A Project Planning Guide For Healthcare Facility Owners

by

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Purpose

According to a recent study, about 30 percent of US real estate projects are cancelled midstream, while more than half run up to 190 percent over budget and 220 percent over their initial time estimates. The reasons for this are manifold but poor decisions during the initiation and early planning of the project can be pointed to as one of the main causes. Most poor decision-making stems from lack of information, bad judgment, or lack of communication and transparency between what the client expects and what the project team can deliver. Proper project planning procedures and methods will lead to proper contingency planning, management of partner relationships and contracts, management of dynamic unforeseen changes and associated risks that can, and most probably will, occur in the course of the project. The role of the owner cannot be overstated in all of these targets.

As a general rule, healthcare executive leaders may have only one opportunity in their career to participate in the design and construction of a hospital replacement or major hospital expansion project. The interaction with planners, public bodies, architects, engineers, and other stakeholders is a daunting prospect for which an owner organization will seek help from specialized firms that can represent the owner. This guide should allow the owner to better navigate the process. Additionally, while this guide has no intention of replacing the deep and specialized knowledge of or need for advisors (internal or external), it will prepare owners to recognize the major tasks and decision steps throughout the process, while keeping the focus on the desired outcome. Any owner should recognize that the slogan: “if you don’t know or cannot express what you want, you will not get what you need” is as true today as it ever was.

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Executive summary

There have been various acronyms used in the business world over the years such as the "Five P rule" or Proper Planning Prevents Poor Performance. This common adage can be applied to this guide in the form of the "Six P rule" by adding the word "project" before "planning."

The goal of project planning is to better define the scope of work of a project in order to meet both the owners' expectations and the project requirements in terms of budget, time, and performance. The ability to execute the planning effort with the right team and the right dedication of resources is paramount to project success.

Research has shown that increased project planning efforts lead to improved performance in the areas of cost, schedule and operational characteristics. Success during the start-up phase and later phases of a project depends highly on the effort that goes into the scope definition phase as well as into the efforts to maintain the integrity of the project scope definition package. The engagement of the owner during the early stages of defining the project's cope is a critical step of project success. The owner's role in the process must focus on:

- Maintaining transparency of the planning process
- Managing risks adequately, especially with respect to pending funding approval steps
- Enforcing frequent consultation of all parties during the process
- Ensuring a complete scope definition with active involvement of design professionals
- Addressing client requirements fully and early on

Owners must understand that not all projects are created equal. Projects are unique, not fully up-front definable, goal-oriented, unrehearsed happenings. They differ from everyday business operations because they are temporary and only exist until project goals are realized. There are many considerations, obstacles, opportunities, etc. that will need to be addressed from the very start. This guide has no intention to replace experts but intends to inform the owner how to make the best use of them An owner should involve consultants early in the planning/design process to help "steer" the project in the right direction from its inception point. This is especially important when in-house resources are not available or the owner has limited experience in planning construction projects, which is true in almost all cases.

This guide introduces the owner to the healthcare construction industry, defines project planning from various perspectives, outlines healthcare specific project planning, and concludes with advice on how to be a good owner in the planning process.

As one industry leader put it to the research team: "Tell owners to be cautious of using this guide as a cookbook or to the letter document. It should be used to gain a better understanding of healthcare planning and make optimal use of consultants like me".

CEO's Expanded Summary

This expanded executive summary is geared towards senior healthcare executives, in particular CEOs that do not have the time to read the full report, which targets different levels of middle and upper management of owner organizations. The following pages are contain (verbatim) parts of the full report. They contain the key statements and information that is deemed useful for a CEO.

Why makes healthcare design special, or in other words, why is design and construction of healthcare facilities a special challenge?

- Healthcare relies on continuous operations that do not tolerate disruption
- Intense energy and water use
- Unique waste streams, such as chemicals
- Infection control requirements
- Indoor air quality requirements
- Stringent regulatory requirements
- Any new facility or expansion project differs significantly from business as usual, due to its unique, once in a life time character.

The healthcare industry is growing rapidly:

- Healthcare construction expected to increase to $61B in 2010 (from $41B in 2006) – nearly a 50% increase in just five years
- Continued growth results from:
    - Aging facilities
    - Aging population (baby boomers)
    - New standards of care
    - Technological innovations
    - A favorable reimbursement and financing environment

Owners should understand that projects are realized in terms of a three dimensional space formed by the three axes: time, cost, and performance. The owner is heavily involved in establishing criteria, or boundaries, in the development of the initial scope of work, maximum budget allowed, and potentially the maximum length of time required for completion. Constantly monitoring and managing the trade off (over time) between performance and resources (time, cost) is a prime responsibility of the owner organization.

Timeline Planning:

The timeline for projects can vary from a few weeks (simple upgrade or renovation) to several years (complicated, phased new construction). In terms of planning for large scale projects, the Department of Defense (DoD) military construction timetable recommends starting 15 months prior to the start of design (including 6 months for A/E selection and award). For substantial renovation projects, 6-12 months for planning is normally accepted.

Cost Planning:

It is important for owners to realize that healthcare construction varies dramatically depending on the type of facility desired and its geographical location. The most expensive healthcare facilities to construct on a per square foot basis are two and three story hospitals ($194/SF to $320/SF depending on geographical location according to yearly updated information from RS Means). However, most the experts point out that RS Means (although reputable) typically provides low estimates – for instance, some projects in California have been as much as $500/SF. Another expert claims that RS Means can be as much as 30% below expected actual construction costs. One obvious reason is the rapid increase in construction cost (mostly in raw materials), which runs currently at a rate of 1% increase per month!

It is very important for owners to realize the true cost of construction per square foot. First, understand that cost per hospital bed is a poor metric. It is too simplistic, typically does not reflect different types of beds, and often compares cost estimates to national averages – which depending on the geographical location as mentioned above can be misleading. Next, realize that the cost per square foot will fluctuate depending on the service provided or department area – administrative space is cheaper to build than surgical space for instance.

Finally, realize that most owners think of construction cost as the cost per net square foot (NSF) without understanding that both square footage and costs have added multipliers that can dramatically increase the original cost. There are factors such as converting to departmental gross square feet (DGSF) and overall building gross square feet (BGSF) to consider. Additionally, keep in mind there are multipliers to go from construction to project cost estimate (to include initial outfitting, fees, permits, etc) and inflations factors to consider. Owners need to understand the difference between soft and hard costs (section 2.6.2) as well as operational costs related to energy and water consumption once the building is occupied (sections 2.6.3 and 2.6.4).

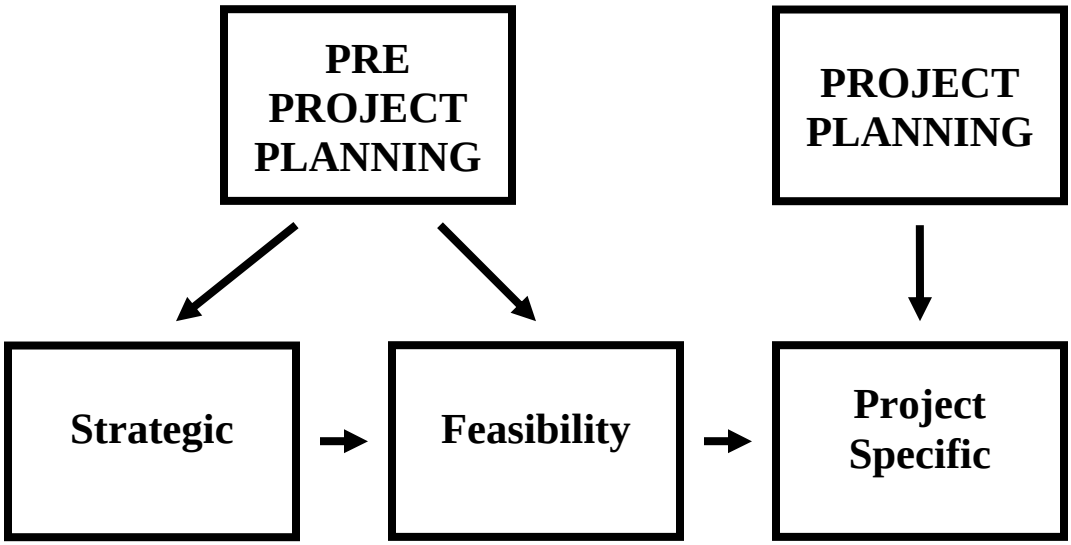
Best practices

In a number of areas, the supply side of the construction industry (planners, design firms, contractors, manufacturers, etc) has been moving towards “best practices”. Notable areas where this is happening are (1) sustainable design, (2) evidence based design, (3) technology master planning, (4) building automation management, (5) Building

Information Modeling, (6) guiding rational decision making, and others. Owner organizations should come prepared to the table to know how and when to engage the right consultants to enforce best practices.

Identifying major project phases

As a first step, it is important to define the basic pre-project and project planning effort in three key phases: Strategic Planning, Feasibility Studies, and Project Specific Planning.



Major Planning Phases

The *Pre-Project planning* effort is defined by the Construction Industry Institute (CII) as "the process of developing sufficient strategic information with which owners can address risk and decide to commit resources to maximize the chance for a successful project".

Project planning continues the planning effort with the project specific planning phase until the project is ready to enter the design stage. It involves some critical steps that will be defined in more detail under the project specific task breakdown.

Strategic planning is defined as a management process used to determine the company's fundamental purpose by means of environmental analysis, objective setting, actions to reach those objectives, and adapting the plan accordingly once feedback is received. Strategic planning is often overlooked because of a lack of management training, perceptions that planning is not important, and issues with implementation.

Strategic planning can benefit the health care organization in three areas: (1) Analyze the current market conditions and assess both external opportunities and threats as well as internal strength and weaknesses (2) Help establish clear goals, objectives, and strategies

(3) Increased employee loyalty – through the shared commitment working towards common goals.

Feasibility studies (or needs assessment) are typically an outsourced finite deliverable. The feasibility study will consider several of the following: building use, business justification, business plan, economic analysis, facility requirement, future expansion or alteration considerations, site selection considerations, and project objectives in order to address the mission need (Federal Facilities Council, 2003). The study usually is performed in order to assess the viability of various options and present alternatives to the owner in order to move forward. Feasibilities are not so much a phase, but a transition from strategic planning to project specific planning.

Project specific planning is a planning phase that starts after a decision about which project alternative has been made. It is the necessary phase focused on setting project expectations and defining project requirements. This phase must "piggy-back" off the pre-project planning efforts and apply the organizational mission and vision to the unique project at hand. There are four key areas of this phase: the Project Plan, the Environmental Impact Statement, Identifying stakeholders risks related to the project, and finally the Design Program. Sometimes the Design Program phase is included with the start of design, since often A/E firms can assist the owner in developing this document.

How to be a good owner

The following aspects of how to be a good owner are applicable to CEOs and other senior healthcare executives.
Some of the key points that owners should do or be aware of in the healthcare planning effort are:

- Good project planning does not come about by following a "cookbook".
    - This guide is no exception to that rule and is meant to give a better understanding of planning
    - This guide should not replace consultants but help to make informed decisions about when and how consultants should be used
    - Remember that all projects are unique and different – some planning activities have more emphasis depending on the specific needs of the project

- The ideal client (owner) is eager, understanding, and performs analysis, and fosters a participatory design process, e.g. by
    - Appointing a highly motivated project coordinator
    - Forming champion teams as resources in participatory design
    - Forming user groups to advise on functionality of solutions
    - Forming topic teams, to provide input in innovative solutions
    - Be engaged from the beginning – project planning is the foundation on which the rest of the project is built
    - "Over communicating" to the organization

- Think past your immediate needs – strategic and master planning is critical; take a leadership role on the strategic planning level

- Know what you want to do, how much you have to spend, and when you need it; do not rely blindly on the supply side to tell you when your expectations are unreasonable with respect to your current funding ceiling

- Know that your commitment to establish an owner's representative with the authority to make decisions is vital. Identify a clearly defined decision-making process.

- Realize that it is important to get the consultants, designer, contractor (and whatever other outsource partner) on board early in the process

- Induce a culture of innovation, keeping an open mind towards new solutions; Have your consultants look for evidence that suggest new solutions with better outcomes. Create a mandate for the team to find and execute best practices such as EBD, technology master planning, building automation, energy conservation etc. in the early design stages of the project

Why the role of the CEO/owner is important:

The project planning process is a methodical way to define all the steps that lead to the successful execution of the project. The interjection of the owner (or owner representative) in this process is crucially important. The primary responsible party (the owner organization) is to:

- Set/reinforce the project vision
- Channel expectations from the owner organization to the project team
- Be a responsive project partner that is aware of the risks inherent in large capital projects
- Operate responsibly from a sufficient knowledge base in the organization if the resources for hiring owner representation throughout the project are not present

Avoiding common mistakes in (large) projects:

In general the biggest failure of project planning is a poor requirements analysis and an incomplete scope definition package. This seems a no-brainer but it is still the most fundamental lesson for every project planning team. All too often a scope definition plan (the master program) is not well aligned with the business and funding plan (the budget), leading inevitably to a disastrous and frustrating confrontation at a later stage in the project planning (and waste of effort).

Most bad decisions stem from lack of information, bad judgment, and lack of communication and transparency between what the client expects and what the project team can deliver. It occurs regularly that an orchestrated optimism about potential risks takes hold of the project team, leading to self deception and disillusion down the road. It is the owner's responsibility to establish an open relationship with the project team. The owner's representative should be encouraged to be the bad news messenger in the early stages of the planning process. This is also true when it comes to the commitment of predevelopment dollars. At this point one should take extra care to bring all costs and risks into the open.

Proper project planning procedures and methods will lead to proper contingency planning, management of partner relationships and contracts, management of dynamic change and associated risks that can, and most probably will, occur in the course of the project. The main object of disputes in projects is change. Although change is in many cases inevitable, it is not clear who bears the costs of the change and who is responsible for additional changes down the road. The only way to deal with this is a well thought out change management plan. Omitting this will sooner or later start haunting the project team and endless disputes and litigation will result. The role of the owner cannot be overstated in all of the above targets, as the owner organization is the catalyst and prime risk bearer in the project.

Conclusion:

Historically, the CEO's of health care facilities have a once in a lifetime involvement in the design and construction (or remodeling) of their facility. The confrontation with planners, public bodies, architects, engineers, etc. is a daunting prospect for which an owner organization needs sound advice and the organizational input to manage his expectations from start to finish. Owners should utilize this guide as an educational tool prior to launching into any facility capital investment project. Once informed, owners can utilize this guide as a reference tool to help them plan and engage in-house and outsourced resources throughout the process. The ultimate goal of this guide is to never again here the quote, "if I had only known – I would have done things differently."

1. INTRODUCTION

1.1. Introduction to healthcare construction

Unique healthcare design has evolved from early concepts such as "do the sick no harm" from Florence Nightingale, to the need for increased ventilation (original ward designs) and a desire for improved sanitary conditions. Hospitals and healthcare facilities are continually changing to meet new regulatory requirements, introduce new technologies, and continue providing a healing environment for patient care.

Healthcare construction is a uniquely complex service industry. Patients are seeking comfort and re-assurance from the hospital setting. Providers are demanding the facility provide a safe, healthy environment to deliver care. Facilities often have unique requirements such as around the clock operations, intense energy and water use, chemicals use, strict containment and separation of waste streams, infection control requirements, indoor air quality requirements, and stringent regulatory requirements, all of which pose significant challenges for the supply of these facilities, i.e. the design and construction industry. Probably the most significant challenge is to maintain around the clock operations during a major renovation or expansion project at an existing facility.

1.2. The status of the healthcare construction industry

The healthcare industry represents 3.9% of all U.S construction and is projected to remain strong until 2010. As shown in Figure 1 below, healthcare construction could increase from $41.0B in 2006 to as high as $60.1B in 2010, nearly a 50% increase (FMI, 2007). The continued growth is a natural by-product from obsolescence (aging facilities), demographics (aging population and baby boomers), new standards of care, technological innovations and a favorable reimbursement and financing environment.

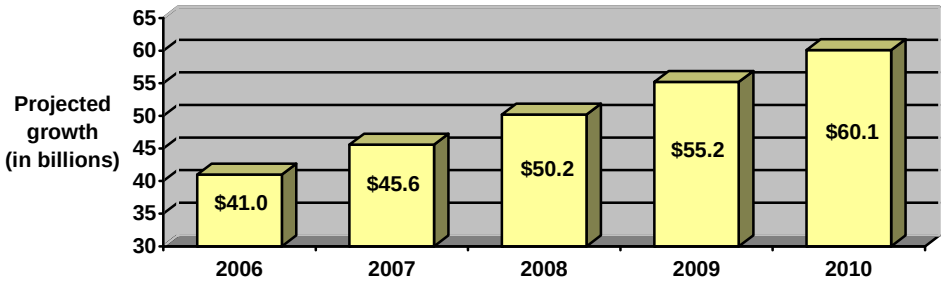


Figure 1: Healthcare construction growth projections (in billions) from 2006-2010 (FMI, 2007)

1.3. The inception of this guide (New Orleans Case Study)

The project guide began with analyzing the healthcare project planning efforts from the LSU Health Care Services Division (LSU HCSD) and the Medical Center of Louisiana at New Orleans (MCLNO) in 2006 in the wake of Hurricane Katrina. This study was

conducted by Georgia Tech as part of a grant from the Robert Wood Johnson Foundation (RWJF) and included several deliverables – this healthcare project planning guide being one.

As the study continued, it was soon realized that this was truly a unique project to study on many accounts: (1) Hurricane Katrina impact (2) a rapid response requirement to attempt to jointly design and construct a new facility with Veterans Affairs (VA) on a new facility (3) limited resources and state funding limitations (4) other regulatory requirements – state and VA requirements.

The New Orleans case study is presented in Appendix A. It is important to realize that the information and data collected is representative of a system challenged by the unique factors referenced above. Therefore, it is important to realize that the questionnaire information located in Appendix A may be misleading on the quantification of project planning sub-tasks completed. For instance, MCLNO did a lot of pre-project planning (strategic and master planning) prior to Katrina, but many respondents felt that this information needed to be updated – giving some variance in the level of completion for this particular activity.

This guide is not a fix-all solution. Its use targets to inform owners in the early stages, i.e. even before the need for a project arises. The MCLNO and VA project is entering the design stage, and not everything is this will be useful to the MCLNO-VA team as they are about to enter in the follow-up stages of project planning. In general, this guide is meant to be used as an information source for any future projects and to ensure all stages of pre-project planning and project specific planning are recognized and completed.

2. UNDERSTANDING THE CONSTRUCTION INDUSTRY

2.1. What are projects?

"A project can be defined in terms of its distinctive characteristics—a project is a temporary endeavor undertaken to create a unique product or service. By definition, the word "temporary" means that every project has a definite beginning and a definite end. Unique means that the product or service is different in some distinguishing way from all other products or services" (PMBOK, 2000).

In simple terms, building construction projects can be defined in two categories: new construction (additions or replacement) or renovations (repair). New construction might involve the demolition of previous facilities, new land acquisition, added utility and infrastructure support requirements, etc. The decision to build new isn't always the best alternative. Owners should carefully articulate their requirements and needs and allow the feasibility studies (mentioned later in this guide) to help them decide what alternatives are acceptable. Renovation depends on several factors, such as the condition of the existing facilities, monetary and timeline constraints, and land availability.

Owners should understand that projects are realized in terms of a three dimensional space formed by the three axes: time, cost, and performance. The owner is heavily involved in establishing criteria, or boundaries, in the development of the initial scope of work, maximum budget allowed, and potentially the maximum length of time required for completion. The figure below shows the resources-performance space in which projects are planned and realized. It is normal for the realized solution to be a variation from the original planned solution. Managing the tradeoffs between spent resources and obtainable performance is in fact the primary, unique and most difficult challenge of construction projects. This will be elaborated upon in the last chapter of this guide.

It seems to be part of human nature that most projects (personal as well as professional) start with a nominal estimate of expected performance, cost and time which is unfeasible. The problem is that the unfeasibility of the nominal solution is not discovered early enough, because irrationality and optimism take over. Another contributing factor is the asymmetric ignorance between the parties involved, i.e. mainly between the demand side (the expected performance of the owner organization) and the supply side (the expected fulfillment by the design and construction firms). The owner does obviously not fully understand the implications in terms of resources of his expectations. The supply side works with significant uncertainties in the forward projection of resource needs and is often not capable to understand all the implications of certain expectations that the owner has. All these factors combined lead to a large gray area around the solution point in the figure. The art of conducting a successful construction project is to manage this gray area and never let it grow beyond the comfort zone of the owner. This takes an open mind, commitment, trust and honesty from all parties involved.

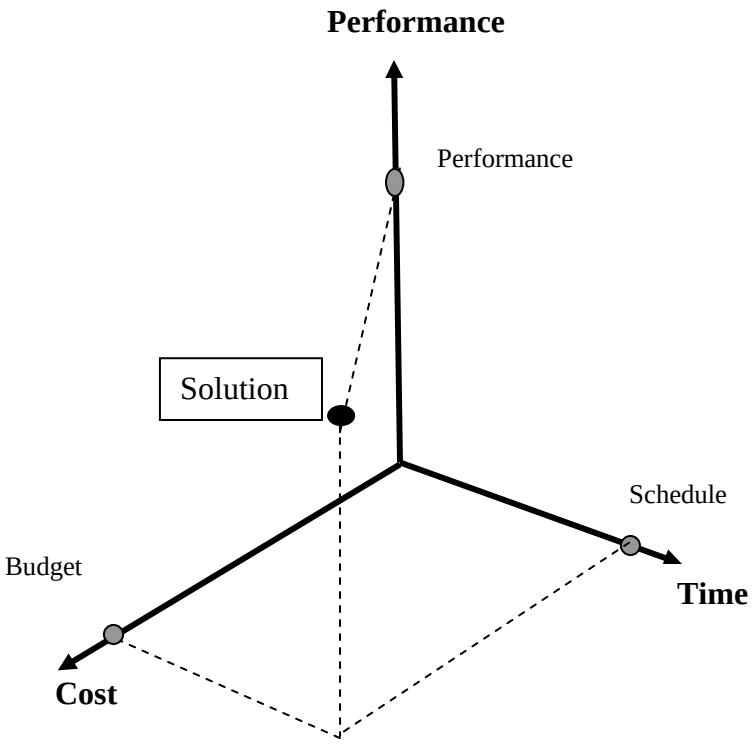


Figure 2: Relationship of time, cost, and performance

2.2. What are the phases of projects?

The crucial phases that compose a new construction project from inception to reality are: (1) Planning (2) Engineering and Design (3) Construction and (4) Commissioning. The planning phase determines and validates the need for a project. The Engineering and Design phase is typically broken into preliminary and detailed design. The preliminary or schematic design phase deals with the initial development of schemes developed from the owner's intent and planning process. It usually includes basic appearance, building mass and initial floor plans. The detailed design phase further develops these schemes, testing the design against the owner's intent, regulatory compliance, and the program budget. The Engineering and Design phase culminates with completion of construction documents. The construction phase is the process where the plans and specifications of the designer are used to build the structures. Finally, the commissioning phase ensures the proper testing and balancing of equipment and systems so that the facility is ready for occupancy.

2.3. Definitions and roles

Below is a simple table depicting the various participants in the project planning and construction process, definitions for each, and their potential roles in the planning process.

Table 1: Definitions and Roles

Participant	**Definition**	**Project Planning Role**
Owner	A private or public organization (usually represented by a person or board of directors) that is ultimately responsible for the proper execution of the project (CMAA, 2002).	Defines the boundaries for performance (what they expect), budget, and time; provides much of the information that consultants utilize to determine feasibility and viability; provides information to develop the design program (transition into design phase)
Stakeholder	Specific people or organizations who have an interest in the outcome of the project – can be internal (management, employees, etc) or external (investors, community and environmental groups, government organizations, etc)	Can add additional performance requirements and information to the process.
Consultant (s)	Providers expert advise and a variety of specialized services, such as feasibility studies, master planning, functional and space programming, operational planning, geotechnical reports, environmental assessments, real estate acquisition, permitting consultants, etc (CMAA, 2002).	Critical to the planning process – advise the owner on various aspects (feasibility, cost expectations, future trends, operational effectiveness, constructability, design/contractor advertisement and selection, etc)
Architect/Engineer	Person or firm responsible for creating a building design that is constructible and meets the owners intent; delivers final drawings and specifications to be used by the Builder	Sometimes used during planning stages – can be very beneficial in creating and finishing the design program (documents required at the start of design effort)

Table 1 continued

Participant	Definition	Project Planning Role
Project Manager/Program Manager (PM)	Responsible for day to day management activities with regards to meeting project requirements and quality, schedule, and cost - usually considered the representative of the owner.	Can be utilized throughout the project construction life cycle – used to manage administrative functions, represent the owner in many cases, expedite decision making, etc.
Construction Manager (CM) Agent	(Similar to PM)	(Same as PM)
Construction Manager (CM) At Risk	Similar to PM, except he or she holds the trade contracts and therefore also assumes the risk for the performance of the work (AGC, 2004)	(Same as PM)
General Contractor (GC)	Responsible for transforming the architect's drawings and specifications into reality – assumes overall responsibility for the construction, holds the sub-contractor trade agreements and therefore assumes the risk for the performance of work.	Can be utilized during planning (especially with a Design Build firm) where one contract is utilized. Can provide information on cost and timeline expectations early in the process.
Subcontractor(s)	Works for the CM@Risk or the GC – responsible for a particular trade or service as part of the construction effort.	Usually not involved in project planning – but can be used to obtain specific material or process costs and time expectations.
Developer	A person or group that develops real property and maintains an ownership interest in the project (AGC, 2004)	Might coordinate with potential owners to obtain their interest in order to build a desirable project – owners might have the ability to influence planning

2.4. What is the timeline for projects?

Projects can vary from a few weeks (simple upgrade or renovation) to several years (complicated, phased new construction). Below are two U.S. Army examples of typical planning timelines for new construction and renovation efforts:

(1) In the U.S. Army Health Care Military Construction (MILCON) program for all new construction projects above $750,000, there is usually a total of 4 years planned from the start of design until the completion of construction. Keep in mind that this includes hurdles such as waiting for fiscal year funding releases as well as mandatory submittal reviews, audits, and progress approvals. In terms of planning, the Department of Defense (DoD) military construction timetable recommends starting 15 months prior to the start of design (including 6 months for A/E selection and award).

(2) U.S. Army Health Care renovation projects typically follow a variable timeline that allows 6-12 months for planning, 4-6 months for design, and 12-18 months for construction.

Again, it is imperative to realize all projects have unique requirements and therefore have variable times spent on planning, design, and construction. It is important to utilize consultants early on in the process to address the time requirements for each phase.

For private or public projects without as many "hurdles", an owner can anticipate reduced durations in some areas – each have their own unique advantages and disadvantages. Some of the ways to reduce durations include:

- Fast tracking or the overlapping of project phases (can be used with any delivery method described in the next section)
- Using a Design Build firm – improves internal communication and can reduce project duration by starting construction prior to a complete design effort – some state regulatory bodies have difficulty dealing with the design-build process
- Streamlined decision making – private owners may have less requirements or mandatory regulations to adhere to (but this varies considerably by state)
- Improved access to funding – owners may have immediate access to funding, rather than an annual release as described above. However, most healthcare organizations do not have access to governmental sources of funding and, therefore, are dependent on a combination of operating performance and fund raising/philanthropy to fund major projects.

2.5. Delivery and procurement methods

The owner should start to think about and develop a list of delivery systems available. For public entities, there can often be limitations on which delivery systems can be utilized.
The appropriate delivery method should be selected with respect to the following factors: schedule, project complexity, potential for changes, in-house staff capabilities, experience with a particular method, quality, and the availability of funding (AGC, 2004).

There are three delivery methods (Design-Bid-Build, CM@Risk, and Design-Build) and three procurement methods (Low Bid, Qualifications-Based, or Best Value) for owners to evaluate for a total of six various options (AGC, 2004). Of course, there is some confusion in the construction industry as to other "hybrid" or "alternate" delivery methods, but one can argue that some of these are management methods or just a variation of one of the six options mentioned above. It should also be mentioned that there is a movement towards integrated project delivery (IPD), mainly experimented with in European pilots. In this approach the interests of all primary team members are aligned in such a way that they all share the risk and profit for total project performance. A single contract binds the team to the owner. The contract spells out the commercial terms and defines the scope, schedule and cost of the project. Although it will require a culture change in the industry before IPD will become common in the US, it is interesting to note that developments in Building Information Model (BIM) standards may accelerate the acceptance of IPD. The reason for this is that the adherence to a common shared digital representation of the facility forces all parties to enter into some form of an aligned agreement with respect to ownership, obligations, and risk of the data.

There is considerable help and guidelines available on the choice of the most appropriate project delivery method. For The state of Georgia for example has two websites that define delivery methods and give advice how to select the most appropriate one for your project:

Volume 1: Project Delivery Methods, Understanding Your Options:
http://gsfic.georgia.gov/vgn/images/portal/cit_1210/11569190pdo_v1_0503final.pdf

Volume 2: Selecting the Appropriate Project Delivery Option:
http://gsfic.georgia.gov/vgn/images/portal/cit_1210/11569193pdo_v2_0503final.pdf

Additionally, the owner should invest some time to determine various ways to contract or procure the potential project. One should realize that the budgets during the planning stages of a project are only estimates – it is an "educated estimate" from the general contractor (GC) based upon the various sub-contractor price quotes he/she has received. Therefore, there is risk involved in the general contractor's ability to perform the work for an agreed upon price. There are five common types of contracts: lump sum, unit price, guaranteed maximum price (GMP), cost plus, or time and materials.

(1) A Lump Sum contract is a basic agreement where the supplier (general contractor) provides services for a specific price. The profit and overhead is included in the agreed upon price and may fluctuate depending on how well the estimated costs are realized by the general contractor during the construction process. The GC assumes the risk and the cost to the owner remains constant. Bid projects with Lump Sum tend to set the lowest possible cost as the highest owner priority.
(2) A Unit Price contract breaks the scope of work (SOW) into smaller components, usually by construction trade, and a fixed price is set for each unit of work. Similar to lump sum, the contractor(s) are paid an agreed amount for the work regardless of actual costs.
(3) A GMP contract uses a maximum ceiling amount for the total construction cost. It usually allows the contractor to keep or split the savings below the ceiling amount from the actual construction cost. GMP contracts with negotiated arrangements tend to set quality and working relationship as the highest owner priority.
(4) A Cost Plus contract allows for the GC to receive a guaranteed profit. If the project costs more than anticipated, the GC still receives an agreed percentage of profit and overhead. Most public entities cannot use such a contract due to fixed budget appropriations. However, this contract allows the GC to avoid "cutting corners" or substituting with cheaper materials when the budget becomes tight.
(5) A Time and Materials contracts state that the owner will pay the actual costs for construction that are needed to complete the project. Under this agreement, the GC bills for all of his costs to build the project plus a fee. This is not a GMP agreement. Owners should be wary of this agreement.

2.6. Getting a grasp on cost expectations

2.6.1. Understanding Healthcare costs

It is important for owners to realize that healthcare construction varies dramatically depending on the type of facility desired and its geographical location. Usually costs are estimated during the design process through consultants (estimating companies), the A/E, and/or the contractor providing pre-construction services. The most expensive healthcare facilities to construct on a per square foot basis are two and three story hospitals ($194/SF to $320/SF depending on geographical location). Realize that the cost variance from an expensive area (such as New York City) to a lower cost of living area (such as Winston-Salem, NC) is usually 33% on average and can be as high as 65% difference (Carrick, 2006). Table 2 below gives more detail. However, some of our experts reviewing this guide believe RS Means (although reputable) has typically provides low estimates – for instance, some projects in California have been as much as $500/SF. Another expert claims that RS Means can be as much as 30% below expected actual construction costs.

It is very important for owners to realize the true cost of construction per square foot. First, understand that cost per hospital bed is a poor metric. It is too simplistic, typically does not reflect different types of beds, and often compares cost estimates to national averages – which depending on the geographical area mentioned above can be misleading. Next, realize that the cost per square foot will fluctuate depending on the service provided or department area – administrative space is cheaper to build than surgical space for instance.

Finally, realize that most owners think of construction cost as the cost per net square foot (NSF) without understanding that both square footage and costs have added multipliers that can dramatically increase the original cost. For instance, imagine a 10 foot by 10 foot room (100 NSF) that was quoted as $250/NSF. The construction would be $25,000. However, realize that a department gross square foot (DGSF) factor and a building gross square foot (BGSF) factor can easily double the construction cost to $50,000. Construction costs should include fees, permits, general conditions and other project items and services. The multiplier for construction-to-project cost is often between 1.25 and 1.4, depending on the engineering requirements. With an escalation value of 1.3, the project cost of that room is now $65,000. With inflation and financing, the room can easily exceed $75,000 (Aliber, 2007).

Table 2: RS Means data for healthcare facilities

RSMEANS COSTING INFORMATION – HOSPITALS, NURSING HOME AND APARTMENT BUILDING – NOVEMBER 2006

Alex Carrick – Released December 1, 2006

U.S. DOLLARS PER SQUARE FOOT CONSTRUCTION COSTS – BY TYPE OF STRUCTURE – NOVEMBER 2006

MAJOR CITIES (alphabetically)	HOSPITAL (2 TO 3 STORIES)			HOSPITAL (4 TO 8 STORIES)		
	2006	2005	% Change	2006	2005	% Change
1 ATLANTA	$218.78	$197.66	10.7%	$200.23	$179.93	11.3%
2 BALTIMORE	227.02	203.59	11.5%	207.77	185.33	12.1%
3 BOSTON	282.17	255.28	10.5%	258.25	232.38	11.1%
4 CHICAGO	277.14	245.75	12.8%	253.64	223.71	13.4%
5 CLEVELAND	246.01	221.60	11.0%	225.16	201.72	11.6%
6 DALLAS	205.28	185.79	10.5%	187.88	169.13	11.1%
7 DENVER	232.51	211.43	10.0%	212.80	192.46	10.6%
8 DETROIT	256.77	233.67	9.9%	235.00	212.71	10.5%
9 HOUSTON	216.49	193.63	11.8%	198.14	176.26	12.4%
10 KANSAS CITY	252.19	227.53	10.8%	230.81	207.12	11.4%
11 LOS ANGELES	261.80	234.94	11.4%	239.61	213.87	12.0%
12 MIAMI	212.14	191.09	11.0%	194.16	173.95	11.6%
13 MINNEAPOLIS	274.85	245.96	11.7%	251.55	223.90	12.3%
14 NEW ORLEANS	211.92	189.61	11.8%	193.95	172.60	12.4%
15 NEW YORK CITY	320.16	290.02	10.4%	293.02	264.01	11.0%
16 PHILADELPHIA	279.65	248.71	12.4%	255.95	226.41	13.0%
17 PHOENIX	218.55	193.63	12.9%	200.02	176.26	13.5%
18 PITTSBURGH	241.89	220.96	9.5%	221.39	201.14	10.1%
19 PORTLAND	250.13	228.16	9.6%	228.93	207.70	10.2%
20 ST. LOUIS	254.02	225.83	12.5%	232.49	205.58	13.1%
21 SAN DIEGO	255.17	230.07	10.9%	233.54	209.44	11.5%
22 SAN FRANCISCO	297.73	268.63	10.8%	272.49	244.53	11.4%
23 SEATTLE	254.71	230.07	10.7%	233.12	209.44	11.3%
24 WASHINGTON, DC	240.06	214.18	12.1%	219.71	194.97	12.7%
25 WINSTON-SALEM	193.61	169.27	14.4%	177.19	154.09	15.0%

MAJOR CITIES (alphabetically)	NURSING HOME			APARTMENT BUILDING (8 TO 24 STORIES)		
	2006	2005	% Change	2006	2005	% Change
1 ATLANTA	$121.32	$110.19	10.1%	$146.55	$131.04	11.8%
2 BALTIMORE	125.88	113.49	10.9%	152.07	134.97	12.7%
3 BOSTON	156.47	142.31	9.9%	189.02	169.24	11.7%
4 CHICAGO	153.68	137.00	12.2%	185.65	162.92	13.9%
5 CLEVELAND	136.42	123.53	10.4%	164.80	146.91	12.2%
6 DALLAS	113.83	103.57	9.9%	137.51	123.17	11.6%
7 DENVER	128.93	117.86	9.4%	155.75	140.17	11.1%
8 DETROIT	142.38	130.26	9.3%	172.00	154.92	11.0%
9 HOUSTON	120.05	107.94	11.2%	145.02	128.37	13.0%
10 KANSAS CITY	139.84	126.84	10.3%	168.94	150.84	12.0%
11 LOS ANGELES	145.17	130.97	10.8%	175.38	155.76	12.6%
12 MIAMI	117.64	106.53	10.4%	142.11	126.69	12.2%
13 MINNEAPOLIS	152.41	137.11	11.2%	184.11	163.06	12.9%
14 NEW ORLEANS	117.51	105.70	11.2%	141.96	125.70	12.9%
15 NEW YORK CITY	177.53	161.68	9.8%	214.47	192.28	11.5%
16 PHILADELPHIA	155.07	138.65	11.8%	187.33	164.89	13.6%
17 PHOENIX	121.19	107.94	12.3%	146.40	128.37	14.0%
18 PITTSBURGH	134.13	123.18	8.9%	162.04	146.49	10.6%
19 PORTLAND	138.70	127.19	9.0%	167.56	151.26	10.8%
20 ST. LOUIS	140.86	125.89	11.9%	170.16	149.72	13.7%
21 SAN DIEGO	141.49	128.26	10.3%	170.93	152.53	12.1%
22 SAN FRANCISCO	165.10	149.75	10.2%	199.44	178.09	12.0%
23 SEATTLE	141.24	128.26	10.1%	170.62	152.53	11.9%
24 WASHINGTON, DC	133.12	119.40	11.5%	160.81	141.99	13.3%
25 WINSTON-SALEM	107.36	94.36	13.8%	129.69	112.22	15.6%

Data source: Reed Construction Data – RSMeans/Charts: Reed Construction Data – CanaData.

These charts and tables were abstracted from RSMeans cost data publications for the A/E/C industry. For more information about RSMeans Square Foot Cost Guide and RSMeans CCI (Construction Cost Index), which indexes square foot costs for cities in the U.S. and Canada, visit the online bookstore at www.rsmeans.com and click on cost data publications (or call 1-800-448-8182).

2.6.2. Understanding soft versus hard costs

Every owner will need some guidance early on in the process of what a planned facility will cost. The first step is to delineate between hard and soft construction costs. Hard costs are often referred to as "bricks and sticks" or "bricks and mortar" and represent the actual amount paid to contractors building the facility. Hard costs include all built-in equipment such as the Heating Ventilation and Cooling (HVAC) system, specialized equipment that is not able to be moved, and some furniture (like installed cabinetry). One simple way to think about it is to picture being able to pick up a facility, turn it upside down, and shake everything out of it – what is left over are the items typically associated with hard costs. Soft costs are everything else associated with completing the construction project. They include consultant and architecture fees, permits, feasibility studies, project management, equipment, furnishings, and other administrative costs. Usually, owners are not aware of or may underestimate the magnitude of soft costs on a project. Table 3 below demonstrates the breakdown of an example project - notice that soft costs represent 27% of the total construction cost.

Table 3: Hypothetical $110M health care project construction project (Turner Construction Company)

Total Construction cost	Hard cost	$80M	73%
Permits and Fees	Soft cost	$1.5M	1.3%
Equipment and Furnishings	Soft cost	$21M	19%
Professional and Technical costs	Soft cost	$5.5M	5%
Insurance and Taxes	Soft cost	$0.5M	0.4%
Contingency	Soft cost	$1.5M	1.3%
TOTAL		$110M	100%

The next step is to place hard and soft costs into industry recognized terms. First, the Total Construction Cost (reference above in Table 2) is the cost of the construction work, the constructor's general conditions, and the constructor's fee. It is important to understand this concept, especially when selecting your delivery method. The Total Construction Cost is added to design fees and other soft cost described above to give the owner the Total "Project" Cost (AGC, 2004). It is important for the owner to understand the contingency as well. It is typically considered a best practice for owners to carry a 10% contingency (of the construction costs). Realize that the contractor will typically carry their own contingency in addition to the owner. Also, a separate inflationary contingency might be required for projects with a significant duration. Some industry experts feel the factor to go from construction costs to project costs can easily be 40-50%. The next two sections deal with operational cost impacts versus project costs.

2.6.3. Energy Related Costs

Healthcare facilities have the fourth highest energy consumption behind office, retail, and education buildings. They have the second highest intensity of energy use (per square foot cost), second only the to the food service industry (DOE, 2003). A common breakdown of energy use areas in a hospital is shown in this figure:

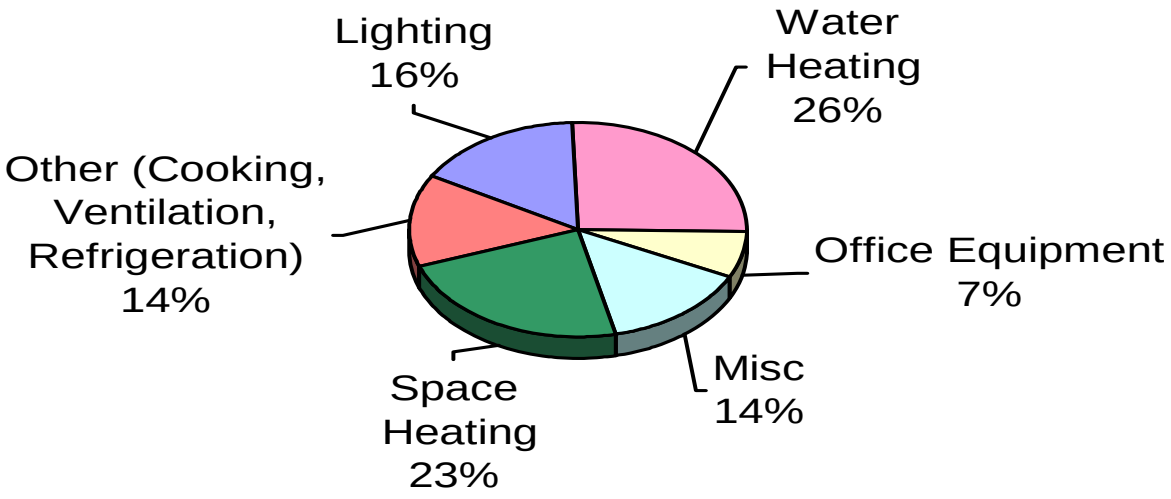


Figure 3: Hospital Energy Use Areas (EIA, 1995)

The average yearly utility costs per gross square foot (GSF) in healthcare facilities are reported to be a total of $2.87/GSF with a breakdown of electricity: $1.30, fuel oil: $0.05, gas $0.30, steam $0.91, water $0.18 and sewage $0.13 (IFMA, 2001). With over 3.16 billion SF of inpatient and outpatient facilities in the US, this amounts to a total yearly healthcare utility bill of $ 9 billion (DOE, 2003). The same DOE report lists the yearly average total costs of operation (janitorial, utility and maintenance) for healthcare facilities to be $7.19/GSF.

Although often overwhelming, there are many ways to improve energy efficiencies – especially in old, inefficient buildings and systems. Typical improvements include using energy efficient lighting (fluorescent, LED, etc), retrofitting or replacing inefficient boilers/chillers/HVAC equipment, or installing energy management systems. Additionally, measures that reduce energy consumption also tend to improve patient comfort and increase staff productivity.

2.6.4. Water Related Costs

Hospitals and healthcare facilities consume different amounts of water depending on various factors including the services provided, the number of inpatient/outpatient visits, equipment used, age of the facility, to name a few. Reports often present water consumption in various ways; for instance, one report utilizes a benchmark of 28 gallons/GSF (IFMA, 2001), while another uses 120 gallons/bed with a range of 80-150 gallons (DOE, 2007).

Water rates are projected to increase in the future. A conservative estimate of future increases in water rates for federal agencies is about 10% per year across the nation in the near term (US DOE, 2007). An example of water use breakdown is show in this figure:

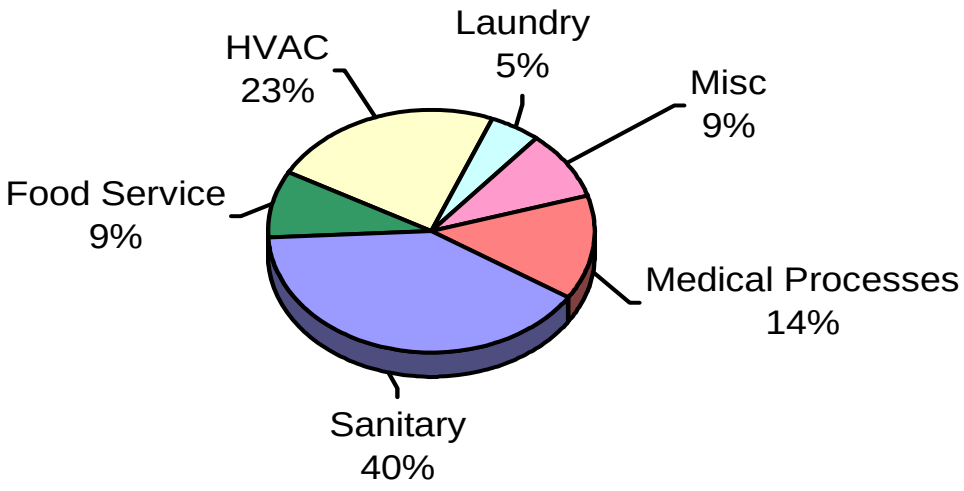


Figure 4: Hospital Water Use Areas (Reed, 2005)

The U.S. Department of Energy has established that all federal agencies shall reduce potable water usage by implementing life cycle cost-effective water efficiency programs with a goal of reduction goal of 50% by 2008 and 80% by 2010 (DOE, 2007). Usually facilities managers and owners can focus on water efficient systems (urinals, toilets, cooling towers, etc) and water reduction (water efficient landscaping, single-pass cooling equipment, etc) to meet reduced water consumption rates.

2.7. Understanding the planning effort

Planning starts at the earliest "inception" stage of a new facility. Although the planning effort has a clearly defined start, its end is not sharply defined. In fact, in many projects a continuous planning effort is necessary as situations change and original plans need to be revised. In fact, despite everyone's best efforts to attempt to predict the future, all master plans and functional and space programs should be kept open as long as possible to allow

for the inevitable changes that will come in healthcare delivery in each organization. These plans need to be "living and breathing" documents that can be modified to meet the organization's needs. It is much more cost effective to make changes in the early stages of planning rather than trying to change construction documents or a building under construction.

The goal of project planning is to better define the scope of work of a project in order to meet both owners' expectations and project requirements in terms of budget, time, and performance. The ability to execute the planning effort with the right team and the right dedication of resources is paramount to project success.

Owners must understand that not all projects are created equal. Projects are unique, not fully up-front definable, goal-oriented or rehearsed happenings. They differ from daily hospital operations because they are temporary and only exist until project goals are realized. There are many considerations, obstacles, opportunities, etc. that will need to be addressed from the very start. An owner should involve consultants, as required, early in the planning/design process to help "steer" the project in the right direction. This is especially important, when in-house resources are not available or the owner has limited experience in planning construction projects. Large projects often require augmenting in-house staff with full-time outsourced employees to have project success.

It is important for owners to realize a simple fact up-front: the owner has the greatest impact (influence) on the process early on with relation to cost. As illustrated in this figure:

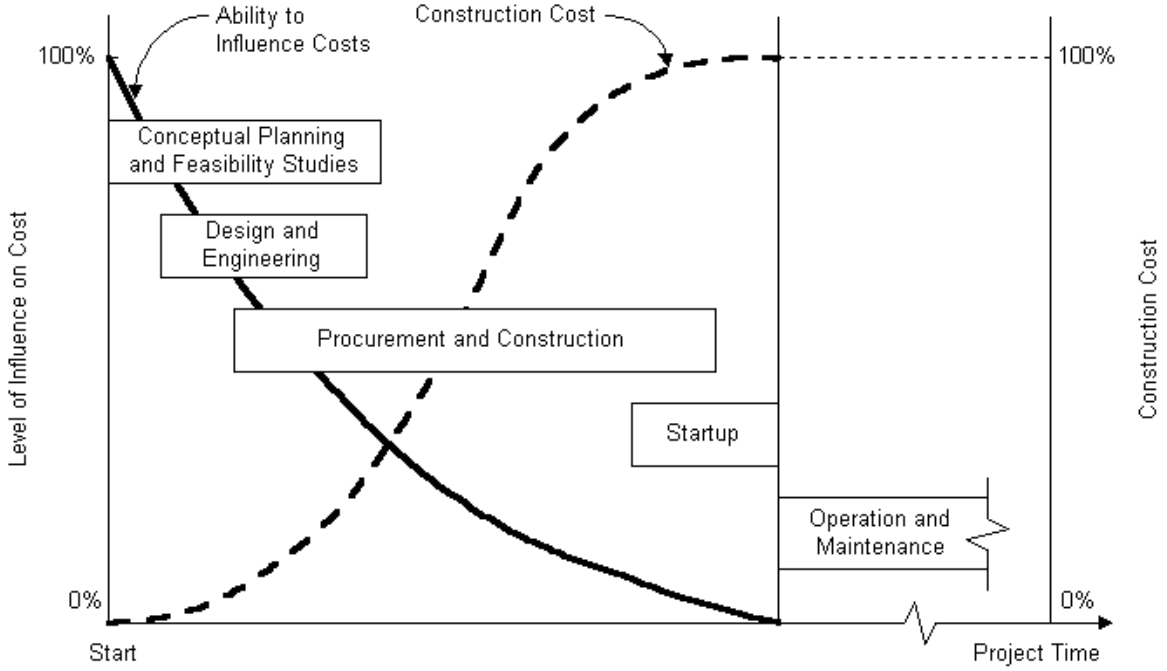


Figure 5: Cost Influence Graph (Hendrickson, 1998)

3. DEFINITION AND EXECUTION OF PROJECT PLANNING

3.1. Why focus on project planning?

If you ask the average person about project planning, the first thing that comes to mind is the breakdown of the project into specific tasks and the planning (or rather scheduling) of these tasks. But, as any planner will tell you, this is the easy part of what they do and usually follows what they call real project planning. In fact, many planners will claim that the work breakdown structure (WBS) and the scheduling of tasks is not even a part of true project planning. This chapter focuses on the key ingredients of project planning and discusses the reasons that make project planning so difficult, highly collaborative, and hard to formalize into a set of clearly delineated activities. Oftentimes, planning efforts need to be customized to meet the needs of the owner.

Project planning (PP), according to Webster dictionary, can be defined as "the projection of the realization or achievement of a plan." It quantifies the amount of time and budget required to undertake an endeavor and to create a unique product, service or result. Wikipedia.com defines the purpose of project planning as "creating a project plan that a project manager can use to track the progress of his team." A carefully planned and organized strategy is needed to accomplish the specified objectives. The strategy includes developing a plan which outlines the goals, sets the tasks to be completed, determines how tasks will be accomplished, and an estimate of the time and resources needed for their completion. How well projects are planned and managed will seriously impact the profitability of the ventures that they are intended for and the quality of the products or services they generate.

A project should reflect the strategic and operational goals of the organization. Time needs to be set aside to determine the historic performance (patient activity levels, market share, strategic foci, etc.), future strategic goals and expected performance. Strategy and operations must drive the development of the facility, for instance:

- Will the organization make particular investments in certain programs and physician recruitment?
- What will be the impact of those investments? Will our capture of market share and patients change over time?
- How can we organize our facility in a way that allows us to operate more efficiently and also allows us to be flexible in the use of the facility

Once the patient volume projections and operating guidelines have been determined, well qualified healthcare planning consultants can translate those volumes into room requirements and space needs. This can form the fact base on which the entire project will be built.

The US-based Project Management Institute (PMI) defines project planning as "the development and maintenance of formal, approved documents used to guide both project execution and project control." The primary uses of the project plan are to document planning assumptions and decisions, facilitate communication among stakeholders, and document approved scope, cost, and schedule baselines. A project plan may be anywhere between a high-level summary and a detailed work plan (PMI, 2000a).

A couple of well known techniques are typically associated with and used for the purpose of planning and scheduling the different tasks in project management:

- Work Breakdown Structures (WBS)
- Gantt charts
- The Critical Path Method (CPM)
- The Program Evaluation and Review Technique (PERT)

A WBS is a list of tasks ordered as a tree of activities that represent the total work required to complete the project. Gantt charts (named after the social scientist Henry L. Gantt) arrange the different events in synchronism and associate each task with its precedence and duration. It displays activities as timed bars and graphically visualizes the sequence of the events. The CPM focuses on the timing by more explicitly taking into account the interdependence of critical tasks. It identifies the tasks that need to be completed on time to meet the intended project deadline (the critical path), while considering the possibility of parallel tasks and float/slack times for every activity. The Program Evaluation and Review Technique (PERT) is a variation of the CPM in that it follows a probabilistic rather than a deterministic approach, taking into account the likeliness of activity durations. The CPM method is typically used by construction managers to successfully schedule and execute a construction project.

Few professionals in the design and construction industry will dispute that better project planning will likely lead to better project deliverables in terms of time, cost and quality. Enhanced preparation can reduce the amount of change orders, misunderstandings, litigation and delays during project execution. Many studies have shown that poor project planning leads to large numbers of claims due to – among others –project specification and contractual incompleteness, and consequent adjustments, resulting in significant cost increases for the owners. The 'Dispute Avoidance and Resolution Task Force' of the American Arbitration Association comments in its February 1994 newsletter (AAA, 1994): "During the past 50 years much of the United States construction environment has been degraded from one of a positive relationship between all members of the project team to a contest consumed in fault finding and defensiveness which results in litigation. The industry has become extremely adversarial and we are paying the price… A positive alliance of the parties (involved in the construction process) constitutes an indispensable link to a successful project." In today's environment, margins have often become too tight including schedules, budget, and contingencies.
New types of partnerships and alliance contracts could reduce the litigious climate in construction projects and create a more synergetic atmosphere, but in order to improve

the situation, adequate vehicles are needed for empowering partnerships to engage in better project planning.

Recent research in Canada and the United States indicates that the traditional practice of shifting project risks to the other contracting party by using disclaimer clauses in contracts, is a significant reason for parties to increase the total cost of a project (Zaghloul and Hartman, 2003), with estimated premiums between 8 and 20%. Any improvement in the process and more appropriate risk allocation would deliver substantial savings for the construction industry. Research also shows that there is an important relationship between trust and risk allocation through contract provisions.

The five most commonly used exculpatory clauses in construction contracts regard:

(1) uncertainty of work conditions
(2) delaying events
(3) indemnification
(4) liquidated damages
(5) sufficiency of contract documents

Based on a survey among industry experts – owners, consultants and contractors – with more than 300 respondents, it can be concluded that a trust relationship between the contracting parties should exist first to reach a better risk allocation process. Certain stages are proposed to achieve higher pre-project trust:

- A clear understanding of risks being borne by each stakeholder and who owns and manages that risk
- More time and effort in the front-end of a project and sufficient experience to manage or mitigate the risk and administer the contract
- A negotiation phase prior to the start of the contract should exist This phase is needed to build a trust relationship between the contracting parties
- Adequate risk-sharing, or risk-reward systems should exist to share the benefits if the risk does not occur during the project lifecycle
- Introducing the contractor early in the planning or design effort can allow early input into the project, build a team dynamic, create shared accountability, and achieve higher trust

3.2. The broader perspective of PP

Project planning brings the strategic objectives of the project to the realm of tactical decision making. PP is tactical in nature; it prepares a plan for the actual execution of the project in a way that guarantees predictable outcomes.

In summary, the overall objectives of project planning are to:

- Alleviate information asymmetry between project partners
- Ensure proper handling of the negotiation process and resolve intermediary agreements
- Share the planning burden between involved project partners
- Achieve a clear, optimized allocation of planning tasks to the proper, most proficient resource across organizations
- Guarantee timeliness of invoking planning events and comprehensiveness of planning outcomes
- Avoid an ad-hoc approach to contract definition
- Foster knowledge retention across recurring projects within organizations
- Enable industry-wide diffusion of best practices, thus increasing quality and productivity in Architecture, Engineering and Construction (AEC)
- Increase transparency and mutual understanding of project expectations

The latter bullet points carry a strong relationship with the ongoing proliferation and consolidation of evidence based design (EBD) practices in healthcare design. These practices build on proven architectural methods for improving patient outcomes, safety, and satisfaction, as well as staff retention and service efficiency. It is well recognized that project planning is the project stage where EBD methods need to be anchored as part of the tactical phase of the project execution. We will elaborate more on EBD later in this guide.

Project planning is very collaborative by nature. Current planning practices of most owners incorporate little systematic effort to capture and reuse the knowledge of experienced project planners as they make preparatory decisions. The knowledge base is cultivated in firms that specialize in vertical markets, such as healthcare facilities. But even with this concentration in specialized firms, some project teams will be composed differently on every project and the lack of stored procedural information can lead to a rather ad-hoc approach to project planning, an enduring over-reliance on individual experience. On the other hand, some firms offer the same project teams over and over. This can help address the issue of improving the knowledge base, but can also lead to a stale and non-innovative approach to project planning.

3.3. Project Planning: a general process view

An elaborate, but abstract series of project planning steps is proposed by the Project Management Institute (PMI) in their Project Management Body of Knowledge (PMBOK) which represents over thirty years of project management experience spanning multiple industries worldwide (PMI, 2000 a,b). At the highest level, the PMBOK describes project management as consisting of initiation, planning, execution and project closure, with a 'controlling' loop going back from execution to planning (Figure 6).

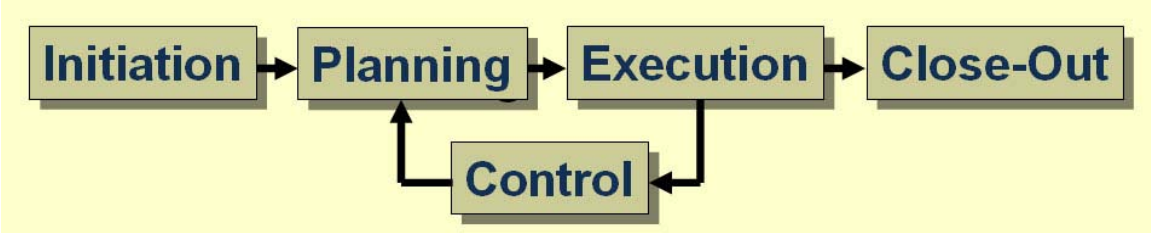


Figure 6: Top-level Phases of the PMBOK (PMI, 2000 a,b)

During project initiation the recognition of the need for a project and the commitment of the organization to it are assured by defining a project charter, an initial scope statement, project managers, stakeholders and team composition, while assessing constraints and assumptions in the cultural context of the endeavor. After completing project initiation, the PMI suggests a series of core planning processes – though recognizing the repetitive nature of project planning – in parallel with a series of optional facilitating processes (Table 4). The latter are applied and deemed necessary based on the characteristics of the particular project at hand. Core planning processes are for activity definition and schedule development, whereas facilitating processes could be risk identification and procurement planning. The various planning sub-processes should result in a consistent and coherent overall project plan to guide execution and control.

Table 4: PMBOK Planning Process Groups (PMI, 2000 a,b)

1. Core planning processes	2. Facilitating planning processes	3. AEC-specific
1.1. Scope Planning 1.2. Scope Definition 1.3. Activity Definition 1.4. Resource Planning 1.5. Activity Sequencing 1.6. Activity Duration Estimating 1.7. Cost Estimating 1.8. Schedule Development 1.9. Cost Budgeting 1.10. Project Plan Development	2.1. Quality Planning 2.2. Organizational Planning 2.3. Staff Acquisition 2.4. Communications Planning 2.5. Risk Management Planning 2.6. Risk Identification 2.7. Qualitative Risk Analysis 2.8. Quantitative Risk Analysis 2.9. Risk Response Development 2.10. Procurement Planning 2.11. Solicitation Planning	3.1 Safety Planning 3.2 Environmental Planning 3.3 Financial Planning 3.4 Claim Identification 3.5 Claim Quantification

3.4. What is standard practice in project planning?

It is important to keep in mind that there is no single correct approach to planning a project and choosing the level of detail of actions to perform. Too much detail wastes time, money, and frustrates the project team, whereas too little of it introduces risk, confusion and extra costs. Different teams with same intentions may therefore produce very different plans to accomplish their goal. Even with a number of services predetermined at the outset of a project, other activities might still become necessary once the project is underway. There is no feasible way to preempt all future changes that will occur as response to the dynamic changes of the project environment, and one should therefore not attempt to anticipate potential through the use of overly detailed plans. Moreover, many of the owner's needs and expectations come into focus only in the design process, which may require revisiting and updating the original planning.

It should also be noted that the PMBOK only describes input and output deliverables at a generic level, without much detail of the actual procedures and required domain knowledge to complete activities, and without much detail at the level of applicable techniques. For example, the output of "Scope Definition" is defined as the Work Break-down Structure, but implicit familiarity and experience are assumed as to how to arrive at a realistic project-specific set of phases. Moreover, the PMBOK does not explicitly define resource allocation in the form of activity assignments to parties or individuals involved in a construction project (who should do what), whereas the division and coordination of responsibilities and tasks between project partners is a crucial aspect of construction project management.

Realizing the above leads to an important conclusion: the PMBOK is concerned about the WHAT, and not about the HOW. This has led to many different firm specific and industry type specific realizations of the planning process. This is the reason why many firms are cultivating their own proprietary HOW-implementations of the broader PMBOK WHAT-definitions. It is interesting to note that the some web collaboration environments have started collaborative project planning and execution services, where PRINCE2 (one of the semi-standardized implementation methods) is receiving a lot of attention (Bentley, 2005).

Other efforts describe in narratives (rather than providing actual support systems) small slices of practice that can be more easily structured, such as the contract negotiation between owner and architect, for which the American Institute of Architects (AIA) recommends five general steps (AIA, 2003):

- Establishing project requirements
- Describing project tasks and responsibilities for each of them
- Identifying schedule requirements
- Adapting plan, budget and/or schedule if necessary
- Determining the architect's compensation

A number of project management organizations have taken initiatives to put forward industry standards with regard to approaches and techniques for improving performance of project organizations.

The British Standards Institute (BSI) has published BS6079 "A Guide to Project Management". BS6079 is aimed primarily at small to medium sized organizations as a guidance document rather than a statement of requirements for formal project management conformance, and it includes the implementation and operational phases as part of the project lifecycle. Organizations who wish to adopt the BS6079 standard as a general framework for project management will still require detailed guidance on the processes, activities, and products of their projects.

The Association for Project Management (APM) has developed a method which is used primarily as the basis for competency assessment of individuals in managing projects, but also as the basis of syllabi for training courses and for accrediting training companies in Europe. It identifies forty key competencies divided under four headings: project management, organization and people, techniques and procedures, and general management. For establishing a guided planning process, a particularly useful project management methodology is provided by the American equivalent of the APM, the US Project Management Institute (PMI), introduced above.

The Construction Industry Institute (CII) has a method called the Project Definition Rating Index (PDRI) that is a structured project management tool to assist the team in determining the level of project definition (CII, 1995). PDRI is a weighted score sheet used for determining scope definition through a checklist of 64 items. Each item is weighted based on its relative importance to the other items. A PDRI score of 200 or less has been shown to greatly increase the probability of a successful project. This tool has been widely adopted by various owners in the building construction industry.

3.5. Best practices

In a number of areas, the supply side of the construction industry (planners, design firms, contractors, manufacturers, etc) has been moving towards "best practices". Notable areas where this is happening are (1) sustainable design, (2) evidence based design, (3) technology master planning, (4) building automation management, (5) Building Information Modeling, (6) guiding rational decision making, and others. Owner organizations should come prepared to the table to know how and when to engage the right consultants to enforce best practices. In the following sections we will elaborate best practices in the first three of the mentioned categories, as they are regarded the ones where leadership of the owner is highly recommended.

3.5.1. When to think about sustainable design?

At an early stage in the process a good owner will raise the question about green building practices; in particular, what are the benefits and how much does it cost. Green building

is in fact a combination of design solutions, system designs and products that have positive effects on the environmental (indoor and outdoor) outcomes and impacts of the facility. Such outcomes and impacts may consist of (a) lower energy use and reduced emissions into the local and regional ecosystems, (b) a healthier indoor environment, both for workers as well as for patients, and (c) contribution to wellness and healing.
The owner has to decide how their mission statement aligns with sustainable design objectives. This will address expectations with respect to the value that the facility adds to the community and the emphasis that is placed on maintaining a healthy, productive and work/patient centric indoor environment.

The costs are hard to predict and vary per project, but estimates float around a one to three percent increase of the construction budget. This can be largely off-set by savings, particularly in energy consumption. Some studies have shown that investment in sustainable building practices have a pay-back time of less than 5 years, even at current low energy cost levels (Augenbroe and Pearce, 1998). The U.S. Green Building Council has accelerated the introduction of green building practices through the introduction of LEED (Leadership in Energy and Environmental Design) program. LEED works through third party certification and is based on rating a building against benchmarked levels of sustainability in five categories: Sustainable sites, Water efficiency, Energy and Atmosphere, Material resources, Indoor Environmental Quality and Innovation. In addition to meeting a number of prerequisites, a building obtains a score in each category, the sum of which constitutes the overall LEED score. There are four levels of recognition based on the total score: Certified (26-32), Silver (33-38), Gold (39-51) and Platinum (52-69).
If an owner decides to achieve a certain level of LEED certification during the project planning phase, the design team will select the combination of criteria to be achieved during the design phase. The LEED process is elaborate as it comes with a heavy burden on data gathering and reporting. The documentation and soft costs associated with LEED will impact the A/E's fee. This may explain why organizations have shown only moderate interest in LEED certification.

According to the USGBC, only 74 (or ~2%) of the 3,600+ LEED registered projects are healthcare related (Levin, 2006). This is not surprising as some credits are harder to obtain for medical facilities compared to non-medical facilities. Unfortunately, hospitals and other healthcare facilities have very unique operational requirements such as around the clock operations, increased energy and water use, chemical use, infection control requirements, indoor air quality requirements and stringent regulatory requirements, all of which pose significant obstacles in the implementation of currently accepted sustainability standards ("GGHC," 2006). In response, an organization called the Green Guide for Healthcare (GGHC) has been conducting pilot studies as an alternative to LEED certification. Their program is a voluntary, self-certifying toolkit that has a construction and operational checklist. This approach may assist projects in attaining green principles, while saving some documentation and certification costs typically associated with LEED. Currently, the USGBC has a steering committee working with the GGHC to develop a healthcare specific LEED checklist for future use.

Other sustainable practices sources are Healthcare Without Harm (www.noharm.org), Hospitals for a Healthy Environment (www.h2e-online,.org) and the US Environmental Protection Agency (www.epa.gov).

Green building is not a one time owner commitment; it requires a constant involvement with the design and construction team. Moreover sustainable building strategies require higher levels of integration of the different disciplines amongst themselves and with the owner organization. Without proper integration and management the multiple interactions between design options are impossible to orchestrate and resolve. A commitment to natural daylight, operable windows and energy saving alternative systems requires total harmony between the design team and the systems designers. This breaks a long tradition of health care facilities where the mechanical system design "repairs" ill-advised architectural design choices. This has typically led to over-engineered systems, low satisfaction by the occupants and tremendous waste of energy and water.

3.5.2. Trends in evidence based design

Evidence based design (EBD) is a practice where the owner, design team and consultants set goals for improved patient outcomes, staff satisfaction, safety, quality improvement, operational efficiency, and financial performance and use the design of the physical environment as a strategic tool to attempt to achieve those goals. EBD differs from some traditional practice in that EBD practitioners are called on to be able to find, evaluate and synthesize research and best practices and apply them to a design project (Marberry, 2006). EBD is parallel to evidence-based medicine in that practitioners combine a knowledge of research with good clinical judgment, to set hypothesized outcomes and to test them (Hamilton, 2007). Three organizations currently lead the way in promoting EBD: (1) The Center for Health Design, (2) The Robert Wood Johnson Foundation (RWJF) and (3) The American Institute of Architects (AIA). The Military Health System is one of the organizations adopting EBD strategies in their planning and design approach.

It is useful to understand the strengths and weaknesses of EBD in its current state of development. EBD has proven useful in helping owners articulate goals for improved quality and safety and in helping understand how the physical environment might play a role in improvement. However, it is in most cases not able to provide rigorous predictive (simulation) models linking design decisions to objectively measurable outcomes. This is not surprising as outcomes are the result of the complex interplay of human centric factors of care delivery, organizational processes and the physical environment.

EBD is related to a an established movement in the construction industry towards creating a more formal and transparent dialogue between stakeholders. Such a dialog is based on objective metrics with which both client expectations and the performance of the designed or delivered facility is formally expressed and quantified. In several areas of technical building systems, such metrics have been developed, embodied in so-called performance indicators (PI). In some areas, successful attempts have been made to standardize PI's, notably in energy, lighting and thermal comfort. Sustainability is

another area where a PI was introduced based on a scoring technique (the already introduced LEED score). In these areas it was relatively easy to introduce objective metrics, either based on first principles based simulation (e.g. energy) or on expert-consensus based rating methods (e.g. LEED). One of the earliest attempts to broaden the performance based approach to organizational effectiveness in office buildings was the introduction of the Serviceability Tools and Methods (ST&M), an ASTM standard (ASTM, 2000). The ST&M approach only deals with a limited subcategory of building performance in office buildings and is not applicable to hospitals. The EBD movement takes a similar approach as ST&M, by collecting expertise from different sources, case studies, common experiences and translating these findings into preferred action in a specific case. In view of the complexity discussed above, EBD has a long way to go to deliver the performance metrics that could support an unbiased and formal expression of owner expectations as would be necessary to check proposed solutions against these expectations. This by the way is also the ultimate (and probably elusive) promise of performance based design, promising the objective matching of the expectations on the demand side with the delivered solution on the supply side. Formulating performance based requirements (or de facto a performance based specification) makes no presumption about the solution; the specifications are in fact written in way that nothing relates to desired properties of the solution, it only specifies the performance of the solution. This leaves total freedom to the design effort with the only burden to prove that performance expectations are met. In spite of the often quoted endorsement of innovative solutions, this would make a rather impractical approach to design as everything would be open to rethinking. So, in real life the better approach is to work within the prescriptive regulations, and add a practical mix of prescriptive and performance based specifications. The performance based specs should be used in design solutions where we need more innovation and better control of measurable outcomes.

We are not there yet in healthcare design. The introduction of metrics to verify what works and what doesn't work would require the development of models of hospitals, patients and staff with which we could simulate different options and quantify the simulation outputs into a performance indicator of a solution.

Simulation of the physical and organizational performance of hospitals is currently being discussed as a not so remote possibility. But one should recognize that in spite of some recent hype about modeling hospitals in cyberspace, the road towards reliable models of healthcare processes is long and bumpy. As the reliability of these models is intricately linked to the behavior of human beings, none of our current models is even closely accurate in predicting outcomes. Moreover, the level of detail required to study patient outcomes through simulation in a reliable way is far beyond the capabilities of our current simulation models. It is therefore not surprising that EBD has taken a more practical approach by evaluating and synthesizing research and best practices and apply them to a design project, without having to rely on a scientific theory of performance.

What does all of this mean for the owner? First of all, it should be recognized that EBD is not a theoretical method, but a translation of collective observations into better assumptions about the effect of healthcare design options. Some findings stem from uncontrolled "experiments" and are influenced by many extraneous factors, while others have several studies to strongly support their implementation (e.g. increased natural

lighting or private patient rooms). The research world is continually working hard to un-bias and generalize findings and declare them best practices.

Owners should consider various EBD design recommendations from the standpoint of "improved quality" and "return on investment" with a reflection on their own organizational strategic goals, vision, and mission statement. The main lesson for the owner is that nothing should be taken for granted. Standard solutions should be challenged with evidence that is available; generally acknowledged defects and inefficiencies of current healthcare solutions should not be accepted as a way of doing business. The main responsibility of the owner should be to issue the mandates during the planning stages to address these deficiencies and bad practices head on and make their avoidance part of the owner expectations. Hiring of specialized EBD consultants and A/E firms is a pre-requisite to issue this mandate.

3.5.3. Technology Master Planning

Information Technology (IT) fundamentally changes the way care is delivered and work is performed in healthcare. Therefore, it is essential to know not only the infrastructure but also the ways information will be captured in the facility and what the space implications are of kiosks, computers on wheels, and other data input devices.

To keep a healthcare facility on pace with the current advancements in information technology, the planning of all IT systems has to start at the very early stage of a project. This is particularly true for the planning of the IT infrastructure, especially in large complex facilities, where the careful planning of the IT infrastructure can have large impacts on construction budgets, long term planning for adaptability and robustness, introduction of new (wireless) technologies, layout of emergency power systems, integration of different building automation systems, flexibility of energy and lighting control systems and others. What makes early decisions necessary is the ongoing convergence of technologies which makes it possible (and ultimately necessary) to run multiple systems on one single cabling infrastructure and logical network system. The always on and everywhere availability of the network has often been compared as the introduction of the 4th Utility. This is not without consequence for the early planning decisions, as the integration of low-voltage communication, life safety and automation (CLA) is no longer a matter of choice but a necessity. This includes everything from the wiring for clinical/operational devices and control systems to patient terminals. Additionally, voice over IP telephony, video and television, PA systems, and wireless devices will all run over the same backbone and via universal data access boxes. This has already spurred developments in doctor, patient and device tracking, for example with RFID tags (an electronic bar code). The automated operating room is a good example as they form information hubs in the IT infrastructure that need to be flexibly serviced by a range of hospital wide CLA and other locally operated systems.

Selection of a vendor team that is capable to "standardize" its services and exploit the common single backbone is essential and can lead to substantial savings in infrastructure cost, mainly because of cable end space economies, and reduction in commissioning of

the integrated systems as only one main contractor is in charge of all systems. During this phase a strategy needs to be put in place that links the contracting of the IT infrastructure to the bidding of the M/E/P services. As the IT infrastructure is installed later, it is vital that the M/E/P bid packages and system development are totally aligned with the IT systems infrastructure.

A technology master plan should involve the owner and it is important for the owner to understand the implications of the strategic planning phase where needs and desires of the IT infrastructure systems are studied and products and systems are compared. At this point it is crucial to develop a realistic vision on the use of latest technologies, and make the IT systems a line item in the budgetary process.
The next directives should help the owner take the right steps:

- As a general rule the A/E team should focus only on standards based technologies based on an open architecture
- Develop a vision on how to incorporate existing and future technologies, keeping future technology shocks to a minimum; make sure that the systems are (over) designed to grow with your technology needs
- Make the A/E team adhere to a 4th utility philosophy with maximum guarantees for future expansion of systems that run over a common backbone
- Develop a strategy to align the IT infrastructure with other infrastructures (HVAC, sprinkler, power)
- Stay involved in the budget development for the IT infrastructure; demand a plan that compares capital costs to life cycle maintenance costs
- Start developing a vision on service contracts and/or workforce training that will eventually be necessary to run the systems in the delivered facility. Consequences of different options for the daily operation of the systems should be considered at the earliest possible stage

A technology master plan is equally important in renovation projects. The change in infrastructure has strong ripple effects and is a main cause of budget overruns in renovation projects. Industry groups like the Continental Automated Buildings Association (www.caba.org) publish regular studies that provide market and industry outlooks that can feed into the IT master planning.

3.6. The Project Management Culture

The days that an owner can take responsibility for managing and coordinating the design and construction team has come to an end. The complexity of scheduling, managing objectives, certificate of need application, and analyzing costs are overwhelming, except for the simplest of projects. Some owners with a long term program of new projects may develop the in-house expertise to manage their projects (program management), but the average owner will resort to contracting an external party that performs this task from the very early stages to the delivery of the facility. The actual execution can take different forms of contractual partnerships. The external partner offers a single point of contact for the owner to oversee a comprehensive set of services, while relying on the contracted

party to integrate project planning and manage design and construction. In many cases the third party will also be asked to facilitate the selection of medical equipment and furnishings as the design develops and intermediate the needs of hospital processes and operations with design programming and development.

Typically the hired manager evaluates the A/E services and the actual construction. In renovation projects the hired management firm typically takes responsibility for the coordination between ongoing construction and hospital operation, with the objective to guarantee a smooth transition from the old to the new situation.

If the owner is involved in multiple major construction projects, it is advantageous to hire the same firm, who then de facto becomes a program manager. The added value of having a long standing and trusted relationship with the program managing firm can be significant. There are several firms that have specialized in this type of program management.

4. HEALTHCARE PROJECT PLANNING

4.1. Identifying major project phases

As a first step, it is important to define the basic pre-project and project planning effort in three key phases: Strategic Planning, Feasibility Studies, and Project Specific Planning.

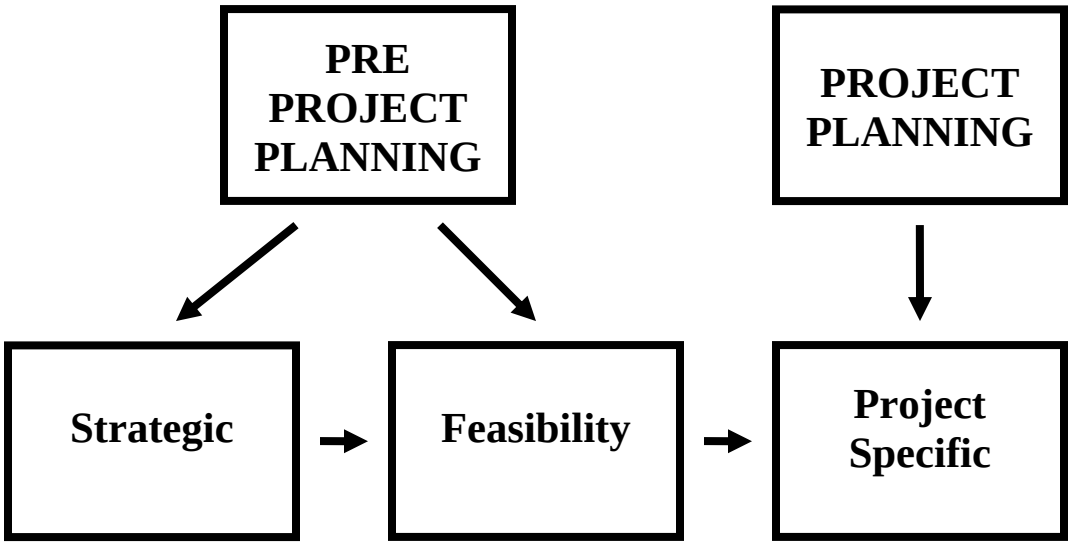


Figure 7: Major Planning Phases

The *Pre-Project planning* effort is defined by the Construction Industry Institute (CII) as "the process of developing sufficient strategic information with which owners can address risk and decide to commit resources to maximize the chance for a successful project" (CII, 1995).

Project planning continues the planning effort with the project specific planning phase until the project is ready to enter the design stage. It involves some critical steps that will be defined in more detail under the project specific task breakdown.

Strategic planning is defined as a management process used to determine the company's fundamental purpose by means of environmental analysis, objective setting, actions to reach those objectives, and adapting the plan accordingly once feedback is received. Strategic planning is often overlooked because of a lack of management training, perceptions that planning is not important, and issues with implementation (Williamson, 1997).

Strategic planning can benefit the health care organization in three areas: (1) Analyze the current market conditions and assess both external opportunities and threats as well as internal strength and weaknesses (2) Help establish clear goals, objectives, and strategies

(3) Increased employee loyalty – through the shared commitment working towards common goals (Williamson, 1997).

Feasibility studies (or needs assessment) are typically an outsourced finite deliverable. The feasibility study will consider several of the following: building use, business justification, business plan, economic analysis, facility requirement, future expansion or alteration considerations, site selection considerations, and project objectives in order to address the mission need (Federal Facilities Council, 2003). The study usually is performed in order to assess the viability of various options and present alternatives to the owner in order to move forward. Feasibilities are not so much a phase, but a transition from strategic planning to project specific planning.

Project specific planning is a planning phase that starts after a decision about which project alternative has been made. It is the necessary phase focused on setting project expectations and defining project requirements. This phase must "piggy-back" off the pre-project planning efforts and apply the organizational mission and vision to the unique project at hand. There are four key areas of this phase: the Project Plan, the Environmental Impact Statement, Identifying stakeholders risks related to the project, and finally the Design Program. Sometimes the Design Program phase is included with the start of design, since often A/E firms can assist the owner in developing this document.

4.2. Implications of poor planning

So why is planning so important? It is estimated that 50% of all U.S construction projects run approximately 200% over budget and over the original schedule. These negative results can me mitigated with an increased project planning emphasis (Rodarti, 2005). The average cost for pre-project planning is 2.4% of the total project cost, thus a significant return on investment compared to the cost of time delays and budget overruns (Construction Industry Institute, 2000). Although planning efforts are most often considered the most critical stage, they are often the least understood.

4.3. The Project Planning Timeline

The project planning timeline will be discussed in two parts. A generic project planning timeline (Figure 8) will be addressed, defining each sub-task.

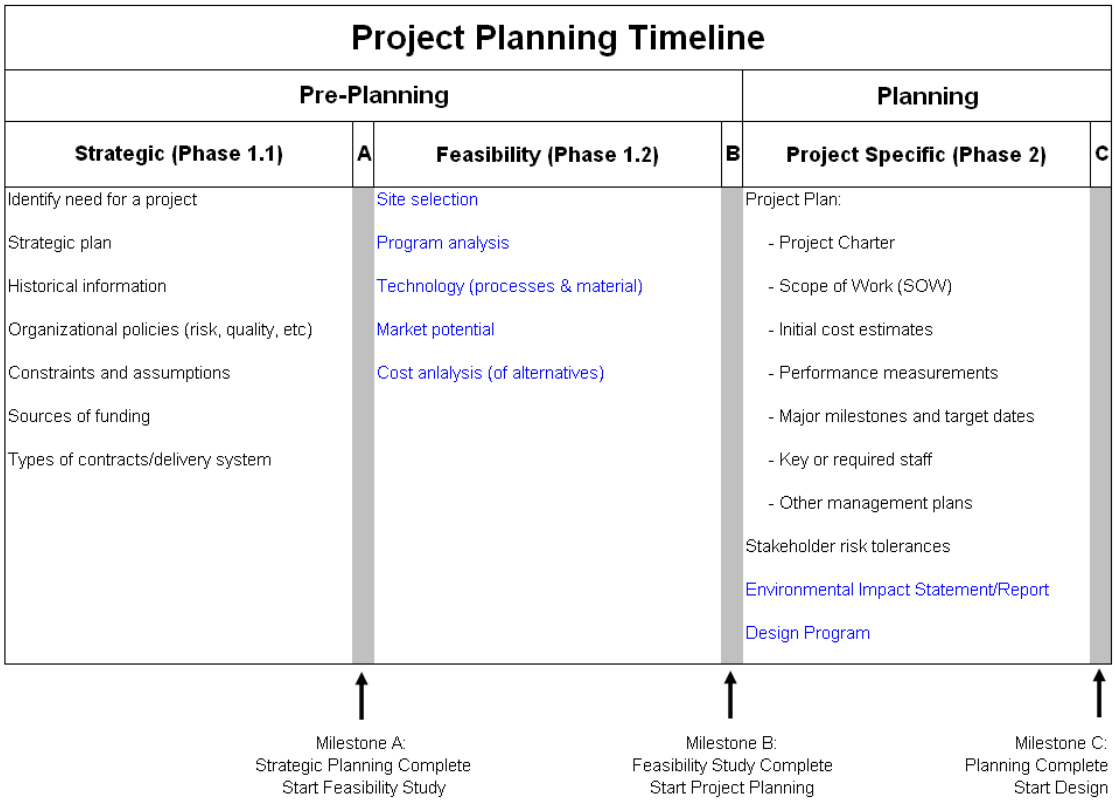


Figure 8: Generic Project Planning Timeline

The description that follows will only be for user responsibilities only – in black text in Figure 2 (although it is understood that typical outsourced items like feasibility studies or the design program can be done in house).

4.4. Strategic Planning (pre-project)

CII describes three advantages to pre-project planning: (1) Reducing costs by up to 20 percent (2) Less project variability in terms of cost and schedule and (3) Increasing the chance of meeting project goals (CII, 1995).

Identify need for a project: The most important starting point for an owner is to clearly articulate your needs. This need should be expressed in terms of Who, What, When, Where, and Why (the five Ws). Once you create a list of questions, start by examining potential answers. For instance, why build new (why not renovate existing)? (Miller, 1997). The answer may be as simple as "you cannot disrupt any current operations" or "the building is in too poor condition"; or it may lead you to now addressing the fact that renovation may be a perfectly logical solution to your needs.

Strategic Plan: Strategic plans are long-term, not changed very often, and are broad in scope. They answer the question of how an organization should commit resources in the

years to come. The easiest way to think of the strategic plan is to frame it in the question, "What will we do?", "Who will we do it for?" and "How will we do what we want to do?" (Williamson, 1997). Master Plans are often grouped in this category and therefore are likely to embody the manifestation of strategic priorities. Where strategic plans deal with the organization, the master plans often deal with the relationship to other facilities, a community, or a city. Master plans are especially useful for owners with multiple buildings with various service relationships. Master plans should be viewed as ways of looking at the facility implications of a strategic plan. In that way, a master plan serves as a management tool to understand the capital requirements of the strategic needs of the organization. The master plan lays out block space needs and costs and can be a good way for an organization to set priorities and phasing for facility projects.

Historical information: Historical information can be any piece of past information that can assist the organization in decisions towards the future. The key is to pull information that will assist consultants with feasibility studies and analysis. What information do you know, that will potentially impact future project decisions? Strategic plans with comprehensive patient volume projections rely on historical data to base the future changes implied by the strategic plan.

Organizational policies: Organizational policies (pertaining to project related areas such as risk or quality) are common in companies that perform construction on some type of reoccurring basis. There may in fact be no such thing in your organization. Regardless if they exist or not, they can be developed and used to set owner requirements as standards for future projects.

Constraints and Assumptions: Constraints and assumptions are used similar to organizational policies, but might in fact be changed more often. For instance, for this fiscal year, you might have a particular constraint on a funding stream or limitation – therefore all projects in that fiscal year are subject to that constraint. Likewise, the owner might have certain assumptions that should be voiced as well.

Sources of Funding: Regardless of what type of project may come up in the future, it is a good idea for the owner to always have a running list of potential sources for funding. There are various avenues depending on public/private organizations.

Types of contracts/delivery system: Similar to funding options, the owner can develop a similar list of potential ways to contract work or what types of delivery systems are available. For public entities, there can be limitations on how the project or work will be contracted for and delivered.

The appropriate delivery method should be selected with respect to the following factors: schedule, project complexity, potential for changes, in-house staff capabilities, experience with a particular method, quality, and the availability of funding (AGC, 2004).

There are three delivery methods (Design-Bid-Build, CM@Risk, and Design-Build) and three procurement methods (Low Bid, Qualifications-Based, or Best Value) for owners to evaluate (AGC, 2004).

4.5. Team Development

As mentioned earlier, strategic planning is an on-going effort and not project specific. Often completed and addressed with in-house staff alone. However, there is a flourishing industry of third party, objective strategic planners which many healthcare organizations and stand-along hospitals use routinely. The second part of pre-project planning (Feasibility Studies) usually is the first outsourced step towards developing and executing a project.

At this point it is imperative to develop a team (internal and potentially external) to assist the remainder of the planning effort as well as the management of the project through design, construction, commissioning, and transition into the new facility.

This team can be comprised of several different individuals, but must be chartered and given the appropriate resources by the project sponsors to effectively plan. The team members much each possess three key attributes: (1) Expertise – knowledge of the key elements of the project (2) Capability – ability to accomplish tasks towards the completion of the planning effort and (3) Authority – the right to make decisions (CII, 1995).

4.6. Project Specific Planning

The start of project specific planning is one of the most critical points in the process, however often not given the proper allocation of time. The owner or CEO defines the scope of the project, continues to assemble team members, incorporates consultants as needed, and sets the foundation on which the project is designed and constructed (Kemper, 2004).

4.6.1. Project Plan

(a) Project Charter: The authority to begin work (from the owner, BOD, etc)

(b) Scope of Work (SOW): The SOW is a perhaps the most important part of a project planning initiative. It is the foundation document in the project plan and is used throughout the project life to make sure the needs of the owner have been met. It is imperative that proper definition and boundaries are conveyed to outsourced entities.

(c) Initial Cost Estimates: Now that a project alternative is selected, initial cost estimates should be provided by the consultant that prepared the feasibility study OR and A/E that comes on board early to assist with the planning and design program. This step is critical to give owners and BODs an unbiased and expected estimate for the project. It should include soft and hard costs,

anticipate changes in the market, attempt to look at availability of materials, look at geographical location, etc.

(d) Performance Requirements: As discussed in the previous chapter, working from a complete set of objective performance based requirements would be totally impractical. But we should try to create better performance specifications in areas where we need to control vital outcomes, i.e. usually in a limited subset of expectations about the facility. In fact, it is always better for owners to start to think about what they want out of the project versus how they want it. Basically, the owner (potentially with consultant assistance) should frame much of the SOW and project plan with performance-based language and be careful of using wording like "the contractor shall" followed by a prescriptive (design limiting) statement. Early in the planning stages those areas where performance expectations should be attempted, should be addressed with A/E and EBD consultants.

(e) Major milestones or important dates: The owner should include any known milestones or important dates (even desired targets). Some examples include: if the BOD wants the new facility open by a certain date, if the BOD wants the design complete and presented by a certain date, or if a known critical piece of equipment will be available at a certain date. These should all be listed and presented to the A/E, contractor, and other consultants as early as possible to address schedule/cost trade-offs (acceleration) or simply to meet the owner's intent.

(f) Key or required staff: The owner should identify key staff, with an emphasis on who will be the owner's representative throughout the life-cycle of the project? This is an opportunity for the owner to identify what can be done in-house versus purchased services as well.

(g) Other management plans: This section related back strategic planning. It is important for the owner to potentially alter generic organizational policies into a project specific management plan (i.e. Quality or Risk Management Plan).

4.6.2. *Stakeholder Risk Assumptions*

As early as possible in the planning process, stakeholders should start to analyze risk and how they want to deal with risks. This section is designed at a macro level from the owner's perspective. Much like constraints and assumptions for strategic planning; how do those get specific with regard to the project at hand in terms of embracing, mitigating, or avoiding risks.

Risk assessment is absolutely critical and should not be overlooked or taken lightly. It is a management tool that analyzes alternatives in terms of established thresholds for cost, scheduling, and performance. Many owners utilize a traditional approach, where the project is sub-divided into smaller parts, establishes minimum and maximum values of confidence, and calculates a relevance or contingency need for that particular item. Overall project contingency can be evaluated once all sub-tasks are evaluated. This

method only looks at direct costs and does not account for total risk including other market variables (CII, 1995).

4.6.3. Environmental Impact Statement /Report

The Environmental Impact Statement (EIS) is usually an outsourced document that can be performed along with the feasibility study; yet, is project specific. The EIS is required by the National Environmental Policy Act (NEPA) for all federal/public projects. It is comprised of four key areas: (1) Purpose of the project (2) Description of the impacted environment (3) Range of alternatives to the proposed project and (4) Analysis of the impacts of each alternative ("Environmental," 2006).

4.6.4. Design Program

As mentioned earlier, Design Programming can be identified as the last piece of planning or the first stage of design, depending on previous project history, the experience of in-house staff, or what type of consultants are hired. For the sake of clarity we assume that there is good demarcation between the project planning and design programming phase. The project plan lays the foundation for design programming in that it documents key management parameters and how they must be updated throughout the project focusing on major design decisions and how they impact the project plan, especially with respect to program goals, technical requirements, schedules, resources, budgets, and business considerations. Design programming deals with the organizations functions, determining the overall size and layout of the new facility, identifying and analyzing various departments and their relationships and adjacencies, and the criteria for space utilization (Rondeau, 1995). It is extremely important that cost estimates developed from planning and programming be fed back into the strategic/financial plan to assure that balance is achieved. This is a highly iterative process.

Once a design team has been put together and procured, a high level of owner coordination is needed in the next design programming phase. Design programming is very complex; it is probably the most significant task in the whole process, especially for large healthcare facilities. Its complexity stems the concurrency of different concurrent management objectives:

- Meeting regulatory compliance (e.g. Joint Commission on Accreditation of Healthcare Organizations (JCAHO))
- Re-use of recommended solutions in literature, EBD
- Use of design templates ("design guide plates")
- Spatial location and process synchronization of very specific functions
- Managing and harmonizing the inputs of specialized consultants
- Managing a decision culture that is multi-stakeholder, multi–aspect, formal and efficient

During this phase the owner should be active, and review key design decisions and review compliance with project goals and design objectives. A constant monitoring of the owner's expectations is necessary during this stage.

Realize that many states also require owners to produce a Certificate of Need (CON) that places stringent requirements for accurately defining square footage and cost. In Georgia, for example, the square footage estimates much be within 5% and the cost estimates much be within 10% of the project cost. The CON process is a very real requirement for project definition and often some owners have defaulted to it as the sole project planning objective for a project.

4.7. Healthcare project planning checklist

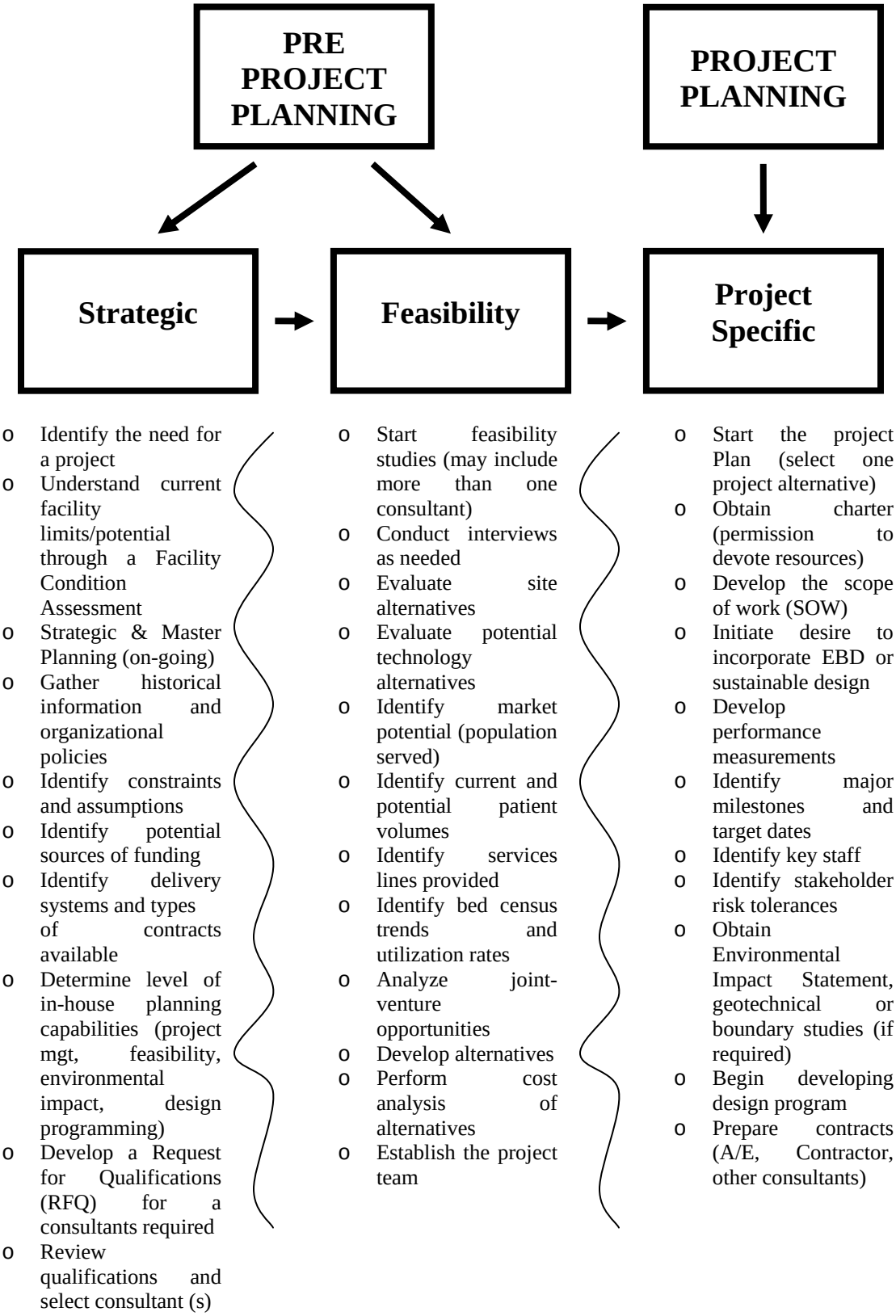


Figure 9: Healthcare Project Planning Checklist

5. HOW TO BE A GOOD OWNER

5.1. Things an owner should know or do

The following list is based on comments from "industry experts" on what owners should do or be aware of in the healthcare planning effort:

1. There are no cookbooks for project planning of construction projects and this guide is no attempt to change that
    a. Remember this guide is meant to give a better understanding of planning
    b. This guide should not replace consultants
    c. Remember that all projects are unique and different – some planning activities deserve more emphasis depending on the project at hand

2. The ideal client (owner) is eager, understanding, and performs analysis, and fosters a participatory design process, e.g. by
    a. Appointing a highly motivated project coordinator
    b. Forming champion teams as resources in participatory design
    c. Forming user groups to advise on functionality of solutions
    d. Forming topic teams, to provide input in innovative solutions
    e. Be engaged from the beginning – project planning is the foundation on which the rest of the project is built upon
    f. "Over communicating" to the organization

3. Think past your immediate needs – strategic and master planning is critical; take a leadership role on the strategic planning level

4. Know what you want to do, how much you have to spend, and when do you need it

5. Inspect and formulate your core values and develop your project targets from there

6. Usually there is way too much project planning OR not enough

7. Make sure and document the planning process - capture the intent, goals, and objectives

8. Understand costs – life cycle versus first costs, soft versus hard costs, escalation and inflation, etc.

9. Understand the project participants – know who is responsible for what

10. A commitment to establishing an owner's representative with the authority to make decisions is vital; Identify a clearly defined decision-making process.

11. Important to get the consultants, designer, contractor (whatever outsourced entity) on board early in the process

12. Always ask why? Let your consultants work for you, but be available and make authoritative decisions when necessary

13. Induce a culture of innovation, keeping an open mind towards new solutions; Have your consultants look for evidence that suggest new solutions with better outcomes. Create a mandate for the team to execute EBD in the design stages of the project

14. Understand the risk concept, and develop a sense of utility of the overall project and manage your sense of risk in line with the expected utility

5.2. Why the role of the CEO is important

As explained in the previous section, the project planning process is a methodical way to define all the steps that lead to the successful execution of the project. The interjection of the owner (or owner representative) in this process is crucially important. The primary responsible party is to:

- Set/reinforce the project vision
- Channel expectations from the owner organization to the project team
- Be a responsive project partner that is aware of the risks inherent in large capital projects
- Operate responsibly from a sufficient knowledge base in the organization if the resources for hiring owner representation throughout the project are not present

At the outset of the project planning, the owner needs to understand what can be expected from the consultants during the process. It is not unusual that the owner makes the first steps in the initiation of the project on his own. The owner needs to start the process by putting the right type of questions in front of the team, such as “why do we want this facility and why not XXXX?”, in other words “are we pursuing the right project?”

Research has shown that increased pre-project planning efforts lead to improved performance in the areas of cost, schedule and operational characteristics. Success during the start-up phase and later phases of a project depends highly on the effort that goes into the project definition phase as well as into the efforts to maintain integrity of the project scope definition package. The engagement of the owner during the early stages of defining the project’s scope is a critical determining factor of project success. The Owner’s role in this process must focus on:

- Maintaining transparency of the planning process
- Managing risks adequately, especially with respect to pending funding approval steps
- Enforcing frequent consultation of all parties during the process

- Ensuring a complete scope definition with active involvement of design professionals
- Addressing client requirements fully and early on

Any good plan starts with good people and good people management. This is the early responsibility of the owner, instating the right point person, management team and focus groups from the organization.

5.3. Avoiding common mistakes in large projects

According to a recent study by the Standish Group International Think Tank, about 30 percent of US real estate projects are cancelled midstream, while more than half run up to 190 percent over budget and 220 percent over the initial time estimate. The reasons for this are manifold, but poor decision-making during the initiation and early planning of the project can be pointed to as the main causes.

In general the biggest failure of project planning is a poor requirements analysis and an incomplete scope definition package. This seems a no-brainer but it is still the most fundamental lesson for every project planning team. All too often a scope definition plan (the master program) is not well aligned with the business and funding plan (the budget), leading inevitably to a disastrous and frustrating confrontation at a later stage in the project planning (and waste of effort).

Most poor decisions stem from lack of information, bad judgment, and lack of communication and transparency between what the client expects and what the project team can deliver. It occurs regularly that an orchestrated optimism about potential risks takes hold of the project team, leading to self deception and disillusion down the road. It is the owner's responsibility to establish an open relationship with the project team. The owner’s representative should be encouraged to be the bad news messenger in the early stages of the planning process. This is also true when it comes to the commitment of predevelopment dollars. At this point one should take extra care to bring all costs and risks into the open.

Project planning should address the choice of a project delivery method early on. Postponing this decision will maintain a state of confusion that can stifle other decisions. Project planning should be executed on the interface of strategic and tactical management to avoid mixing with design programming decisions too early. This danger is notably present if A/E firms take charge of the project planning effort. If design programming flavor gets dominant too early, the right strategic focus on project management and delivery plan, budget and schedule does not get the right level of “executive” attention.

Proper project planning procedures and methods will lead to proper contingency planning, management of partner relationships and contracts, management of dynamic change and associated risks that can, and most probably will, occur in the course of the project. The main object of disputes in projects is change. Although change is in many cases inevitable, it is not clear who bears the costs of the change and who is responsible

for additional changes down the road. The only way to deal with this is a well thought out change management plan. Omitting this will sooner or later start haunting the project team and endless disputes and litigation will result.

The role of the owner cannot be overstated in all of the above targets, as the owner organization is the catalyst and prime risk bearer in the project.

5.4. More on the performance, cost, time relationship

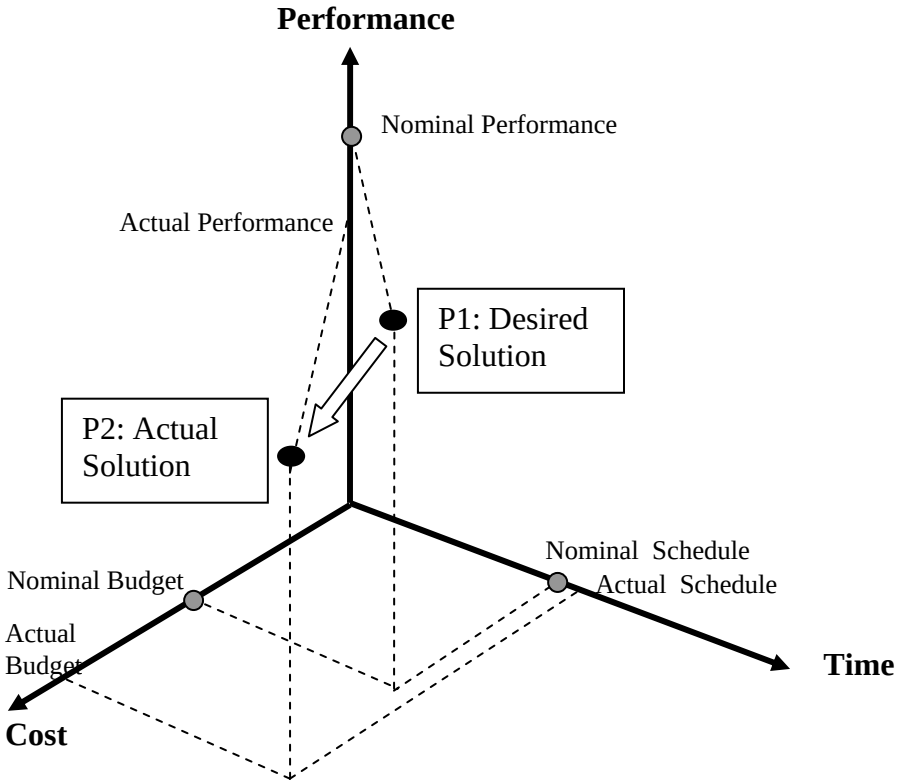


Figure 9: Desired and Actual solution

At the start of the project, one of the desired outputs of the PP phase is to describe a desired solution, represented as point P1 in the "solution cube". A solution point is defined by its nominal level of performance and allocation of a nominal budget and schedule. The solution process can be described as the planning-design-construction-delivery process that translates desired owner functions to form in a way that desired levels of performance are met, while staying within cost and budget constraints. The process is extremely complicated as predictability of time, cost and performance are limited given the novelties of every project, its special requirements, partly unpredictable project environment etc.

It is rare that projects can be planned in a way that the actual solution (P2) is very close to P1. Project planning plays a very significant role in managing expectations and constraints and setting up a management environment that realizes the best trade-offs

between relaxing some performance expectations versus increasing time and costs. A euphemistic term that has permeated the industry is "value engineering" which is the phase when projects get stripped of cost-increasing features without affecting overall performance too much. More often than not the outcome of this phase will haunt the owner many years after the project has been delivered. It is generally accepted that there must be better ways, and the construction industry is constantly trying to gain a better handle on the complex management of realization versus expectation, and many research efforts in the academic world are focused on this.

5.5. How to manage expectations

Managing expectations during project planning has three dimensions:

- Translating the core values and mission of the organization into clear expectations about the facility. Where possible these expectations should be translated into objectively quantified performance expectations but one must realize (as discussed before) that this is only possible for a limited set of aspects; most statements will be of qualitative nature, often in accordance and complementary to a large set of regulatory and project specific prescriptive statements
- Using the project planning to lay out a management structure and commissioning process that keeps a constant check on how design decisions may impact the resulting performance and deviate from the owner's expectations. Such a management structure is known in the industry as total commissioning, often supplied by independent specialized contractors. Total commissioning can be seen as the process that keeps the actual performance within an allowable margin from the expected performance
- Making provisions to calculate and minimize risks, when overruns in time and money resource may be unavoidable because of unforeseen circumstances

The latter bullet deserves closer inspection. Substantial cost or time overruns are often the effect of unforeseen circumstances which have not been sufficiently recognized in the planning stages. In everyday life, risk is mostly a subjective perception and hard to rationalize in decision making. The only way to rationalize risk is to see it as the product of the chance that an occurrence takes place times the effect (damage) when that occurrence happens. This is adequate for normal risk situations, but it becomes very hard to fathom if the chance that something happens is very small, but the effect is very large. The Katrina occurrence was a perfect example of this. For most owners risk is a concept that they find hard to use in the decision making process. "Buying" protection at a cost that is deemed reasonable is a matter of the risk attitude of an organization. Many studies show that organizations are caught flat footed in cases where there should normally have been adequate protection or at least a contingency plan. In most cases it was not even considered during the planning of the project. Large infrastructure projects which run in the billions of dollar are the notable exception. A thorough risk analysis is a mandatory part of project planning in that case. As large healthcare construction projects tend to involve similar huge investments it is about time that risk planning enters the project planning from day one.

5.6. Concluding remarks

Historically, the owners of health care facilities have a once in a lifetime involvement in the design and construction (or remodeling) of their facility. The confrontation with planners, public bodies, architects, engineers, etc. is a daunting prospect for which an owner organization needs sound advice and the organizational input to manage his expectations from start to finish.

Owners should utilize this guide as an educational tool prior to launching into any facility capital investment project. Once informed, owners can utilize this guide as a reference tool to help them engage in-house and outsourced resources throughout the process. The ultimate goal of this guide is to never again here the quote, “if I had only known – I would have done things differently” or, as one expert put it “uninformed owners create inefficient projects!”.

APPENDIX A (CASE STUDY)

As mentioned earlier, the inception of this project planning guide began with analyzing the healthcare project planning efforts from the LSU Health Care Services Division (LSU HCSD) and the Medical Center of Louisiana at New Orleans (MCLNO) in 2006.

As the study continued, it was soon realized that this was truly a unique project to study on many accounts: (1) Hurricane Katrina impact (2) a rapid response requirement to attempt to merge with Veterans Affairs (VA) on a new facility (3) limited resources and state funding limitations (4) other regulatory requirements – state and VA requirements.

Hurricane Katrina hit New Orleans on 29 Aug 2005, creating substantial damage from extensive flooding caused by levee breaks. This unique event occurred in the middle of the on-going planning efforts by MCLNO towards the construction of a stand-alone replacement facility to consolidate Charity Hospital (built in 1939) and University Hospital. MCLNO had performed strategic and master planning prior to the storm, however in the storm's aftermath, certain pieces of the planning effort needed to be redone or revised.

Most notably was the decrease in population supported – 50% of the city's population had left by early September and by December was down to 91,000, or 19% of the pre-Katrina population of 485,000. It is estimated that the future population (3 years post-Katrina) will rise to 272,000 or 56% of the original population by (McCarthy, 2006).

The MCLNO staff and consultants had to re-evaluate their existing plans to see if they were still relevant. As the adjacent VA facility was also damaged beyond repair, an opportunity presented itself in early 2006 to for the VA and MCLNO to potentially share a campus, as well as certain services. However, the VA was quick to start planning and seeking funds for their new facility – which made the MCLNO react faster than expected due to the desire to share services and potentially building space in a joint project.

The following study was conducted between May and July of 2006. There are two sections: (1) Interview questions and (2) Interview results.

Interview questions

Informal Interview

This interview will attempt to understand how various key personnel are involved with LSU healthcare facilities decisions and collect their views on the planning process. This interview and follow-up analysis will try to determine areas of improvement and point out areas of sustainability. This study is the first step towards the goal of determining methods and tools that allow earlier control over the outcomes of the design process. The interview should take no more than 30 minutes and will be scheduled at your convenience.

Proposed Questions:

1. Please tell me about your job and your potential role in the upcoming new healthcare facility planning, design and construction effort.
2. If we chart the pre-planning process by the attached excel document (Figure 1 below), then where do you see yourselves in this process today? For each process step, select a number from one to ten that corresponds with a point on the scale from left (0) to right (10). If you are unsure or don't know anything about the task, simply write "Don't Know."
3. What do you perceive as the key next step in the planning process as far as your organization is concerned and for the process as a whole?
4. What do you perceive as a major obstacle in the next 6 months to make progress with the project planning?
5. Who is the best individual or entity to take charge of the overall planning effort from the perspective of your organization and for the process as a whole?
6. Who typically performs the design programming for your organization? (In-house, consultants, architecture firm)
7. What services will be contracted out? Do you know who or what type of service provider will be solicited?
8. What existing documents, policies, studies, etc do you regard as most relevant to the planning effort?
9. Who are additional outside resources/consultants/or other personnel that the team from Georgia Tech should talk to about the planning effort?

Interviewer: Bryan Walrath (GT graduate student)

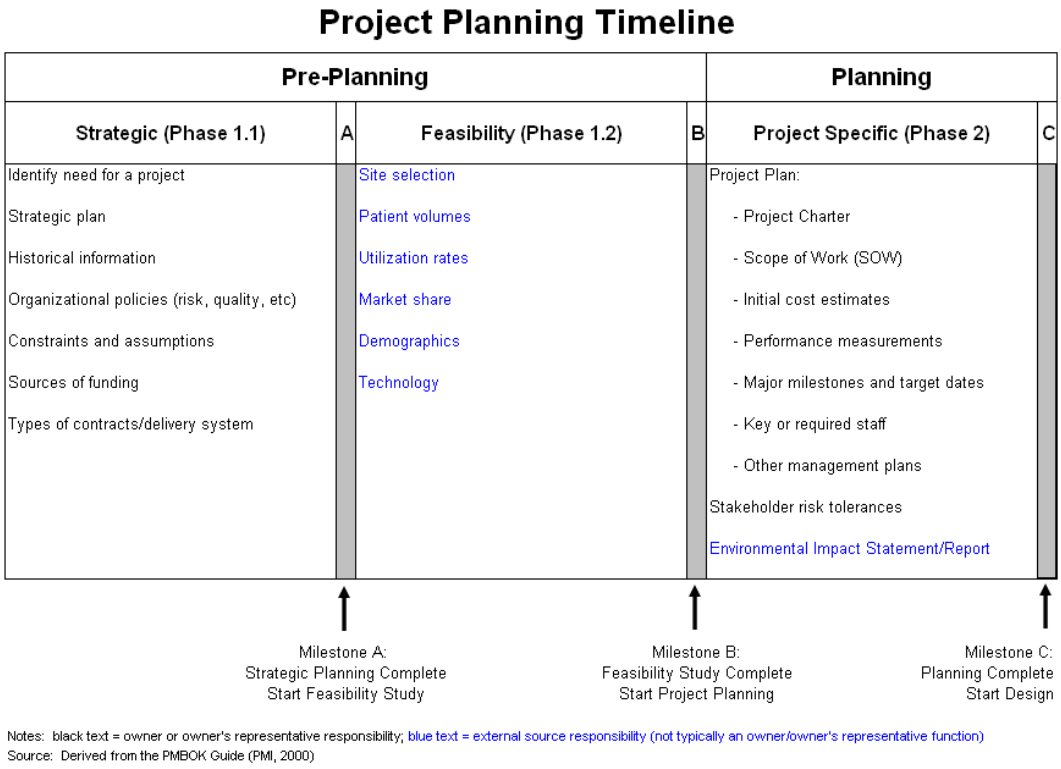


Figure 11: Spreadsheet used during interviews

Interview results

The following notes contain summary data and statistics from telephone interviews conducted between May and July 2006. The target audience was individuals that were internal stakeholders or individuals that would be highly involved with the decisions regarding health care construction efforts. A total of eight surveys were completed.

Question #1

Respondents were asked their job titles and potential role in the upcoming new healthcare facility planning, design, and construction effort. The following answers were given:

a. Director of Facility Planning, LSU System; architect that oversees all campuses, reviews projects to send to board for project approval
b. CEO, Hospital System; provides vision and guidance for replacement endeavor for New Orleans – leadership role, assigns appropriate talent towards the joint LSU/VA project
c. Associate Chief Medical Officer; worked the post-Katrina "war room"; chaired the joint LSU/VA effort (medical/leadership/management role); got involved to add to local leadership in New Orleans
d. Director, Research and Development; worked on process with joint LSU/VA effort (what could be contracted out, what should be shared, etc), worked mainly through clinical, legal, and financial aspects
e. Senior Project Manager, Adams; not currently under contract, but did work through pre-Katrina studies and looking at assigning new projected costs with joint LSU/VA project; needs to update pre-storm program which LSU supports doing
f. Director, VA Pittsburg System; viewed himself as a consultant; some expertise with developing creative agreements with VA and other entities (outlines how collaboration would be accomplished)
g. Medical Director, New Orleans; overseas clinical services for served population, works with Tulane and LSU school programs, and helped determine what clinical services should be contracted, shared, etc with joint LSU/VA project
h. Director of Facility Planning, New Orleans; make sure all appropriate stakeholders are involved, help them think outside the box (old facility versus new) to apply appropriate resources; makes recommendations on building components, systems, and life cycle costs.

Question #2

A series of questions were asked around a hypothetical project planning timeline. Respondents were asked to numerically rank various categories on how well LSU had completed or accomplished them. The following figures (Figure 2 & Figure 3) show the average response and standard deviation for each question:

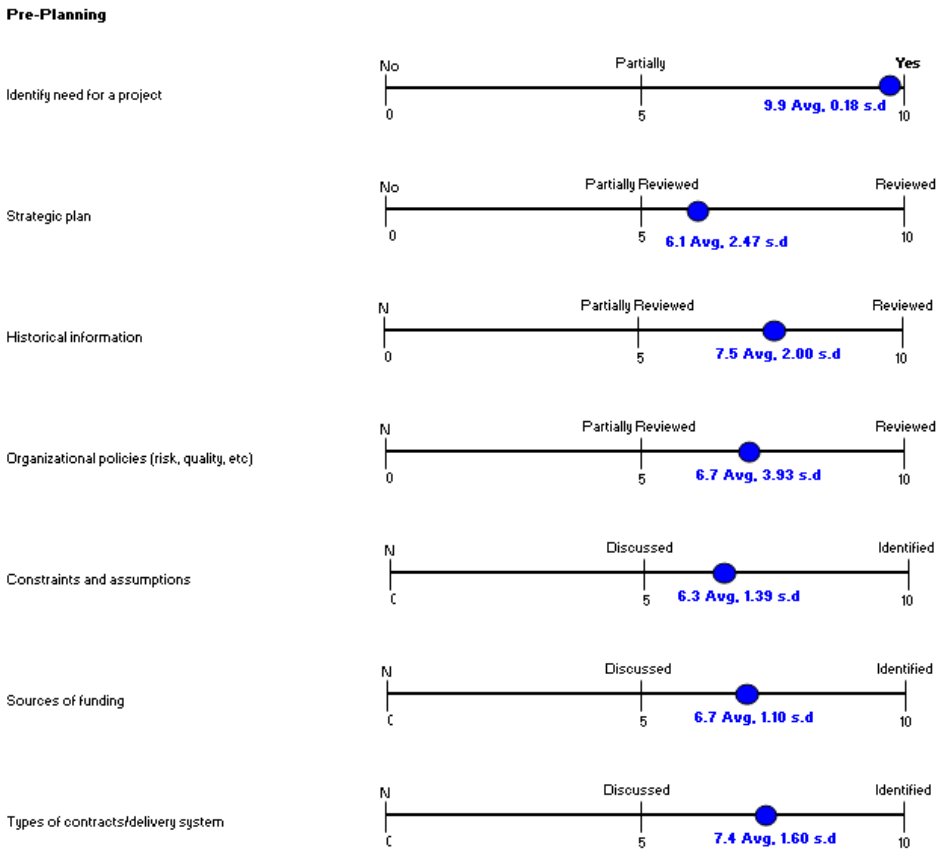


Figure 12: Statistical Results from interviews (pre-planning)

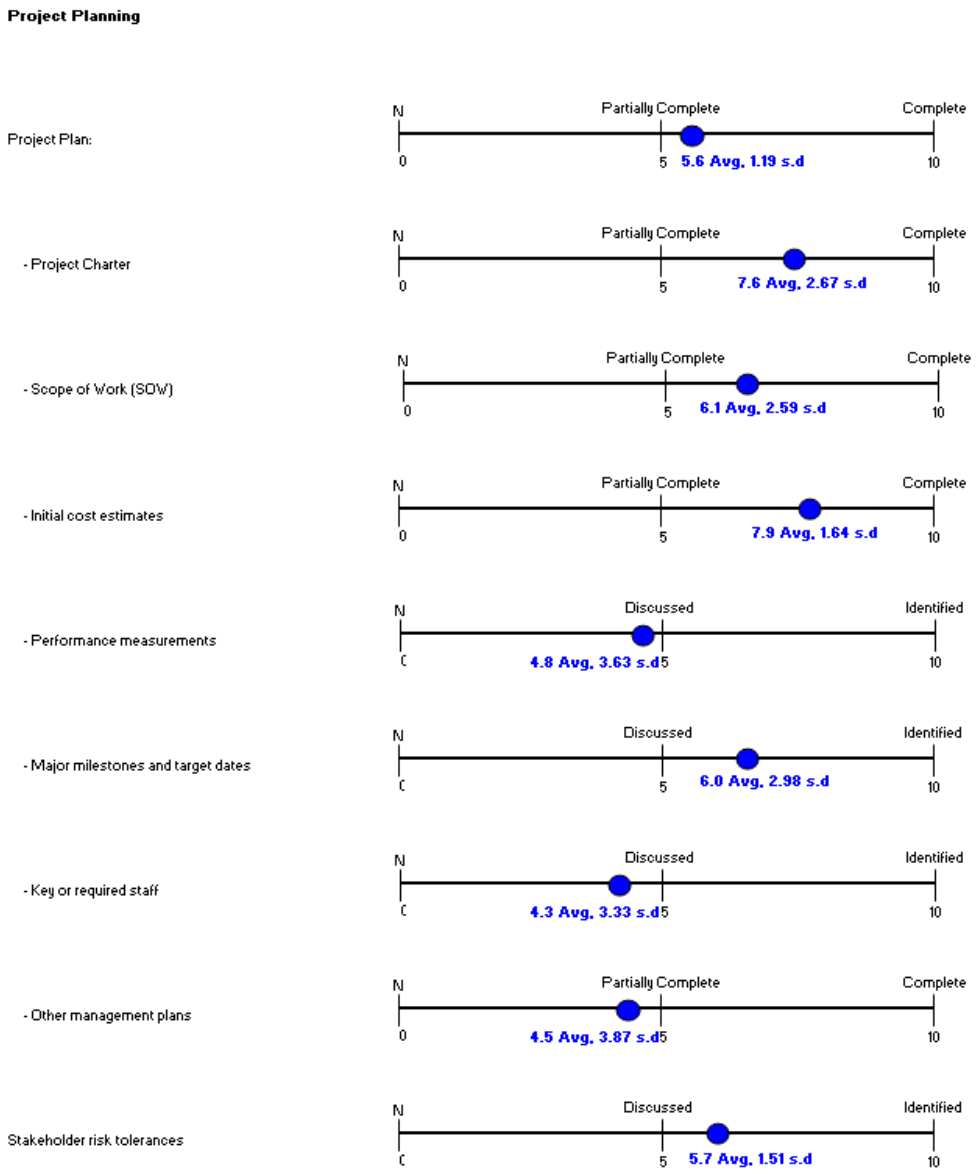


Figure 13: Statistical Results from interviews (project-specific planning)

Question #3

What do you perceive as the key next step in the planning process as far as your organization is concerned and for the process as a whole? There were 3 key responses: (1) Funding (2) Land Acquisition/Site Selection and (3) Support from State (funding limits, procurement rules, etc). Some responses had multiple responses, therefore 63% included funding, 50% included land acquisition, and 63% included support from the state. A few other responses included: (1) RFP for A/E (2) Consensus on # of beds for new facility and (3) Update pre-storm master and business plans

Question #4

What do you perceive as a major obstacle in the next 6 months to make progress with the project planning? Similar answers to question #3, however more specific and far less multiple responses. Funding was mentioned by 50% of responses, followed by state support by 38%, and a collaborative effort (including the VA) by 38%.

Question #5

Who is the best individual or entity to take charge of the overall planning effort from the perspective of your organization and for the process as a whole? Wide variety in responses, 75% mentioned purchased or external support with the other 25% of the responses selecting the CEO of the hospital system, but that he needed more help. Interesting to note that 75% also answered with uncertainty in their recommendation.

Question #6

Who typically performs the design programming for your organization? (In-house, consultants, architecture firm) Question that confused some respondents. Organization has not historically had construction projects and therefore had same responses. All respondents answered with either external consultant OR A/E firm to perform design programming mission.

Question #7

What services will be contracted out? Do you know who or what type of service provider will be solicited? Several multiple answers. One provider that was surveyed only mentioned clinical services (non-construction related) and one other respondent said "Don't Know." Out of the remaining personnel surveyed, all mentioned the basics (A/E and Construction), while 67% mentioned CM firm or management services specifically. Some other responses included: interior design, equipment planning, procurement services, pre-design (master and business planning) and consultants.

Question #8

What existing documents, policies, studies, etc do you regard as most relevant to the planning effort? Variety of responses, 63% mentioned strategic or master plans with 50% mentioning the Adams/NBBJ/Kaufman Hall plans specifically. That was a pre-Katrina effort that focused on business planning and facility designs. Additionally, 38% mentioned the COSG report (Collaborative Opportunities Study Group) report dealing with various agreements to work with the VA. Some other responses included: RAND/CDC studies on demographics, EBD information, historical data, the Price Waterhouse reports (a misleading report that included private hospitals, ignoring the Charity hospitals), and a Deloitte & Touche report on operational issues.

Question #9

Who are additional outside resources/consultants/or other personnel that the team from Georgia Tech should talk to about the planning effort? Many respondents were reluctant to provide additional names for GT to contact regarding the planning effort. Some of the recommendations were contacted and non-responsive. Some were not contacted because other individuals surveyed felt the individuals were stakeholders, but not involved in the planning process and therefore would add little value to the survey.

Summary

In reviewing the data, it was clear to see that there was some ambiguity and confusion among stakeholders on the level of "completeness" of various planning activities. However, as noted previously, this project had such unique dynamics that the data results may not be useful or even applicable to other owners seeking where to focus their efforts within the planning process. The appropriate update to the strategic/financial and campus master plan was not initiated until November, 2006 (after the interviews were completed), thus, explaining some of the variance in the respondents answers.

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