move forward with the build decision.

Estimating Power Requirements

Why Is it Important?	The data center's power supply must adequately support the organization's current infrastructure as well as meet future power needs and requirements. To determine supply, IT must have a method to properly calculate and forecast data center power
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	<p>requirements.</p> <p>IT departments that use a best-guess method are likely to run into trouble, and will incur unnecessary costs when adding new power for equipment in the future.</p> <p>Underestimating the power supply can lead to power disruptions when capacity is increased. Conversely, overestimating power supply can be costly.</p>
Key Considerations	<p>When estimating power requirements for the data center, IT should consider the following in its calculations:</p> <ul style="list-style-type: none">• Critical loads for server and storage equipment.• The loads of other equipment located in the data center such as switches, routers, and computers.• Future loads in the data center based on the enterprise's future needs.• Other power loads associated with the data center, such as lighting, cooling, standby power, and generators.
Who Is Involved?	<p>Estimating power requirements for the data center involves both internal and external personnel such as:</p> <ul style="list-style-type: none">• Data center personnel (system and network administrators) to estimate the power requirements for all devices located in the data center.• Business stakeholders who can aid in determining future requirements.• Electrical engineers who can provide expertise and advice to confirm estimations.• The utility companies to help translate IT's power requirement estimates into cost estimates for a high level budget for data center power.
Navigating the Research	<p>Use the following ITA Premium research notes to aid in the power requirements estimation process when building or refreshing the data center:</p> <ul style="list-style-type: none">• "Estimate Data Center Power Requirements for Stable Long-Term Outlook"• "Data Center Power Requirements Calculator"• "Data Center Requirements Planning: Seek Expertise to Ensure Success"

Estimating Cooling Requirements



Why Is it Important?	<p>Each data center requires a sufficient amount of cooling to balance the heat given off by servers and equipment. Careful estimation of cooling requirements is important because excessive cooling can be very costly to the business. Generally, 50% of the costs associated with power in the data center are a result of the cost of cooling.</p> <p>If IT underestimates cooling requirements, equipment in the data center can be damaged or may operate at less than optimal levels of performance. The latter issue may result in misguided purchases of additional capacity. If cooling is overestimated, electricity costs will go up. IT must understand what generates heat in the data center and how much it generates to accurately estimate cooling requirements.</p>
Key Considerations	<p>When estimating cooling requirements for the data center, IT should consider the following key factors in its calculations:</p> <ul style="list-style-type: none">• Server and storage device heat output.• Other IT equipment's heat output in the data center, such as routers, switches and computers.• Future equipment's heat output.• Standby power unit's heat output (if located in the data center).• Power distribution unit's heat output.• Heat output from lighting.• People working directly in the data center (to account for body heat and air exchange).
Who Is Involved?	<p>Estimating power requirements for the data center involves both internal and external personnel, such as:</p> <ul style="list-style-type: none">• IT personnel who can gather the information required to estimate cooling requirements.• Mechanical engineers who should aid in design, installation, and testing of all HVAC equipment required to cool the facility efficiently.• Cooling system vendors and suppliers who can help to translate estimates of cooling requirement measures into estimated cooling equipment costs.
Navigating the Research	<p>Use the following ITA Premium research notes to aid in the cooling requirements estimation process when building or refreshing the data center:</p> <ul style="list-style-type: none">• <u>"Estimating Data Center Cooling Requirements: Just the Right Amount of Cool"</u>



- ["Data Center Cooling Requirements Calculator"](#)
- ["Data Center Requirements Planning: Seek Expertise to Ensure Success"](#)

Estimating Standby Power Requirements

Why Is it Important?	<p>Sufficient standby power is important in data center estimations to ensure enterprise data is not lost or corrupted during an outage. The ultimate decision is based on how much runtime is required for the enterprise. This decision can be expressed in three different outcomes based on business impact and cost:</p> <ul style="list-style-type: none">• Enough battery to hold up the data center until the generator is activated.• Enough battery power to keep the data center running long enough to perform an orderly shut-down of servers.• Enough battery to keep the data center running for an outage of a longer duration.
Key Considerations	<p>When estimating standby power requirements for the data center, IT should consider the following key factors in its calculations:</p> <ul style="list-style-type: none">• Risk tolerance of the enterprise.• Power requirements for critical servers and equipment.• Cooling requirements.• Future power and cooling requirements.• Emergency lighting.• Data center access control.• UPS charging.
Who Is Involved?	<p>Estimating power requirements for the data center involves both internal and external personnel, such as:</p> <ul style="list-style-type: none">• Business stakeholders who can help with the business impact analysis to determine risk tolerance.• IT personnel who can gather the information required to estimate the necessary standby power.• Electrical engineers who can help determine a high level analysis of standby power.• Vendors and suppliers who can aid in determining costs associated with standby power devices such as UPS and generators.• Utility companies which can help to determine costs associated with standby power requirements.



Navigating the Research

Use the following ITA Premium research notes to aid in the standby power requirements estimation process when building or refreshing the data center:

- "[Need Backup? Estimate Data Center Standby Power Requirements](#)"
- "[Data Center Standby Power Requirements Calculator](#)"
- "[Data Center Requirements Planning: Seek Expertise to Ensure Success](#)"

Fire Protection Options

Why Is it Important?

Fire protection is a critical and obligatory part of data center design and planning. Because a fire can happen at any time, IT must be prepared to protect the data center with the necessary equipment for the following reasons:

- **Life safety.** The primary concern when assessing data center fire protection requirements is to protect the lives of data center and surrounding personnel.
- **Protection of property.** Servers and other equipment located in the data center are extremely expensive to replace. A fire protection plan should safeguard all equipment from excessive loss or damage.
- **Continuity of operations.** The cost of downtime in critical business activities can cost the company thousands of dollars and interrupt employee productivity.
- **Codes and standards.** IT managers must comply with the state, local, federal, and National Fire Protection Association (NFPA) codes and standards. However, it is ultimately the Authority Having Jurisdiction that will dictate the majority of fire protection requirements.

Key Considerations

Options in fire protection consist mainly of the following:

- Fire detection systems (smoke and heat detection).
- Alarms (signaling, notification and control systems).
- Emergency power off.
- Sprinkler systems (wet and pre-action systems).
- Clean agent fire suppression systems (portable fire extinguishers and permanent fire suppression extinguishing systems).

Under the NFPA 75, the data center must have, at minimum, a sprinkler system, fire detection and alarm, portable fire extinguishers and Emergency Power Off. Any other form of fire protection is classified as an add-on (e.g. a clean agent suppression system).



Who Is Involved?	<p>When exploring options in data center fire protection, involve and consider the following parties in the decision making process:</p> <ul style="list-style-type: none">• NFPA provides standards and guidelines on which to base fire protection options.• Authority Having Jurisdiction will ultimately govern fire protection regulations.• Fire protection engineers can implement and advise on fire protection options.• Facilities manager/building owner can aid in installation and understanding of building regulations and codes.
Navigating the Research	<p>Use the following ITA Premium research notes to understand the options in fire protection when building or refreshing the data center:</p> <ul style="list-style-type: none">• <u>"Fire Protection: Only YOU Can Prevent Data Center Fires"</u>• <u>"FirePASS: The Next Revolution in Fire Prevention and Suppression?"</u>• <u>"Data Center Requirements Planning: Seek Expertise to Ensure Success"</u>

Estimating Data Center Size

Why Is it Important?	<p>One of the first steps in data center planning and design is sizing the data center for both current and future requirements. Careful estimations are necessary in order to develop a high level budget for the design phase.</p> <p>There are various methods that can be used as a starting point for sizing and budget estimations, one of which is the employee-based sizing method. The general rule of thumb is to start by estimating about 10 square feet per employee (for 100 employees or less). This accounts for one server rack of equipment per employee, as well as non-server space for walkways or infrastructure components.</p>
Key Considerations	<p>Take the following into account when estimating the required size of the data center using the employee-based sizing method:</p> <ul style="list-style-type: none">• Enterprise employee to minimum floor space ratios.• Major infrastructure components.• Structural reinforcements.• Entrance ramps.• Future expansion requirements.



Who Is Involved?	<p>Estimating data center sizing requirements involves both internal and external personnel:</p> <ul style="list-style-type: none">• IT personnel should make the initial sizing estimate.• Building architects can help with estimations and cost considerations.• Facilities manager/building owner may require approval for any structural changes needed.
Navigating the Research	<p>Use the following ITA Premium research notes to aid in sizing the data center during the build or refresh stage:</p> <ul style="list-style-type: none">• "Estimate Data Center Size with the Employee-Based Sizing Method"• "Data Center Requirements Planning: Seek Expertise to Ensure Success"

Data Center Space Layout and Design

Why Is it Important?	<p>Before data center building or refresh plans can be finalized, IT must pay careful attention to the layout and design of building space. Along with the room that houses servers and data center equipment, space must also be allocated to rooms which relate to the support of data center functions and activity.</p> <p>The emphasis for space allocation decisions should be based on the workflow of the data center to try to achieve a balance between cost and flexible space for future business growth and changes, such as:</p> <ul style="list-style-type: none">• Security. Can the layout be utilized in a way that it enhances physical security and controls access to sensitive equipment?• Accessibility. Consider the ease of access for delivering equipment.• Workflow/Function. The layout should accommodate the functional usage of the facility and allow for efficient workflow, movement, and transport related to the functions in the data center.• Ingress/Egress. The physical layout of the facility should not work counter to the outside services (power feeds, fiber/carrier data feeds) coming into the building. The placement of these types of network and power distribution spaces should minimize cabling requirements, not increase them.
Key Considerations	<p>Depending on data center activities and the size of the enterprise, there are multiple areas that should be taken into account. The following rooms should be considered when planning space allocations for the data center building:</p> <ul style="list-style-type: none">• The electrical room.



	<ul style="list-style-type: none">• The networking room.• The loading dock.• The build room.• The storage room.• The operations command center.• The backup room.• The media storage area.• The vendor services area.• The equipment room. <p>While not all rooms are necessary for every data center, IT should consider each one and determine its needs individually.</p>
Who Is Involved?	<p>Estimating data center sizing requirements involves both internal and external personnel, such as:</p> <ul style="list-style-type: none">• IT personnel that will decide on room requirements.• Building architects to aid in architectural considerations.• Structural engineers to aid in structural considerations.• Facilities manager/building owner for approval in architectural changes and considerations.
Navigating the Research	<p>Use the following ITA Premium research notes to aid in planning and allocation of physical space, and the layout of the equipment and support rooms in the data center:</p> <ul style="list-style-type: none">• "Planning for Data Center Physical Layout and Support Center Space"• "Data Center Requirements Planning: Seek Expertise to Ensure Success"

Recommendations

1. **Estimate data center requirements before finalizing plans.** Estimations for data center requirements can help determine a high level budget, lower the cost and time of bringing in consultants, and aid in the planning and decision making process. By including both current and future business needs in estimations for power, cooling, standby power, fire protection, sizing, and spatial layout, IT can ensure that due diligence has been accounted for in final data center plans during build or refresh.
2. **Consult with professionals for advice and expertise.** After estimations have been completed, IT should consult with external experts in each area of data center design and planning to validate estimates. For a detailed list of contacts for each area of data center planning, refer to



the ITA Premium research brief, "[Data Center Requirements Planning: Seek Expertise to Ensure Success.](#)"

3. **Develop a high level budget.** Once estimations have been completed and experts have been involved in the project, IT can start to draw up final plans and a high level budget. Include all aspects of data center design in the budget and check again with professionals to ensure it is a proper representation of what the project will look like and cost.
4. **Explore the options.** After the budget has been estimated, and requirements have been determined, IT should still explore other options. As seen in Figure 1, IT should contemplate the build versus buy decision as a next step. Comparing the building, requirements to refresh, and cost to collocate may uncover cost savings in the outsourcing decision.

Bottom Line

When building or refreshing the data center, IT must have a high level understanding of requirements and potential budget. Facility requirements for power, cooling, standby power, fire protection, sizing, and architectural space layout should be estimated before entertaining a build versus buy decision, as well as providing decision makers with a 360-degree view of requirements and costs. Use Info-Tech's research to aid in the facility requirements gathering process and strategy.