

Common Sense Project Execution

How to Achieve Total Mission Success at Lowest Cost and Risk

“Projects should be executed in a way that provides highest probability of achieving the owner’s objectives at lowest cost and risk.”

From a project owner’s point of view, the above statement is common sense. But in the real world most projects are not executed this way. Instead a majority of projects fail to achieve the level of success desired by the project owners. Almost every expert in the field of construction management says that projects could be managed better. These experts say that typical management methods cause project owners to pay 10% to 30% too much. This is a failure of methodology as well as common sense and there is room for improvement. The goal of this paper is to describe how to use a common sense approach to project planning and execution so that project owners have the highest probability of success.

Common sense project execution has several components:

First is applying sound practical judgment to decision making. Every human has room for improvement when it comes to decision making and this paper will describe ways to make better decisions for complex projects.

The second component is that we need to use every management tool available that will improve execution and efficiency. Humans are tool users and we need to use the best tools. Throughout history failure to use the best tools has resulted in

diminished performance when compared to those who skillfully used the best tools and use of outdated tools has resulted in outright failure. Competitive business performance rests on using management tools and those enterprises that fail to adopt good tools and techniques go bankrupt.

The third component is that we need to focus the efforts of the project team on achieving the owner’s goals. There are two reasons for this 1) to enhance performance we need to facilitate great teamwork, and 2) we need to counter the self-serving interests of independent contractors. It turns out that this is

more difficult than most owners expect and it takes real expertise to achieve an efficient focus of effort.

The fourth component is a dedication to constant improvement. Not only

do we need to use the best tools available today, but we must also adopt and improve. Many failures in management occur because of failure to improve as the world changes and as new tools and techniques are developed. It’s easy to become complacent and get lazy about improvement because the last project went well. A recipe for inefficiency is to use outdated methods and tools instead of the most efficient practices. It is wise, conservative and efficient to use best practices.

The Opportunity: Project owners can get better results by applying common sense practices. These practices directly and mechanically improve the bottom line for owners and financiers.

“There is a higher form of project execution which improves the owner’s bottom line while increasing the contractors’ profitability”

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You can get the gist of this paper in a few minutes by reading the Executive Summary and then skimming Chapter 4. This will provide details you can use to have your project executed in a way that achieves total mission success. With this overview you can then use this document as a reference and checklist in formulating your strategy.

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*"I'd put my money on solar energy. What a source of power!
I just hope we don't have to wait until oil and coal runs out before we tackle that"*
~ Thomas Edison, speaking to Henry Ford and Harvey Firestone in 1931

1. Executive Summary

In order to achieve the owner's goals each aspect of project execution and management needs to be optimized to promote best performance. We have identified four important principles that are key to creating an operational environment that is efficient and productive from a common sense point of view. These principles enhance all aspects of project execution. These principles are synergistic in that they combine and support each other to enhance

performance. For example, it is important to make good decisions during the project process. Great leaders can make great decisions, but even a great leader's decision making is limited by the quality of information used. On the other hand a person of average expertise can often make a good decision if s/he has great information. When you combine a great leader with great information you can generate great decisions and great results.

The Four Principles:

1. Leadership: **Use Owner-Focused Leadership.**

Project execution is a dynamic process performed in a changing environment. Results are determined by leaders as they steer the project to completion using a good plan and operational intelligence to make and communicate decisions. In order for owners to receive the results they desire, projects need expert leadership that is dedicated to achieving the owner's goals. We call this "Owner-Focused Leadership" (as distinguish from leadership by people *that have conflicting interests*). Owner-focused leadership has three requirements:

- Deep industry knowledge and expertise in construction and development management,
- Deep understanding of how to create and execute an effective Owner-Focused Execution Strategy,
- Total dedication, *without conflict of interest*, to the owner's goals.

Failure in leadership leads to paying too much, engaging in unnecessary risks, and project failures.

2. Execution Strategy: **Use an owner-focused execution strategy.**

An Owner-Focused Execution Strategy is the plan and means of how to achieve mission success (it's the combination of many elements: it's the roadmap, it specifies the vehicles, provides the fuel, and informs and motivates the team). It employs measures to improve the effectiveness of delivering value to the owner and countermeasures to eliminate waste. Good strategy includes specifying how we play the game so that project owners have the greatest probability of achieving success.

Great strategy improves results for all parties including owners and contractors.

3. Information: **Acquire and use relevant intelligence.**

All aspects of leadership and execution depend on information. Information is core to project development. Not only are the project goals described using information but all contracts, commitments, schedules, monitoring, communications, alerts, and in short everything you can think of is INFORMATION.

The big question is not whether you will use information but *how well will you use it?* How will you set up the project's execution processes so that leaders are provided with all of the relevant intelligence needed to steer the process toward the *owner's* success. Systems are available, affordable, and are easily adopted that provide great information management that supports the owner's success. Failure to use best information management tools will result in project failure. The better the system; the more likely is success.

4. Finances: **Use owner-focused financial controls and strategies.**

There are financial strategies and tools that mechanically reduce costs and risks. Combining these financial strategies with information strategies creates an even better result. When you use these systems you will reduce costs and risks. The principles of financial management are well known – **use them!** Not only do these financial strategies directly save money, they also support the other functions of Leadership, Execution, and Information Management to drive project success.

Primary points of this paper:

- It is only common sense to make sure that projects are executed in a way that has highest probability of achieving the project owner's goals.
- Due to many factors, typical execution and delivery of projects causes project owners to pay too much and projects experience too many failures with respect to schedule and quality.
- There are execution methods that have a higher probability of delivering the success owner's desire, but these methods are not used due to complacency, lack of knowledge, and conflicts of interest that are intrinsic to the members of the development team (i.e. profit motive keeps contractors from using execution methods that would keep owner costs at a minimum).

Patrick Lencioni, author of "The Five Dysfunctions of a Team" states the problem succinctly:

"Teams are dysfunctional because they are made up of human beings with varied interests and frailties. When you put them together and leave them to their own devices, even the most well-intentioned people will usually deviate toward dysfunctional, unproductive behavior. And because most leaders and managers are not schooled in the art of building teams, small problems are left untreated and spiral further and further into ugliness... Team members put their individual needs before the collective goals of the team." ¹

- Project owners have the power to demand and specify an execution process that has the highest probability of achieving their goals. You have the power, don't give it away to people that have conflicting interests. Instead use the principles described herein.
- Project execution that supports the owner's goals can be accomplished in a way that maintains and even improves the contractors' profitability.
- There is a higher form of project execution in which the development team proactively anticipates problems and acts to prevent them while constantly improving the organization of work to reduce waste and promote the flow of value to the project owner.²

"The only constant is change, continuing change, inevitable change, *that* is the dominant factor in society today. No sensible decision can be made any longer without taking into account not only the world as it is, but the world as it will be." ³

~ Isaac Asimov

"By 2030, half of America's buildings will have been built after 2000. We are in the middle of a \$25 trillion building boom" ⁴

2. Gaining Competitive Advantage in Development

This paper describes a system of execution for real estate development projects that is designed to promote the owner's goals with improved results in all areas. This system is designed to work even in the face of the chaos of a changing environment and to counter the forces that increase costs.

Gaining competitive advantage in execution improves the bottom line. This improvement is measurable. Appendix 1 shows that bottom line can be improved by over 50% by using better execution strategies.

The core concept used is to integrate the entire development process from initiation through completion within a system that uses good planning, leadership, information and finances to deliver total mission success at lowest cost and risk. The bottom line is that every element of a project must be in alignment with the owner's goals or in one way or another the owner will suffer loss of final value.

The system described in this paper is part of a journey toward excellence in construction production. As such we can take the steps that will improve results today while continuing to improve into the future.

" What is a system? A system is a network of interdependent components that work together to try to accomplish the aim of the system. A system must have an aim. Without an aim, there is no system. The aim of the system must be clear to everyone in the system. The aim must include plans for the future. The aim is a value judgment." ⁵

~ William Edwards Deming

W. Edwards Deming is widely known for improving management and production systems. He and a few others are responsible for the transformation in the management of production systems that led to Japan's manufacturing ascendancy during the last 60 years.⁶ This improvement journey is now known as lean production.

Deming taught 3 principles that address core problems:

1. Integrated Production System. Deming taught that integrating the functions and interrelationships of all aspects of a production system improves results.

A major key to improving results is to totally integrate the production system. Each individual element of the supply chain integrally contributes to the end product and impacts bottom line. Making these elements work together efficiently and positively synergistically improves results. This includes integrating all elements of the interrelated tasks (rather than the typical approach that keeps elements segregated). From this point of view a production system includes all elements from initial research about what product to produce, business cases, financing, design, iterative redesign, product modeling, suppliers, materials production, assembly, monitoring, inspection, delivery, and ongoing support or maintenance.⁷

Please note that in construction, Architects and others are beginning to use a concept they call "integrated practice." But typically, this form of "integrated practice" is not a totally integrated production system. This paper describes an integrated production system for construction that goes beyond architectural "integrated practice" to integrate the entire production system.

2. Aim. Deming taught that a production system must have an aim and that for a production system to be effective the aim or goal must be clear to everyone and everyone must act in primary support of that aim.⁸

3. Management. Deming taught that a production system needs to be managed – properly managed.

He taught that if every component of a production system is not properly managed, the "natural" selfishness

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and competitiveness of individual components will have a destructive effect on total production harming quality and cost.⁹ One rotten apple can spoil the entire barrel. The kind of management that will lead the construction production system in the right direction is called “Owner-Focused-Leadership.”

How does the typical development project compare to Deming’s principles?

1. The typical development team is not integrated.

Instead the typical project organization and management inherently creates adversarial relationships and allows selfish behavior that does not support the owner’s interests. The work is completed by a disbursed set of independent contractors that are more focused on their own goals than on producing a well-run project that meets the owner’s goals. Operational information and intelligence is not transparent enough to support project leaders and owners or to create integration of the team or supply chain.

2. The independent contractors do not fully support the owner’s Aims and Goals.

If the project team fully supported the owner’s goals we wouldn’t have so many problems and high costs. Instead the project’s stated goals within contract documents are often fuzzy and incomplete and the independent contractors are able to push their own goals in the absence of well stated contracts and monitoring.

3. The typical development project is not well managed.

The only definition of good management *that matters* is management that produces mission success for the project owner at lowest cost and risk. By that definition most projects are not well managed because owners are paying 10% to 30% too much.

Several forces are creating a demand for more efficient project delivery

- **There is a huge demand for new facilities and infrastructure:**

“According to the Brookings Institution, between now and 2025 the population of the United States will increase by 70 million. That’s the populations of California, New York and Florida put together. [and] half of the buildings in which Americans will live, play and work in the year 2030 don’t even exist yet. We are in the middle of a \$25 trillion building boom...”¹⁰ This building boom will last for many years and it is driven by need. During this boom we will experience some short term down markets, but over the decades we will see the necessary construction completed. Improving construction efficiency through better management can improve the entire economy as well as the built environment by delivering between \$2 trillion and \$8 trillion in added value to the \$25 trillion in cost while improving employment.

- **Money is tight. None of us have enough money to waste it:**

Using money efficiently and with total accountability is important. This is true for any organization that cares about bottom line including:

- Public Agencies that are facing cost increases even as they need to upgrade infrastructure
- Donor funded organizations that need to show donors that they are responsible
- Businesses and Corporations

***“30% of the cost of construction
is wasted”***

The Integrated Construction Production System

The Construction Production System¹¹ is all elements of the project and facility during its entire life from inception to completion including delivery and support of ongoing facilities operations. The production system includes ideas, financing, design, making and operations of the facility.

The aim is for the project owner to achieve total mission success with lowest cost and risk.

A facility has a total lifecycle. Depending on how a project owner defines goals, it is the role of development management to manage the entire Construction Production System to optimize and improve all elements of the project's total lifecycle.¹² Owners may modify this role.

The Construction Production System (Total Lifecycle)

1. Initiation of Project

- a. Initial Ideas/Conception/Germination/Vision/Needs/Wants/Concept
- b. Assemble initial project team (internal and external)
- c. Initial business cases, pro forma, feasibility, planning, funding (seed capital)

2. Planning and Design

- a. Procure and Assemble initial services team
- b. The overall vision/plan
- c. The Business Case(s), Pro Forma, Market Study, Feasibility, Viability, Site Analysis
- d. Project Execution Strategy
- e. Design Process (Design and Redesign)
- f. Schedule
- g. Budget and Cost
- h. Land, Permits, Entitlements, Environmental
- i. Contingency Plans and Resources
- j. Funding

3. Initiate Physical Production

- a. Procurement
- b. Contracts and Agreements with external team
- c. Kick off each phase – Impel the actions that will lead to success

4. Manage the Construction Production System

- a. **Acquire information** → *Including progress and cost during project activities*
- b. **Analyze the information** → *How does it compare to plan?*
- c. **Make Decisions** → *Based on the information and analysis*
- d. **Lead the Team** → *Motivate and direct action based on the decisions*

5. Manage the Facility: Throughout the life of the facility

- a. Daily operations
- b. Financial operations including tax management and energy cost management
- c. Maintenance, ongoing and special
- d. Final Disposition

“The Construction Production System is all elements of the project during its entire life from inception to completion. The aim is for the project owner to achieve total mission success with lowest cost and risk.”

The concepts and ideas incorporated used during initial stages and design will influence tax, energy, operational, and personnel costs throughout the total life of the facility.

3. The Problems We Can Solve

“God, Grant me the Serenity to accept the things I cannot change; the Courage to change the things I can; and the Wisdom to know the difference.”

~ The Serenity Prayer

On typical projects, owners pay 10% to 30% too much – this is a problem we can solve.

In the book "Broken Buildings, Busted Budgets: How to Fix America's Trillion-Dollar Construction Industry", Barry LePatner describes one problem as follows:

“ \$120 billion is wasted each year on construction projects due to inefficient and arcane business processes. ”

According to this estimate project owners are paying at least 10% too much. This can be true even on projects that produced high profits due to market conditions. “With three decades of experience representing clients that include eminent architects and engineers, as well as corporations, institutions, and developers, LePatner has seen firsthand how the construction industry is plagued by bad management, ineffective supervision, and insufficient investment in technology.”¹³

A study of 3000 project owners by the Construction Management Association of America shows that 40% of projects by experienced builders go over schedule and it’s likely that most of these go over budget. The CMAA goes on to state that most of this problem is attributable to failures of management rather than the more publicized cost increases of materials and labor. The Construction Management Association of America, *an association dedicated to enhancing the reputation of Construction Managers*, is saying that the primary cause of project loss is failures in Project Management.¹⁴

A paper published on the CMAA website states the following: “It has been reported that as much as **30% of the cost of construction is wasted** in the field due to coordination errors, wasted material, labor inefficiencies and other problems in the current construction approach. This waste and inefficiency is not readily discernable or tracked in project cost data. But over time, the price of this waste has been accepted as a part of the cost of doing business and is built into every estimate, budget, subcontractor bid, contractor markup, contingency, allowance, and the like.”⁹ [This means project owners are paying a high price for inefficient business practices even when using low bids or low cost contractors! There is room for improvement.]

The Construction Users Roundtable, an association of executives representing some of the largest consumers [i.e. Project Owners] of the construction industry, reports that its members regularly experience cost and schedule overruns. These losses are in excess of the built-in inefficiency and waste referenced above.”¹⁵

The National Institute of Standards and Technology, a Federal agency, has also reported inefficiencies.¹⁶

Here is what the Construction Management Association of America is reporting:

1. There is up to 30% of added costs paid by Project Owners in original bids due to poor construction management practices.
2. Additionally, Project Owners are regularly experiencing cost and schedule overruns (change orders) that add more cost and suffering beyond the 30% inefficiency cost described in item 1.

Cortexion’s analysis has revealed that in many cases the bottom line loss is higher than the numbers stated above. Developers and their financiers are exposed to risks that can be reduced and eliminated.

The Negative Effect of High Costs

1. Owners Lose Financial Value when they pay too much:

Bottom Line equals Final Value minus Costs¹⁷

Bottom line is the owner's gain in value. Adding costs always translates to loss of gain in value. This is true for non-profit and public institutions as well as commercial project owners. Due to the leverage typically employed in real estate development, the owner's gain in value, margin or ROI is highly affected by needless costs:

10% in additional costs can reduce ROI by 50% or more

10% in additional costs can reduce Gain in Value by 20% or more¹⁸

**In many cases you can increase
Return On Investment by 50%
by reducing costs 10%**

Please see Appendix 1 for a more detailed explanation of this

2. Project Failures: Many projects fail each year that would have been successful if project owners had not been forced to pay these avoidable costs. Every year projects fail because avoidable risks were not properly mitigated. When a project fails the financier often takes a loss. Project failures affect the region or neighborhood of the project and have a negative effect on the local and national economy. 40% of projects fail to meet one or more criteria.¹⁹

3. Loss of Support for Government Projects: Citizen Voters are so distrustful of government's construction management practices that they often vote "NO" on necessary infrastructure projects and schools because they believe - correctly - that costs are too high and change orders will increase costs. They are voting "NO" as a communication to leaders that they will not settle for inefficiency and are demanding change.

4. Loss of Donations to Donor Funded Organizations: There is competition for donations. While the baby boomer generation is leading an unprecedented increase in philanthropic activity, many worthy projects that could improve our society go begging. Donors are often hesitant when they feel that the money will not be used wisely or for the intended purpose. Donor Funded Organizations could increase donations and better serve their cause if they could show that they use better systems to control costs and risks. Additionally better systems provide transparency so Donors can be assured that their donations are being used wisely and for the purposes intended.

5. The Path Not Taken: Each year many worthy projects are not started because of high estimated costs that could be reduced. This includes many needed projects such as low cost housing, hospitals, and schools. This affects contractors and our whole society

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6. Negatively Effects the US Economy: Because construction makes up such a large portion of the US economy poor results negatively affect the entire economy.

Quoted from a Federally sponsored study: U.S. Construction Labor Productivity Trends, 1970-98:

“Labor productivity is of central importance to the economic health of the United States' economy. Due to the size of the construction industry, productivity changes within it have significant direct effects on the national productivity and economic well-being of the US.” In 1997, new-construction-put-in-place accounted for roughly 7% of the GDP, and if one includes remodeling and repair work the total rises to over 10% of GDP”

“Over ten million people are employed in the U.S. Construction Industry making the design and construction industry the largest manufacturing industry in the United States.”

“Past studies found that poor management was responsible for over half of the time wasted on a job site. Good management is required for profitability and success.”²⁰

Between now and 2030 the U.S. economy will spend \$25 trillion on construction.²¹

Improving construction efficiency through better management can improve the entire economy as well as the built environment by delivering between \$2 trillion and \$8 trillion in added value while improving employment.

4. The Execution Strategy

All you really need is great planning coupled with great execution that delivers maximum gain in value to the owner...

The evidence shows that the kind of great planning and execution that would most benefit the owner is not consistently delivered by the contractors or construction managers when they use traditional methods (including most known project delivery methods). Instead the traditional methods force owners to pay too much even while they are exposed to high risks.

There is room for improvement. No organization has 100% of the best practices available.

A project begins as an idea in a project owner's mind. This idea becomes an objective. The owner wants to achieve this objective. How? We need to perform actions. The set of actions is called "execution." We need an action plan and the better the plan the more efficient and accurate and mistake free is the execution. For purposes of common sense project execution I call this action plan a Project Execution Strategy.

Strategy means many things to many people; hence it is difficult to have a meaningful conversation about strategy unless you define your terms. With respect to projects I believe that strategy and execution are so coupled together that strategy is execution and execution is strategy. I know that I differ on this from the professors at Harvard. But these professors are not working on common sense project execution. At the conclusion of this paper I want you to be able to create a project execution strategy and after years of experience I have concluded that separating the two is less effective than combining the two to gain synergies.

Strategy is the means used to accomplish goals; it is both the plan, in the form of a description of the course to be taken, and it is the actual actions taken based on our decisions as we steer the course toward the goal.²²

Information. To steer the course requires that we can see where we are going, what is happening and have good feedback about all operational aspects of the project. When there is variance from plan, leaders (who are often in locations that are remote from the actions performed) need to be alerted so they can make decisions and steer.

Using current practices the cards are stacked against the owner's ability to total achieve mission success at low cost. Owners are paying 10% to 30% too much even when they use the lowest bids.

If owners want better results they need to do something different.

Improving the project owner's results is only achieved when the project owner gains more value from the project process than he or she would have gained using the traditional processes.

Good strategy is based on principles such as "making good decisions is better than making bad decisions" and "you can make better decisions when you have complete accurate timely information than you can when you lack the needed information." While such principles seem obvious, most projects are run with poor information management and leaders are forced to steer the course without accurate timely information even when good systems are available, easily adopted, and affordable.

"The good news is that we do not need to make big changes to create the desired results. The changes required are not new – it's mainly about putting a good plan in place and watching to make sure that everyone plays by the rules."

What would a perfect project management system be like?

The simple answer is that a perfect system would provide everything needed to successfully plan, initiate, and coordinate all project events and activities to achieve total mission success with lowest cost and risks throughout the entire lifecycle.

Yes, but how?

Planning: In the past, people needed training and talent to understand project design as it is communicated through drawings and specifications. Today we have technology systems that allow all stakeholders to understand the design so they can be part of the creative design process and catch and solve problems early.

Execution Strategy: This paper describes a system that combines principles and tools into a project management system that meets the goal.

Coordination and monitoring during execution: Today, we have systems that provide real-time feedback of operational information so that leaders can properly coordinate the complex project activities in real time. Gone are the days of not knowing what is going on. There are no more excuses. See Chapter 5.

Lowest Cost and Risk: Today we have systems that leverage financial strategies to reduce costs even as we reduce risks and improve execution of the project.

12 Principles to use in formulating an Owner's Strategy

1. You need a Core Purpose; a Mission.

This core purpose will serve as the aim of the project and will help to align the interests of the parties. But the way owners typically state their goals has led to the problems we see. Owners must state their goals in a way that leads toward success. The first step in creating a strategy is to know and state your objectives.

2. The Core Purpose of the Project *and the reason the Project Team is assembled is to deliver the owner's goal of total mission success at lowest cost and risk.*

The core purpose and objective of the project's Team and the Construction Production System is to maximize the value delivered to the owner. How this is stated and how it is then connected to every project document and used to determine the behavior of the independent contractors is one of the major keys to success. Additionally, all members of the project team should provide full transparency and accountability (any team member that balks on this is sure to be a problem).

“Success is achieved by managing, coordinating, and synchronizing a series of events and activities performed by a set of independent contractors toward a specific goal.”

3. **The Team's job is to improve the value gained by the project owner.**

In order for the project owner to gain more value, the project Team and the Construction Production System must reduce waste and improve efficiency in a way that produces added value and delivers it to the project owner. The specific mechanisms of how increased efficiency and reduced costs is delivered to the owner must be part of the project strategy and included in the contractual documents. The contract documents must provide rewards to the independent contractors for delivering added value to the owner.

4. **Gain in Value equals Final Value minus Costs.**

Increasing "Gain-in-Value" is accomplished in two ways: 1) increase final value or 2) reduce costs.

Final Value is dictated by use or by the market. Once design is set, the way to deliver increased "Gain-in-Value" is to reduce costs. The Construction Team's way of delivering value is to produce the facility at lowest cost and risk.

The Builders' job is to deliver the specified product. Provided that the final product is per plans and specs, the product will have a final value that is dictated by use or by the market and the builder has not affected this Final Value. The Builder affects costs.

Since final value and costs *are* highly influenced by design; good design is of highest importance.

5. **Cost is made up of two things: Acceptable Cost and Waste.**

1. Waste is anything that consumes resources without creating added value delivered to the owner.
2. Acceptable Costs are costs for use of resources that result in adding value. Many acceptable costs include elements of waste so we seek to eliminate all waste even from acceptable costs in an effort to maximize the gain in value.
3. The goal is for each incremental consumption of a resource to produce a gain in value.
4. Waste is oppositional to the purposes of the Construction Production System.

6. **The designing and making of a project is a Value Stream that must be made as lean and efficient as possible.**

The Value Stream²³ : Within the Construction Production System the Value Stream is the set of all the specific actions required to bring a specific project through the 3 critical management tasks:

1. **The Problem Solving Task** (which runs from concept through detailed design and engineering though the process of making to completion, delivery and operation...)
2. **The Information Management Task** (which includes all information gathering, analysis, reporting, and communications with respect to the project running from initial concepts through contracts, scheduling, progress monitoring, cost monitoring, through delivery and then through facility operations and management, "in order to facilitate firm-to-firm relations, regulating behavior between firms, and transparency regarding all steps taken along the value stream so each participant can verify that the other firms are behaving in accord with the agreed principles"²⁴...)
3. **The Physical Transformation Task** (proceeding from raw materials to finished product delivered...) (The physical making of the project)

7. Variance from plan is normal and proper information feedback mechanisms must be used so that project leaders can see what is happening as soon as possible, make decisions and take corrective action. You can't steer unless you can see.

To properly manage and coordinate (“steer”) a complex set of activities a leader or manager must know the operational condition of each activity while it is in process. Waiting until task completion is a recipe for failure. When there is a variance from plan, or things go wrong, the relevant project leaders need to know as soon as possible so they can make decisions and act. But the tasks of a construction project are performed by dozens of independent contractors arranged into a multi-layered hierarchy and operational information is not readily available unless one uses technology (i.e. a navigation system that provides the information).

In order to orchestrate project execution as a unified organization that works synergistically to achieve common goals one must use technology to gather information and communicate orders. To achieve Deming’s goal of transforming a production system of independent competitive components into a unified system one must use technology.

Up until the present time, gaining this operational and management knowledge has been too expensive and so projects have not been well orchestrated resulting in problems and high costs. Current technology has reduced the cost of gaining this information to the point where just using the technology reduces costs upfront. See Chapter 5.

8. We are in a human environment. A known element of human nature is the propensity among some humans to cheat. Proper controls must be employed.

This is just common sense that recognizes a universal truth about human nature. It’s not that everyone is a cheater. Instead it is recognizing that studies show that over 50% of people will cheat and that trained professionals are unable to predict which humans are the cheaters.²⁵ Thousands of people have been fooled by Corporate CEOs that later went to jail (most others have not been caught). We need proactive systems and security that protects the owner. The threat of jail is not enough. Trust is not enough. You need to use a system that protects your money.

9. Conflicts-of-interest must be totally recognized and controlled.

A majority of the team that is assembled for the temporary duration of the project have goals that are oppositional to the owner’s goals. Without proper control these conflicts produce waste and add unnecessary costs that are paid by the owner. Again this is a plain truth that must be acknowledged in order to help the owner gain the value he or she deserves.

1. The Construction Production System is made up of independent contractors which are Companies that are driven to maximize profits.
2. If not properly controlled these Contractors employ strategies (learned at the knee of Machiavelli and Sun Tzu) to maximize their own gain in value.
3. The owner’s strategy must provide controls and motivations as counter-measures to these natural behaviors.

10. The strategy must provide a clear path to improving the results gained by project owners by simultaneously motivating and rewarding the contractors for producing and delivering increased value to the owner. Such strategies actually increase contractor’s profit in an honest way while improving owner’s results.

11. The strategy must work within the construction environment in a way that honest contractors can embrace.

12. This is a Journey.

The journey can be accomplished step by step, and we can begin by taking advantage of the largest and easiest areas to remove waste, increase efficiency and deliver value to the owner.

The solution is accomplished by:

- 1) Using project leadership that is focused on achieving the owner’s goals without conflict of interest,
- 2) Developing and using an Owner-Focused Execution Strategy that is designed to achieve total mission success with lowest cost and risk,
- 3) Using modern technologies to enhance planning, execution, and the gathering of information to support ongoing decision making and negotiations throughout the lifecycle of the project, and
- 4) Controlling your money.

4 Principles of Common Sense Project Execution:

1. Leadership	Owner-Focused Leadership	Use Leadership that is focused on the owner’s goals.
2. Execution Strategy	Owner-Focused Execution Strategy	Develop and use an effective Owner-Focused Execution Strategy.
3. Information	Transparent delivery of relevant information to the project team and leaders	Use technology that helps deliver total mission success. Don’t rely on information or technology provided by any entity that has a conflict of interest. See Chapter 5.
4. Financial Control	Owner-Focused Financial Controls and Strategies	Use financial strategies combined with information strategies to mechanically reduce costs and risks. See Chapter 5.

Owner-Focused Leadership – The “Owner-Leader”

Project Results are Determined by Leadership. In order for owners to receive the results they desire, projects need leadership that is dedicated to achieving the owner’s goals. We call this “Owner-Focused Leadership” to distinguish it from leadership provided by people *that have a conflict-of-interest and therefore are not dedicated to the owner’s best interests.*

Owner-Focused leadership can come from the owner, the owner’s staff, or an outsourced Agency Construction Manager (ACM).

The primary requirements of owner-focused leadership is threefold:

- 1. Expertise in all aspects of construction management, and**
- 2. Ability to create and execute an Owner-Focused Execution Strategy, and**
- 3. Total dedication (*without conflict of interest*) to the owner’s goals.**

In ancient Greece the leader of the army was called the Strategos because the Strategos was the person that created the strategy and led the troops. If a person cannot create an effective Owner-Focused Execution Strategy, then he or she is not an Owner-Focused Leader.

It is impossible for a General Contractor (GC) or CM at Risk to perform this function because GC’s have a profit motive that conflicts with the owner’s goals. CM at Risk (construction manager at risk) also has conflicts-of-interest and so a CM at Risk does not provide Owner-Focused Leadership. And even when an Agency Construction Manager is responsible exclusively to the owner you must make sure to contract with them in a specific way that eliminates conflicts.

In the construction environment you need both distributed leadership and central leadership. The distributed leadership typically exists within the ranks of the contractors and subcontractors but these distributed leaders need to operate within an Owner-Focused Execution Strategy with oversight from an Owner-Focused Leader.

You need Leadership that can steer the process:

- | | | |
|-----------------------------------|---|--|
| 1. Know the course | → | <i>Understand the Goals and how to maximize value</i> |
| 2. Impel action | → | <i>Get the team to act to create the owner’s success</i> |
| 3. Acquire information | → | <i>Including progress and cost during project activities</i> |
| 4. Analyze the information | → | <i>How does it compare to plan?</i> |
| 5. Make Decisions | → | <i>Based on the information and analysis</i> |
| 6. Lead the Team | → | <i>Motivate and direct action based on the decisions</i> |

When a leader has good information s/he can accomplish this process with a light touch, making small corrections as needed before they become expensive problems. If the leader cannot see the operational information about activities in progress and therefore fails to make the small corrections then later corrections will become large and expensive!

The operational environment of construction uses both distributed leadership and central leadership. All these leaders need accurate and timely information to make good decisions.

Owner-Focused Execution Strategy (OFES)

An Owner-Focused Execution Strategy is the plan and means of how to achieve total mission success at lowest cost and risk. It employs measures to improve the effectiveness of the project team at delivering value to the owner and countermeasures to eliminate waste.

The Owner-Focused Execution Strategy is a description of how the game will be played. It starts as a plan and becomes the means of execution and the execution itself. It includes the tools needed to steer the course. It is based on principles (universal truths). These principles include: Good Leadership is better than poor leadership, good information (complete, relevant, organized, on-time) is better than poor information, a good plan is better than a poor plan, and the real world is variable and chaotic so one needs to be able to see what is happening, steer the course, making changes, in order to achieve the destination or goal.

A powerful Owner-Focused Execution Strategy (OFES) incorporates all planning and execution into an integrated, cohesive, and agile plan. The Owner-Focused Execution Strategy incorporates all plans, strategies, tactics, and countermeasures required to achieve objectives. The plan should be comprehensive because any hole in the strategy can be used to “Game the System.” The Owner-Focused Execution Strategy must be an agile living plan that can change in service to achieving the goals. Additionally the goals themselves often change and a good OFES will anticipate change to keep costs to a minimum.

A good Owner-Leader can provide leadership in creating the Owner-Focused Execution Strategy. In creating the Owner-Focused Execution Strategy the following elements and countermeasures should be examined and taken into account. The Owner-Leader can certainly choose to not use certain elements, but this should be a conscious choice that is part of the strategy.

You can start on this journey slowly using the elements and countermeasures that apply to your current situation.

Elements of an Owner-Focused Execution Strategy

Depending on circumstances, an Owner-Focused Execution Strategy (OFES) incorporates the following interrelated elements and countermeasures. You can apply these principles to any project delivery method. They are not listed in a particular order.

1. **Roadmap.** An Owner-Focused Execution Strategy produces and describes an optimally integrated roadmap and destination that if followed will result in project success.
2. **Goals.** A strategy is a plan of action designed to achieve one or more goals. In order for the OFES to be effective the goals and aims must be clear. The team, the organization, and all the documents must support the mission.
 - a. One Goal is to receive the facility itself. This is part of achieving mission success.
 - i. At the beginning of a project that “facility itself” is an unknown.

The owner must engage a team that will start with ideas, dreams, and visions; solve ever-changing problems in an ever-changing environment and finally deliver...

You can apply these Principles to any Project Delivery Method to improve results.

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- b. From a project owner's point of view the aim of engaging in a construction project is to gain maximum value from the project. This means it must be delivered at low cost. The overall aim of the OFES is for the owners to achieve total mission success with lowest cost and risk.
 - c. Achieving the goals is more important than the plan itself. Therefore the "plan" is often changed in order to achieve the goals. The OFES must have built-in agility so that such changes keep waste to a minimum.
3. **Advantages.** An OFES details the advantages (the means to an end) that the owner will use to gain maximum value from engaging in the project. If you don't use all your advantages then you will probably not gain as much value as you could and you will definitely expose yourself to needless risk.
- An Owner-Focused Execution Strategy is the roadmap and the means to accomplishing goals.
4. **Team.** An OFES incorporates plans, strategies, and tactics to select and obtain team members that are optimally suited for the project and then contracts with them in a way that promotes owner's interests. This means that each team member must agree to and support the Owner-Focused Execution Strategy and behave to support the goals of the project owner. (But "agreement" to behave is not enough in the face of profit driven conflict-of-interest and typical deceptive practices. You must include other elements of the OFES that monitor and assure behavior. Good people don't mind monitoring. People that intend to misbehave protest monitoring).
- a. The team will start with ideas, dreams, and visions. It will solve ever-changing problems in an ever-changing environment and finally deliver...
 - b. The OFES will include strategies to create an integration of the team so that it delivers.
 - i. Communication
 - ii. Networked

A Test of Contractor Honesty

There are many contractors that support the use of better methods that are designed to achieve the owner's goal of total mission success at lowest cost and risk.

Honest contractors are willing to use Lean Project Execution Strategy because we can show that using lean strategy improves the contractor's profitability and competitiveness in the market.

On the other hand, with some contractors it is difficult to negotiate use of Owner Focused Strategy because these strategies prevent them from taking advantage of the owner to gain financially.

Here are some upfront questions to ask contractors:

- **Do you agree that your purpose is to help me, the owner, achieve total mission success at lowest cost and risk, provided that you earn a reasonable fee that we can agree to upfront?**

The answer is typically YES!

- **Next ask: Then you would agree that we can be open and honest and that all information about my project should be available to me?**
- **And would you agree that the money should flow quickly to the contractors, subcontractors and suppliers without it being delayed for extended periods of time?**

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- iii. Collaboration
 - iv. Alignment
 - v. Incentives
 - vi. Transparency
 - vii. Accountability
 - viii. Incorporate strategies to keep each team member's costs in line
5. **Flow of the Work.** An OFES seeks to create the most efficient and effective flow of work. This is about schedule, this is about providing all of what is needed by the crews so they can get work accomplished without constraint, this is about servant leadership and collaboration at all levels.²⁶
6. **Flow of Cash.** Cash is the lifeblood of a project and an effective OFES recognizes that a secure and streamlined project cash flow is necessary to success. Efficiency of the project is entirely dependent on cash flowing to the subcontractors and at the same time protecting the owner's cash is core to the owner's ultimate success. This cannot be overstated; any Cash that flows outside of the owner's control represents one of the major risks of any project and project owners are harmed by this everyday because they did not employ proper controls. An effective OFES provides an executable strategy that streamlines that project's cash flow so that all contractors receive funds quickly and at the same time provides the control and risk mitigation needed. This executable strategy is provided through use of technology and it is guaranteed to reduce costs and risks by applying solid financial strategies. See Chapter 5.
7. **Support of the Owner's Goals.** An OFES should provide strategies that serve to mechanically make the entire team operate in support of the owner's goals and aims.
- a. **Use an Owner-Leader.** An owner-leader is a person the leads the project and is in full support of the owner's goals without conflict-of-interest. This leadership can come from the owner, the owner's staff, or an outsourced Agency Construction Manager (ACM). With the right contract, an Agency Construction Manager will satisfy this requirement.
 - i. **An owner's rep is not enough** – a large percentage of projects that cost too much and/or fail are overseen by an owner's-rep. An owner-leader is an expert in project execution strategy.
 - b. Provide clear mission, aims and goals.
 - c. Provide strategy to make the team collaboratively strive to support those goals.
 - d. Provide motivation to align the independent contractor's goals with owner goals.
 - e. Provide contracts that specify contractor compliance with the OFES (cooperation and collaboration) and align interests of team with owner.
 - f. Provide systems and technology that alert leaders when there is a variance as early as possible and certainly during the progress of an activity.
8. **Leadership.** The OFES uses leadership in two ways:
- a. First, leadership is dedicated to impelling action, i.e. a leader acts in ways that cause the participants to get work completed in accordance with plan and goals,
 - b. Second, Leadership uses the monitoring and communications systems to see variance, make decisions and act to get production back on plan and flow when there is a variance (or alternately changing the plan). Such variance can be in work in progress or in changes in what can be committed to (see "Last Planner™" item #20.g below).
 - c. **Distributed Leadership.** Because the activities of projects are performed by the independent contractors much of the leadership, planning, execution and control is distributed among the crew

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chiefs. The Owner-Focused Execution Strategy recognizes that complex systems such as the Construction Production System have multiple leaders within the hierarchical levels that control independent actions and these leaders do most of the leadership work of making things happen.

- d. **Central Leadership.** The OFES sets up an environment wherein all these distributed leaders are working toward a common goal. But chaos happens, variance from plan is normal, so the OFES specifies systems that alert the central leaders and owner-leader to variances. Thus we gain the best of both worlds.

9. **Leadership Support.** The Owner-Focused Execution Strategy recognizes that results are determined by leadership and that a leader's job is to make decisions and impel results. The best decisions are made using accurate up to date information and therefore the quality of results is directly dependent on the quality, timeliness, and completeness of information. The OFES should provide strategies, protocols and information systems that are designed to make each project leader more effective (particularly including the Owner-Leader).

- a. Use information technology that gathers and reports accurate up to date information.
- b. Use good contracts tied to mission, aims and goals that specify contractor compliance.
- c. Use Task Monitoring and Control Technology
- d. Ensure Clear Design. (use BIM)
- e. Use Communication technology
- f. Collaboration and integration of the team

See Chapter 5.

10. **Collaboration Support.** The Owner-Focused Execution Strategy should provide strategies and protocols that are designed to support the team's collaboration and cooperation:

- a. Information will be shared very quickly so that all team members have the knowledge needed to achieve goals.
- b. Integration during design
- c. Communication
- d. Technologies
- e. Very fast updates of project conditions
- f. Real time updates of schedules

11. **Decision Making.**²⁷ The OFES recognizes that the foundation of leadership is decision making and therefore incorporates the means for leaders to make the best decisions. The ability to make wise decisions is core to effective execution. The best decisions are made using accurate up to date information and therefore the quality of results is directly dependent on the quality, timeliness, and completeness of information used to make decisions.

- a. There are several levels of decision making to consider:

Decision Making²⁶

When project decision makers have good information that they can make better decisions.

Why? Decision making is a process. It's a process wherein one uses information in some way to come up with a thought.

The quality of a decision is dependent on two things:

1. The information used (based on quality, timeliness, and completeness), and

2. The process used (which is an information processing exercise which is dependent on the information used).

Additionally, decisions are made because a decision maker is presented with a reason to make a decision – and this reason is also *information*.

In other words a decision maker will not go into a decision making process until and unless some bit of information perturbs the decision maker into the process. The decision maker must be alerted to a need.

The quality of decisions made is completely dependent on information.

Better information results in better decisions.

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- i. Strategic –
 - A. Original Goals
 - B. Original Strategies
 - C. Are we on course?
 - ii. Operational:
 - A. How to carry out tasks
 - B. How to get things back on track when there is a variance.
 - iii. Management Control
 - b. The OFES recognizes and supports both centralized and decentralized decision making.
 - c. Includes decision making strategies that are optimized to use the superior information being reported from the technical systems.
 - d. Specifies use of information systems that gather and deliver accurate on-time operational information to leaders. See Chapter 5.
 - e. Specifies systems that alert leaders to variance that requires a decision
 - f. Test ideas for viability and feasibility.
12. **Create an Integrated Organization.** Success is achieved by managing, coordinating, and synchronizing a series of events and activities performed by a set of independent contractors toward a specific goal. Optimal success requires coordination of these independent contractors so that they act and behave like an integrated team that is dedicated to the owner’s purpose.

An OFES incorporates plans, strategies, and tactics to:

 - a. Recognize and treat the entire Construction Production System as an integrated organization whose purpose is to achieve total mission success at lowest cost and risk.
 - b. Synergize the interrelationships of all aspects of the Construction Production System.
 - c. Create a unification of the team designed to achieve the owner’s goals.
 - d. Set the ground rules.
 - e. Monitor behavior. Every integrated organization needs a nerve system.
13. **Integrated Practice.** The Owner-Focused Execution Strategy promotes use of Integrated Practice, which is having the designers as well as the rest of the team use integrative technologies and behaviors to collaboratively add value throughout the project life-cycle.
14. **Prepared for Chaos and Change.** The OFES recognizes that a project is in constant change and that while the changes often match the schedule and budget, at other times events don’t match the plan and therefore the project needs to be steered and schedules and plans need constant updating.
 - a. Even though the team is spread out over a large geography that prevents direct observation, leaders need to be aware of the operational conditions and variances that affect the project in real time so they can make decisions and lead. (i.e. they must use the information gained from your technical systems).
15. **Optimal Combining and Balancing.** An Owner-Focused Execution Strategy recognizes and supports that effective execution requires an optimal combination of processes and countermeasures. The goal of the Strategy is to achieve the owner’s goals not to push a specific management style or philosophy. So rather than using only a “push” style of management or a “pull” style, the OFES is designed for optimum balance in using and combining various elements of project execution (including lean and traditional) and is ready and able to change tactics as required (agility) in order to achieve the real goal. Examples include:

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- a. The OFES uses push and pull
 - b. Central Control and Distributed Control
 - c. Control is many things:
 - i. It is promoting positive action, i.e. Impelling action
 - ii. It is planning, preparing, helping, navigating,
 - iii. Communication
 - iv. Monitoring
 - v. Decision Making
 - vi. Correcting
 - d. Central Leadership and Distributed Leadership
 - e. Master scheduling and Last Planner™ scheduling (see endnote 28)
16. **Agility.** An OFES promotes agility. The leaders and crews must work in a world that changes and to be effective they need to adapt and react in their decentralized locations in a way that promotes the central purpose of the project and promotes the flow of work. A rigid plan cannot survive contact with the Construction Production System as it operates in a real-world future that is full of chaos, variance, mistakes, and change. The OFES, the leaders, and the team must be agile. In other words you cannot make a plan and expect results. Instead you must be ready, able, and willing to change any aspect of the project. The quicker you can adapt to change the better will be the end results. Results are determined by leadership.
17. **Resilience.** Much like agility an OFES needs to be resilient. The Plan and the team must be able to move through change.
18. **Ingenuity.** A good OFES will provide incentives so that every member of the team brings ingenuity to the project that is dedicated to achieving the project's goal as defined by the owner.
19. **Control.** Because the construction process naturally varies from plan it is necessary to include elements and means of control in the OFES. The OFES uses "control" in several ways.
- a. There is Central Control and Distributed Control.
 - b. There is a dance between control elements that must be an integrated process.
 - c. Control is many things:
 - i. It is promoting positive action, i.e. Impelling action
 - ii. It is planning, preparing, helping, navigating,
 - iii. Communication
 - iv. Monitoring
 - v. Correcting
 - d. The OFES promotes "control" as a means of causing and impelling activities to conform to plan. The leaders impel action.
 - e. The OFES also specifies systems that detect and report variance during the progress of activities in real time. When a variance occurs leaders can impel corrective action.
 - f. Because the activities of projects are performed by the independent contractors much of the leadership, planning, execution and control is distributed among the crew chiefs but the leaders

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that have a greater responsibility to the whole integrated project must be able to see variance as soon as possible.

20. **Optimize Scheduling** to support teamwork, collaboration, and leadership in service to the owner's goals as activities are performed through the flow of work to generate value. A schedule is a tool that is used to communicate work flow and upcoming activities to the project participants. A project is a network of commitments and a schedule is one tool used to communicate the commitments and direct the flow of work. A schedule is also a tool that a leader can use to monitor progress.
 - a. Create an accurate initial schedule. A schedule for Construction Production System is a list of design and production activities that will occur in the future. Accuracy would imply:
 - i. Correlation between the "scheduled" activities and the actual activities performed (see item 21 below), this means that the schedule should accurately list the real tasks, not just a list of imaginary tasks,
 - ii. Correlation to accurate time periods of how long tasks should take and when these activities will occur,
 - iii. Dependencies (things need to be complete in a specific order),
 - iv. Correlation to other elements such as cost and progress.
 - b. Create an operations schedule that is based on and describes the actual tasks that will be performed and invoiced by the contractors and subcontractors down to all pertinent levels of the hierarchy.
 - i. A list of the real activities
 - ii. These activities will be the same as the activities invoiced. (this cannot be done top down).
 - c. The operational schedule will be structured to facilitate the flow of the work,
 - d. Create an operations schedule that is correlated to costs down to all pertinent levels of the hierarchy.
 - e. Optimally update schedule in accordance with actual progress (use information from the technology systems) in real time.
 - f. Optimally update schedule in accordance with newest abilities to commit.
 - g. Use Last Planner™ (see footnote ¹ at bottom of this page and note ²⁸ at end of document) and Reverse Phase Scheduling (which is a part of Last Planner).
 - h. The optimal scheduling system includes push and pull.
 - i. Synchronized production. Synchronized production is realized by working collaboratively.
21. **Real Work Breakdown Structure:** The OFES incorporates strategies to make sure the WBS is real. Rather than creating a top down WBS that does not truly describe the real-world tasks, we use a WBS that is a description of the actual tasks that will be performed by the multi-leveled hierarchy of independent contractors. Additionally the WBS will be used to structure a schedule that is optimized for efficient flow and productivity that helps achieve goals. Technology helps with this. See Chapter 5.
22. **Workflow.** The OFES is a method that stresses making the total project workflow most efficient. The OFES recognized that many contractors can make their own portion of the work most efficient for themselves in a way that harms the whole process. The OFES seeks to make each process as efficient as possible within a goal of making the total process most efficient.
 - a. The goal is to make the overall schedule as efficient as possible.
 - b. Within this overall schedule each task and subtask can also be streamlined.

¹ The terms "last Planner" and "Last Planner System" are trademarked by the Lean Construction Institute.

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23. **Task Monitoring and Control Technology.** The OFES incorporates technology systems that gather, analyze, organize and report all pertinent information during progress of activities and report it to project leaders in real time. This supports Leadership and Collaboration. See Chapter 5.
24. **Information Management.** The OFES incorporates use of information systems (see Chapter 5) that support the Value Stream's second essential task "**Information Management**" in order to give project leaders the information needed to steer the project and project owners the information needed to negotiate from a position of knowledge. See Chapter 5.

See item 33.B "**Value Stream Management**" for a description of the **Information Management Task** as one of 3 essential tasks in lean production.

On a complex project performed by a team of disbursed contractors there are always operational problems that need attention. Good information strategy will deliver needed information to leaders so that 1) they are alerted to variances or problems on time, 2) they can make good decisions because they have the relevant information on time, and 3) they can communicate and control the process as needed. Early correction of problems saves money. Negotiating from a position of knowledge with accurate up-to-date information is always preferable.

25. **Design and Design Technology.** The OFES incorporates strategies to make sure the design supports the owner's goals to achieve success at low cost and risk.
 - a. Design needs to be planned and managed. An owner needs to know if elements of design are falling behind schedule.
 - b. Understand and incorporate dependencies
 - c. Design itself incorporates technology
 - d. Conflict checking
 - e. Value engineering
 - f. Design Collaboration
 - g. Design Information Management
26. **BIM:** The OFES should include strategic use of optimal Building Information Modeling. See Chapter 5 for more details.
27. **Prepare for Incomplete Design.** The OFES recognizes that project design and other specific planning may not be "complete" during portions of the project and therefore incorporates strategies to eliminate and mitigate problems and added cost from these incomplete plans.
28. **Communication Strategies** (technologies and protocol). The OFES includes communication strategies that are optimized through use of technology and that use the superior information being reported from the technical systems. Good communication systems support collaboration and leadership. When in conflict the OFES supersedes contractor protocols.
 - a. General communication
 - b. Design Issues and Collaboration
 - c. Communication of operational information
 - d. Request for Information (RFI)
 - e. Change Orders
 - f. Daily ReportsSee Chapter 5.
29. **Conflict-of-Interest.** Incorporate countermeasures for the conflicts-of-interests that may be present in a group of independent contractors brought together for the temporary purpose of the project.

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- a. Recognize the problems that create opportunities for contractors to drive up prices through change orders and provide countermeasures to reduce or eliminate these needless costs.
 - b. Recognizes the conflicts-of-interest and the oppositional interests of the many contractors and provides strategies, tactics and plans to get the team working together. This is not collaborative “happy sauce” this is employing serious strategies and systems that work.
30. **Cost Control Strategies.** Cost control and transparent cost reporting are of the greatest importance. Owners need to protect their core assets.
- a. Include specific strategies and tactics designed to make sure initial costs are low.
 - b. Recognize the problems that push initial costs up by 10% to 30% and included plans to reduce and eliminate needless costs.
 - c. Avoid and/or counter the strategies and tactics used by contractors to drive up prices.
 - d. The OFES incorporates technology to help with controlling costs.
 - e. The OFES incorporates technology to help with financial security. See Chapter 5.
31. **Change Order Control.** The OFES incorporates specific strategies and tactics designed to make sure that change orders are kept to a minimum including technology to help with controlling change orders and providing information for negotiations. Incorporate systems that give the project owner all of the information needed to negotiate from a position of knowledge.
32. **Supply Chain Management.** The OFES recognizes that a Construction Production System includes a complex supply chain that must be managed in order to optimize the entire project as well as every task. The OFES incorporates plans to optimally manage the entire supply chain.
- a. Transparency into all pertinent levels of the hierarchy.
 - b. Variance Alerts about all activities from all pertinent levels of the hierarchy.
 - c. Information Gathering and reporting from all pertinent levels of the hierarchy.
 - d. Communication to all pertinent levels of the hierarchy.
 - e. Use of all the technologies discussed in Chapter 5.
33. **Value Stream Management.**²⁹ The OFES recognizes that the Value Stream is the set of all the specific actions required to bring a specific project through the 3 critical management tasks:
- A. **The Problem Solving Task** (which runs from concept through detailed design and engineering though the process of making...)
 - B. **The Information Management Task** (includes all information gathering, analysis, and reporting with respect to the project running from initial concepts through contracts, scheduling, progress monitoring, cost monitoring, through delivery and then through facilities operations and management, “in order to facilitate firm-to-firm relations, regulating behavior between firms, and transparency regarding all steps taken along the value stream so each participant can verify that the other firms are behaving in accord with the agreed principles” ...)
 - C. **The Physical Transformation Task** (proceeding from raw materials to finished product delivered...)

Value Stream Management is identifying and mapping the value stream and then using countermeasures to expose waste and inefficiency.

Next we use countermeasures with the Lean Project Execution to eliminate waste and make the process more efficient in order to deliver a greater gain in value to the owner.

See Supply Chain Management (section 32 of this chapter)

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34. **Entire Lifecycle.** The OFES recognizes the project's entire lifecycle and seeks to optimize and improve all elements of the lifecycle in accordance with the owner's objectives.
35. **Treat the separate elements.** Include strategically interrelated plans to optimize and improve each element and phase of the project including germination, initiation, planning, design, execution, completion and delivery or hand off.
36. **Optimize quality and quality control.**
37. **Transparency.** Produce transparency of information as required to optimize and improve the owner's results.
 - a. Financiers
 - b. Public Agencies
 - c. Donor funded organizations
 - d. Sarbanes Oxley
 - e. Tax benefits
38. **Risk Management.** Include Risk Management strategies that support owner's goals. In ideal Risk Management a process is employed that recognizes all risks and prioritizes the risks so that one can first handle the risks with the greatest potential loss and the highest probability of occurrence and lower hazardous risks are handled in descending order.
 - a. Understand Context
 - b. Identification of Risks (identify risk of loss from various sources)
 - c. Analysis of Risks
 - d. Prioritization of Risks
 - e. Create Risk Mitigation strategies
 - f. Implement
 - g. Monitor
39. **Liability and Risk Control.** The OFES recognizes that each party seeks to transfer all risk and liability to others and provides strategies, tactics and plans to correctly distribute responsibilities.
40. **Contracts.** The OFES should specify use of contracts that support owner's goals while optimizing issues and liabilities. Contracts need to be reviewed and updated by attorneys that have a complete understanding of the Owner-Focused Execution Strategy.
41. **Tax Benefits.** The OFES should maximize tax benefits. Many project owners end up paying too much in taxes because they fail to use systems that reduce taxes. Other owners end up paying too much for the tax study and get an inferior report to boot. The OFES should specify strategies that result in maximizing tax benefits. Contractors information systems (designed to hide information) are costly to owners with respect to taxes.
42. **Ideas.** Never stop looking for better ideas.
43. **Feasibility Testing.** Incorporate plans to test ideas for viability and feasibility.
44. **Delivery.** Incorporate instructions for the completion and hand off.
45. **Continuously Improve.** Continuous improvement is core to a powerful strategy.
46. **Make It Happen!** Core to all leadership is doing the hard work of making it happen! In a literal sense leadership is what causes projects to be successful. Core to leadership is good planning and good information.

5. ***BIM & Information Management for Development***

“Software has transformed the productivity and competitiveness of every company in every market sector around the world...”³⁰

The goals for this chapter are to:

- Describe the importance of Information to the development process so that readers see that information management is a core task and requirement of construction development.
- Show that ***how*** you perform the information management task is core to achieving the owner’s goals of total mission success at lowest and risk.
- Show that information management is a core task of lean production.
- Describe how accurate, timely, and relevant information is important to gaining value and eliminating waste as we strive to achieve the owner’s goals. Show that inefficiency in Information Management leads to waste and added costs paid by owners.
- Describe some of the systems needed.

A. The Importance of Information

Construction development is one of the most information intensive industries on earth.

It is impossible to engage in construction development without managing information. Since the you cannot avoid managing information your only choice is how well you do it and will you take the steps necessary to gain the advantages provided by good information management. You can be inefficient and pay 10% to 30% too much for your project, or you can become efficient, removing waste, increasing value and increasing your probability of overall project success. Additionally good information is also necessary when negotiating (see appendix 9).

Not only do we create a new custom design for every project (which is information) but we also have one of the most complex supply chains (that we recreate with each new project). This supply chain must communicate complex information back and forth between dozens on disbursed independent contractors. On each project we use dozens of independent specialty contractors that are brought together for the temporary duration of the project and they are managed (using information) from remote locations as they perform custom work according to custom design information (To keep costs low the work needs to done right the first time every time, and this is largely an information and communication process). The contractors and workers are organized into a multileveled hierarchy. Every entity in the chain must use complex information as well as send and receive complex instructions and contractual information up and down the information supply chain. The value to be delivered to the owner flows one direction while the energy that drives the machine (money which is often in the form of information) flows the other direction. Over and over during the course of the project, information needs to be distributed very quickly to the production team – and each member of this team occupies his own office, which is at a remote location from the project site and from every other team member.

Any problem with the information creates waste, adds costs and creates change orders. Good information management saves money, impels correct action and reduces mistakes.

Three facts that describe the construction development process:

1. Project success is achieved by coordinating and synchronizing a series of interdependent activities that are performed and completed in accordance with a custom design and custom schedule by dozens of independent contractors working at remote locations and managed from other remote locations, with minimal waste.
2. The real world is full of variances, mistakes, traffic, disease, greed, lies, accidents, inclement weather, emotional issues, hubris, and other causes that prevent humans from performing in accordance with a plan or schedule. To err is human... and to cover up the error is also human.
3. Project Leaders are geographically remote from many critical components of the work as well as most of the production team and other leaders... Therefore:
 - a. Leaders often cannot directly observe production issues or variances that require decisions, and
 - b. Leaders cannot directly communicate with the production team without travelling.

In order to efficiently lead, manage, and coordinate this complex set of project activities, leaders (both centralized and distributed) must know the operational condition of each relevant activity while it is in process and be alerted to any variance from plan. When and as things change or go wrong each relevant project leader needs to know so that s/he can make decisions and promote actions to make corrections and maintain the overall flow. The sooner the leader knows about variances the sooner s/he can make decisions and impel results (and keep costs low). Central leaders need this operational information because distributed leadership often fail, mistakes happen, or the distributed leader is not cognizant of the total other workflow that needs to be adjusted for efficiency and thus cannot make the best decisions or alter other workflow.

We use information management systems to alert leaders with relevant, timely, accurate information so they can make good decisions and provide clear guidance for action.³¹

It makes sense to use the most practical information management tools available.

B. Good Information Management is Core to Achieving Owner's Goals

Information Management Systems support, enhance, and enable the purpose of the Project:

1. Directly reduce costs and waste by streamlining and reducing waste.
2. Directly reduce costs by taking advantage of financial strategies.
3. Provide information that enables better decision making.
4. Alerts leaders and managers to issues that need attention.
5. Provide better tools for planning and design.
6. Enhance problem solving.
7. Provides better communication of documents.
8. Provides financial protection that secures core assets.

C. Information Management is an Integrated Part of Lean Construction

The traditional way of looking at a project divides the Construction Production System into 2 critical tasks:

1. Design and 2. Build. Because this description misses a key task the description itself serves as a primary source of creating problems that result in reducing the value gained by owners as well as the high incidence of mistakes and project failures.

According to the principles of Lean production ³² there are 3 critical management tasks:

1. **The Problem Solving Task** which runs from concept through detailed design and engineering through the process of making to completion and delivery... (one could say this includes the traditional concept of design – but in lean thinking this “Problem Solving Task” includes much more and is embedded in the total integrated system).
2. **The Information Management Task** which includes all information gathering, analysis, and reporting with respect to the project running from initial concepts through contracts, scheduling, progress monitoring, cost monitoring, through delivery and then through facilities operations and management, “in order to facilitate firm-to-firm relations, regulating behavior between firms, and transparency regarding all steps taken along the value stream so each participant can verify that the other firms are behaving in accord with the agreed principles” ³³... (this task was sort of ignored in the traditional setting).

One of the primary principles of Lean Production is “Visual Control”. In an environment where the workers and leaders are distributed across remote locations from each other it is necessary to use information technology to provide the visualization as well as the communication elements of control.

3. **The Physical Transformation Task** proceeding from raw materials to finished product delivered... (Build.)

We add one more essential task:

4. **The Energy Distribution Task**, which is about providing the money to the team in a safe and efficient way. (Money is the energy that drives the integrated production system).

Information technology is a primary enabler of an Owner-Focused Lean Construction Production System.

One reason for this is that construction is completed by a disbursed workforce (the personnel, managers, leaders and stakeholders that are working on the project are often far apart from each other) and technology enables the complex communications that are required to act in alignment as an integrated team (coordination).

D. Why Do We Need Technology to Execute?

● The Right Information Technology Improves Design

It is extremely important to have clearly described project goals. One goal is to have the best design of the facility and there are technologies that do this better than pencil and paper or two dimensional drawings.

To not use this design technology is wasteful.

● The Right Information Technology Improves Aim

A project is like a rocket that is fueled by cash. You can point it in the general direction and hope for the best. The problem with this plan is that there are many things that can change the rocket’s course. It’s better to use a guidance system that has a target.

- **The Right Information Technology Improves Execution**

During execution you (as the Owner-Focused-Leader) need to be able to monitor all of the tasks being performed by the dozens of independent contractors and subcontractors, each working at remote locations. Why? Because variation is normal and you need to know when any variation that would result in waste is occurring so that you can make decisions and act. (Feedback so that leaders can impel corrective action).

- **The Right Information Technology Improves the Owner's Results**

Prior to modern technologies this type of information acquisition was too expensive if not impossible (the rumor of high cost persists – but it is now inexpensive). The modern technologies that acquire and report information are a core reason that we are able to execute an effective Owner-Focused Execution Strategy.

- **It takes a networked project team to achieve great performance.**

How do you orchestrate a loose group of independent contractors into a well coordinated networked team that can eliminate waste and deliver increased value to the owner? The most efficient way is to use technology to orchestrate the independent contractors performing a diversity of interrelated tasks (at remote locations) into a unified organization that works synergistically to achieve common goals.

If you are not properly managing information then you are not properly managing the project or the development process.

You cannot avoid information or technology; your only choice is whether you will make sure the technology is working in your best interests. Your risks and costs are directly proportional to how well you gather and manage information. In this information rich operating environment your costs can vary by over 100%. Your ability to manage risks can mean the difference between total failure and great success. In the operations of project development, information management consists of gathering, organizing, analyzing and reporting relevant operational information on-time to every person that has a need for it. In this operational environment when leaders become aware of the condition of any activity that needs decision or action they can steer the project toward greater success, but if a leader is not made aware of such a condition (because the information was not gathered or was mishandled) then an opportunity is lost and its probable that the project will tend toward higher cost or other problem. Information that is hidden from the Owner-Focused Leader or other leaders is detrimental to the project and is oppositional to the goals of the project owner. If the contractors hinder transparency of operational information in any way, then the owner will suffer.

E. Should You Use Modern Technology Systems?

There is one primary justification for using a technology system; it adds to the value gained by the project owner by directly reducing costs and risks.

There are 3 fundamental principles to keep in Mind:

1. **The purpose of the Project** is to deliver the owner's goal of total mission success at lowest cost and risk.
2. **The purpose of Information Management Systems** is to support, enhance and enable the delivery of the owner's goal.
3. **The value of Information Management Systems** is equal to the added value that such systems provide (this is measures as added value and reduced risk of loss).

If an Information Management System adds value to the project owner then use it. In fact, to ignore any system that adds value would be oppositional to both the intent of the project and to the principles of lean production. This is a common sense principle.

Appendix 8 goes into greater detail of why we need to use technology to achieve total mission success at lowest cost and risk.

F. Types of Information Technology Systems

Just as there is more than one element to executing a project there are several primary classes of technology that need to be used to facilitate the Owner-Focused Execution Strategy.

We use technology to optimize planning (including a Building Information Model).

We use technology to coordinate and optimize execution of the project's tasks.

Design and Planning Technology is used to describe the facility and the goals of the project. Planning and Design technology helps create a clear picture of the facility as well as the uses of the facility. From the point of view of the Execution Strategy it provides the aim of the project and will help to get the team in alignment with owner's goals. It should be interactive with the execution technologies.

Execution Technology. This technology helps organize, streamline, coordinate, monitor, and control the interrelated task work needed to achieve completion. This creates the networked project.

Integration. These technologies can be integrated using BIM or other strategies. Integration of the project into a networked team requires integration technologies.

There may be several ways to produce integration. Here is one example of a useful system:

1. Use a 3 dimensional model of the facility that is used as a graphical user interface to interface with the other information. This BIM solution must be integrated with the "Execution Information".
2. Use an Inter-Relational-Data-Set that becomes the core data to integrate all systems. This data set is easily produced by technologies that directly reduce project costs.
3. The Inter-Relational-Data-Set includes a set of interrelated data including: task data, schedule data, cost data, and design data that is interconnected to the BIM user interface.

Integration provides superior information management. Please see Appendix 5 for a discussion about technology to support the Construction Production System.

Technology for Planning and Design

There are several useful technologies that help with planning and design.

The foundational element of an effective Owner-Focused Execution Strategy is to have clear goals. Planning and design technologies create a superior representation of the goals and aims of the project and therefore are an integral part of achieving total mission success and lowest cost and risk.

During design and planning several systems are used to produce a clear aim for the project team.

1. BIM (technologies used for BIM include Revit, Bentley, and ArchiCad)
2. CAD
3. Design Collaboration (i.e. Buzzsaw)
4. Spreadsheets, Word Processing, etc.

BIM is Building Information Modeling.

Autodesk's Current Definition: BIM is an integrated process built around coordinated, reliable information about a project from design through construction and operations.

Common Sense Project Execution

The National BIM Standard uses a definition of BIM similar to the following: A Building Information Model (BIM) is a digital representation of physical and functional characteristics of a facility. As such it serves as a shared knowledge resource for information about a facility forming a reliable basis for decisions during its lifecycle from inception onward.³⁴

The National BIM Standard Initiative “categorizes the Building Information Model (BIM) three ways, **as product** [Information Technology], **as a collaborative process**, and as a **facility lifecycle management requirement**.”³⁵

As an IT and business enabler, BIM can help cut across the traditional information silos.

In its typical format, BIM starts as a 3 dimensional model of a facility presented on computers using software. It includes an object oriented information model and can connect to other types of information and databases serving to bring together many elements of design and other information to form a more useful description of a facility than 2 dimensional drawings and specifications. When combined with other systems the 3d model becomes even more useful. The 3d model (BIM) can be used as a graphical interface to access all information about a facility.³⁶

Historically BIM has centered on using a 3d computer model and then connecting to other information. Such as scheduling (a 4th dimension) and cost (a 5th dimension). Today we have some limited interoperability between the 3d models and these other information technologies and the technology is quickly getting better.

BIM provides at least 4 important functions:

- 1. It is a superior way to portray the aim of the project design in a way that all parties can understand.** Without BIM one must be able to read blueprints to understand a facility prior to construction, but using BIM anyone can understand the building’s design because it is presented as a 3 dimensional “sculpture”.
- 2. It reduces costs, waste, and risks.**
- 3. It can help integrate the team because it can serve as a primary interface for other types of information and technology.**
- 4. It can serve to enhance operations and maintenance of the facility throughout its lifespan.**

BIM Helps to Reduce Costs and Risks Through Early Detection of Problems.

A good 3d model helps practitioners to find design mistakes early in the process in three ways. First the process of building a 3d model requires that the human modeler look very closely at the design, during this process s/he catches many issues. Second the whole team can look at the model and see problems that are difficult to see when only looking at 2d drawings. Third, there are software solutions that help to find problems and clashes.

Finding design errors early in the process reduces costs and waste because when the design problem is discovered in the field during construction it typically causes expensive changes.

With BIM you don’t need to be an expert at reading drawings. This means that those stakeholders that are not expert can also see problems. One example is when a project owner sees that design does not match his or her vision.

With BIM many issues can be discovered and corrected prior to construction.

Common Sense Project Execution

At this time BIM technologies (such as Revit, Bentley, ArchiCad, etc.) do not directly address production tasks (although there could be some interoperability between BIM technologies and execution technologies). We need many technologies and we need to integrate the information so that the various systems can make the overall job of achieving mission success more efficient.

Technology for Execution

Technology for Execution performs the following function:

It gathers, organizes, analyzes, and reports the information required by the leaders and managers of the project in order for them to make good decisions and steer the project to completion at lowest cost and risk. Leaders are alerted when something goes wrong.

It does this while simultaneously and directly reducing project costs.

The information provided helps to head off project disasters

The information helps the owner to reduce the cost of change orders.

Technology for Execution is used to achieve the facility described by the Design. Execution technologies enhance the execution and management of the project tasks performed by employees and contractors as well as materials supply and other such elements of the project.

While BIM alerts the team to design problems prior to construction, Execution Technology alerts the team to real time problems during construction.

A Project Dashboard

Today's execution technology puts a dashboard in front of the eyes of project leaders that shows a visual snapshot of the status of current project activities and trends.

With a good dashboard:

- Leaders are immediately alerted to all issues and potential issues
- Leaders can see where they need to put their attention
- Leaders are provided with the information they need to make decisions on time
- Leaders can drill down to root causes.

The dashboard (and the technology behind it) acquires, organizes, analyzes, and communicates the right information – it cuts through complexity, misinformation, and bias – and clearly delivers factual information.

Beware of the False Dashboard...

In order for a dashboard to be truly useful it must provide an accurate picture of a project's status at the detail required. The information you see presented in a dashboard is only as good as the source data and analysis. Many dashboards do not show a view of the facts but only one person's opinion.

#1 The source data should be complete and accurate

The importance of accurate data cannot be overstated. A good dashboard system captures and records the most useful, detailed, and accurate set of data because it gathers this detailed data from every contractor and vender on the project. The accuracy is verified, double checked, and audited.

#2 Make sure the analysis is complete:

1. Accuracy. Analysis is better with accurate data.

2. Correlation. You need correlation between cost and schedule down to a detailed task level. The system should correlate the planned and actual Task Data, Cost Data, Invoice Data and Schedule Data.

3. On-Time. A good system instantly tracks and organizes thousands of pieces of complex information in ways that would take weeks with a calculator and days with an Excel spreadsheet.

#3 The dashboard presentation should be intuitive (from a business user's point of view)

The dashboard should present a clear picture of timely information in a format that is intuitive. It should provide instant snapshots of key performance indicators so that construction leaders can monitor project operations at a glance to support on-time decision-making and management.

#4 You can see and manage multiple projects

A good system will provide a dashboard screen that simultaneously reports on all your projects to give you an accurate, up-to-date view of each project. With such a view, a general manager can view the status of all the projects from a single screen and instantly know where there is a problem and where to devote valuable resources.

#5 You can drill down

Not only can a project leader can instantly know the status of all projects, but he or she can also drill down to any individual project. Next the leader can drill down to details about any project task to find root causes to correct problems. This leader is working with the facts!

A good dashboard will help a leader make informed decisions and take early corrective action without wasting time searching for the problem or searching for where to apply leverage.

Execution Technologies include the following functions:

1. Plan the work to be performed
 - a. Tasks
 - b. Scheduling
 - c. Organizational
 - d. Cost
2. Funds Control (Reduce risks)
3. Cost Control (Reduce costs through financial management leverage)
4. Financial Protection
5. Information Technology (Gather, Analyze, Organize, Report Information to support decision making and leadership)
6. Dashboards
7. Variance Reporting (all tasks)
8. Project Administration
9. Communications

Choosing Technologies:

Choosing the technologies that will be used on a project is an important decision because some technologies do not support the owner's goals of low cost and risk.

- a. Don't rely on technology provided by any entity that has a conflict of interest. Technology and information provided by a contractor is designed to support the contractor's goals of increasing revenue and profits while avoiding responsibility for mistakes.
- b. The right technologies enable the Construction Production System to operate in an integrated way that promotes the owner's goals. The right technologies help to optimize planning (Building Information Model). The right technologies coordinate and optimize execution of the project's tasks. The right technologies provide that information owner-leaders need to lead and negotiate.

See "Appendix 8: Notes on Technology for Construction" for more information on technology for the Construction Production System.

6. *Managing Multiple Projects – Portfolio Management*

In the real world, people and organizations simultaneously manage multiple projects. The methods and technologies described in this paper will help organizations to create an environment and strategy that supports managing a portfolio wherein the overriding company strategy is supported, the organization selects viable projects, and the projects are managed to achieve total mission success at lowest cost and risk.

7. *Conclusion:*

We define project success as achieving the owner's goal of total mission success with lowest cost and risk. This kind of success requires a successful and coordinated blending of many elements.

Project elements can act in concert to support the owner's mission or they can be selfish and competitive with each other and the owner and produce the results we see today: high initial costs compounded by added change orders and a high incidence of project failures.

To achieve the owner's goals requires a powerful Owner-Focused Execution Strategy together with owner focused leadership and technology. The technology includes BIM and Execution Technology (that reduces costs while gathering pertinent project information to support decision making and negotiations). Using this strategy will result in the highest probability of achieving total mission success with lowest cost and risk. When good managers and leaders have factual up-to-date organized information about conditions of all elements of the Construction Production System and they can use this information within a practical Owner-Focused Execution Strategy that is designed to achieve total mission success with lowest possible cost and risk then many issues are solved and costs are reduced. The technology systems alone guarantee better results.

Benefits of Using an Owner-Focused Execution Strategy

- Reduced Costs, *which increases value gained*
- Shorter Schedules
- Better Quality Construction
- Improved Design
- Fewer Mistakes

8. About Cortexion:

Cortexion's services range from full program management to individual assignments, all aimed at completing projects for best results – this means lower cost, reduced risks, and better quality – Guaranteed.

Cortexion's services and capabilities include:

- 1. Strategy and Execution:** *We deliver more than the typical construction manager.*
- 2. Full Program Management:** *unified management of projects from inception to completion*
- 3. Technology:** *Cortexion provides assistance with technology and technology decisions. For projects, Cortexion provides financial and information technology that directly reduces project costs and risks.*
- 4. Individual Assignments to fulfill any project need**
- 5. Project Business Planning and Feasibility**
- 6. Project Management:** *Project Organization and Execution Management*
- 7. Finance:** *Preparation of Docs and Acquisition of Funding – Diligence*

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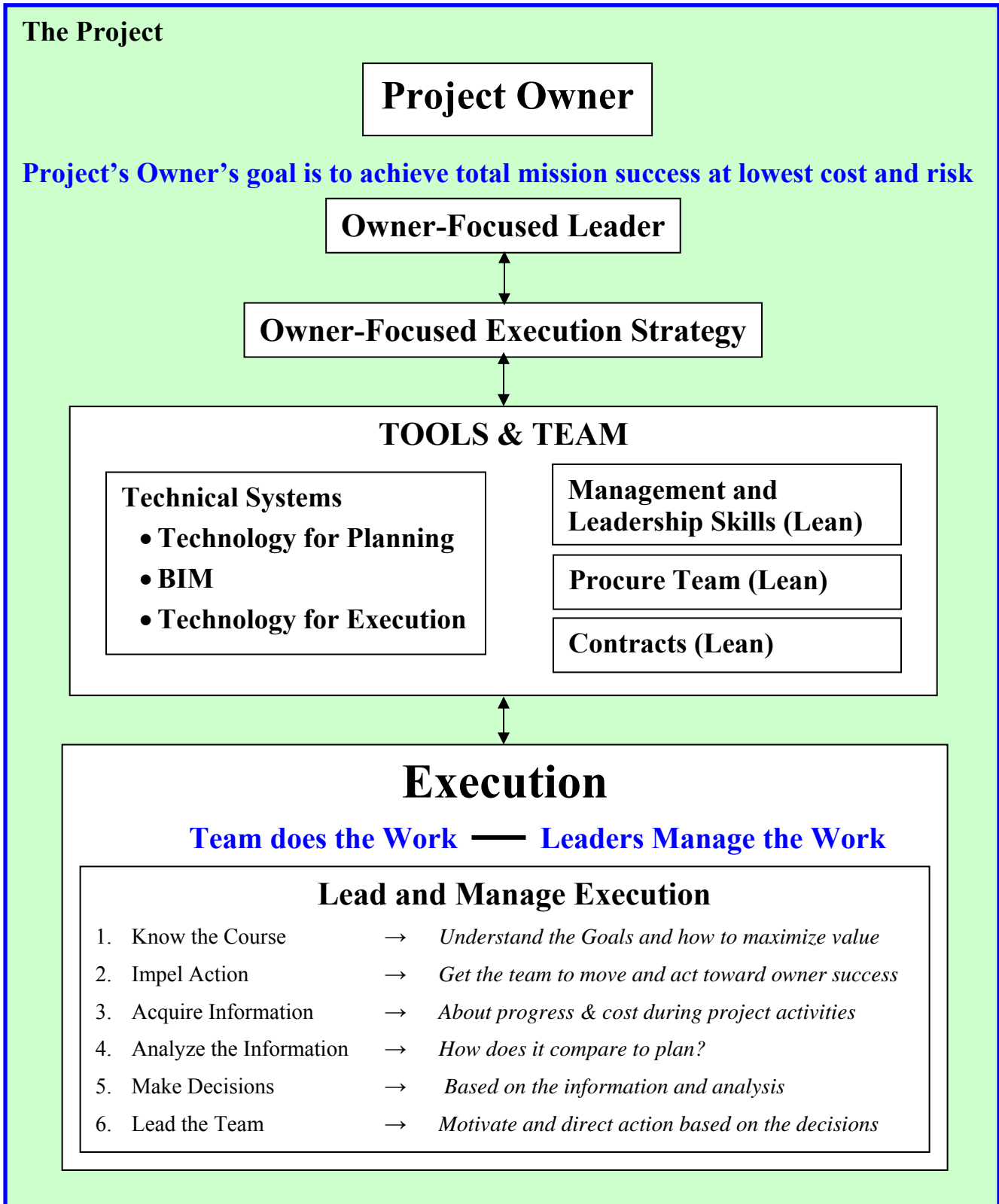
9. Appendix 1: How Reducing Costs Leverages Bottom Line

Data for a typical development project showing how reducing costs increases margins and the value gained by project owners:

	Standard (typical construction costs)	10% Savings In Construction Costs	20% Savings In Construction Costs	30% Savings In Construction Costs
Market Value	\$25.00m	\$25.00m	\$25.00m	\$25.00m
Costs:				
Land and non-construction costs	\$7.00m	7.00m	7.00m	7.00m
Cost of the improvements	\$12.00m	10.80m	9.60m	8.40m
Interest Carry	\$ 2.71m	2.54m	2.37m	2.20m
Total Costs	21.71m	20.34m	18.97m	17.60m
Financing:				
Debt (Construction Loan)	\$16.28	\$15.26	\$14.23m	\$13.20m
Equity (Cash Requirement as equity investment)	\$5.43m	\$5.08m	\$4.74m	\$4.40m
Total Financing	\$21.71m	\$20.34m	\$18.97m	\$17.60m
Equity Investor's Gains:				
Total Return (or total Gain in Value)	8.71m	9.74m	10.77m	11.80m
ROI	61%	92%	127%	168%
• Increase in ROI		51%	110%	179%
• Reduction in Construction Costs		1.20m	2.40m	3.60m
• Reduction in Interest Carry		.17m	.34m	.51m
• Total Reduction in Costs		1.37m	2.74m	4.11m
• Additional Margin		5%	11%	16%
• Increase in Margin		42%	83%	125%

Additionally, the strategies reduce the duration of projects in both design and construction.

10. Appendix 2: The Construction Production System



11. Appendix 3: Lean Construction

This paper started with a quote from William Edwards Deming. Deming's goals were to create better execution of production to achieve better results. The work of Deming and several others has resulted in creating a production system called "The Lean Production System". Toyota applied the lean principles and became the most efficient producer of automobiles on earth; their version of lean is called the Toyota Production System. It is the best production system on earth and it continues to improve. A growing number of business leaders have recognized that when business organizations adopt lean systems they gain in many ways including improvement of bottom line. In fact, it is said that in the near future only lean production systems will be competitive. The strategies promoted by this paper are part of what we term "Lean Construction". In all cases we support and promote Lean Construction.

What is Lean Construction? Without getting into an academic debate, we think of Lean Construction as improving the construction production system using production management principles that are similar to the principles used by Toyota as they created and improved *their* Lean Production System.³⁷ Please note that I did not say "copy Toyota". "Copying does not work."³⁸

The aim of Lean Construction is to create a system of production that effectively and efficiently delivers the highest and best value of the project to the initiator and primary stakeholder of the project, which is the project owner. This means that the aim of Lean Construction is to help owners to achieve their goal of total mission success with lowest cost and risk.³⁹

Lean Construction is a set of strategies and executable practices that work to improve the construction production system with the aim of making sure that project owners achieve total mission success with lowest cost and risk.

Principles of Lean

B. Value: The goal of Lean Construction is to deliver as much value as possible to the project owner.

In Lean Construction "Value" is the value delivered to the project owner *as defined by the project owner*. Value is created by the producers within the Construction Production System.

The Value equation is very simple: Project Owners want exactly the facility or building they need as quickly as possible at the lowest price possible.⁴⁰ The Value equation is further explained in the next chapter.

C. The Value Stream: Value is delivered to the project owner through the operation of the Value Stream (or Supply Chain) which includes all the activities that need to be accomplished to create the product to be delivered. The Construction Production System is a Value Stream. The Value Stream is further explained in the next chapter.

Common Sense Project Execution

- D. Waste:** A primary goal of Lean Construction is to eliminate Waste. Waste is anything that reduces that value gained by the project owner.
- E. Flow:** The objective is to make the Value creation process “Flow” as efficiently as possible with as little waste as possible in order to deliver as much value a possible to the project owner.
- F. Pull:** In Lean Construction “Pull” is a process used by the producers to maximize the efficiency of decentralized leadership in order to deliver maximum value to the project owner.
- G. Visual Control:** Leaders must be able to “see” what is happening in real time in order to make decisions and act to steer the process. Transparent flow of relevant information to leaders is if utmost importance.
- H. Perfection:** The goal is perfection. As we get better and better at eliminating waste and increasing efficiency we approach perfection in delivering value to the project owner.

Current State of the Art

Today we are able to guarantee to significantly reduce costs and risks using the techniques and execution strategies described herein.

Lean Is Green

In adopting a lean construction system, not only will you improve your bottom line, but also you will automatically become a “green builder” because a primary focus of lean is the elimination of waste.

Many Great Contractors Support Lean Construction

By definition a “Lean Contractor” is a contractor that supports and works diligently toward the owner’s goal of achieving total mission success with lowest cost and risk.

A major part of the Owner-Focused Execution Strategy will be to find and use Contractors that embrace the principles of the strategy. But even when you find a contractor that voices support of “lean” you must continue to use the strategies contained in this paper. Saying you are “lean” and totally embracing the concept of total owner success are two different things. All organizations must monitor behavior.

We have a list of contractors that are eager to work using the strategies described.

It’s important to begin using a lean system as soon a possible

Toyota and other companies have demonstrated that those who are the first to begin using lean production get a head start in their industry and that it is very difficult for others to catch up. On the other hand it’s never too late to start improving your strategies and improving your bottom line.

Lean and Cybernetics

Practical Cybernetics is Core to Lean Production

The essential goal of practical cybernetics is to understand and affect the functions and processes of systems in order to make such systems more efficient and effective.

As we begin to think about lean production it is important to remember that Deming advocated “Appreciation for a System”, “Theory of Knowledge”, “Knowledge about Variation” and “Knowledge of Psychology” as the 4 pillars of his System of Profound Knowledge.²⁶ These subjects have been studied and improved by cyberneticists such as Gregory Bateson for many years and have significant influence on Lean production.

In cybernetics, system leaders are persons that steer the course of the system or organization toward the system’s goal using feedback from the environment and system as well as control processes and communication to get the crew to work together. Cybernetics is derived from the Greek word “kybernetes”: steersman, governor, pilot, navigator, etc.

Consider what a navigator-steersman must do to keep a boat on course when currents and wind are constantly changing how the boat moves...

The steersman must constantly make decisions and course corrections in order to efficiently get from point A to point B. To be most efficient the steersman must not only make corrections in real time, but s/he must anticipate how outside forces will try to push the boat off course. This can be compounded by placing rocks and islands in the way and then adding fog.

This is the world of construction project management.

Keeping a project on course is like navigating a fleet of ships along a rocky coast line on a foggy night with high winds and strong currents which seek to push the vessels off course. To be efficient and keep risks to a minimum you need a destination and you need to know your current location; you need a map; you need navigation systems including radar and GPS; you need to make steering corrections along the way; and you need to communicate with the fleet to coordinate steering corrections and course changes. To make matters more complex some of the captains of the vessels in your fleet may have other destinations in mind and will have a tendency to wander off course. So you need radar and communications gear and some ability to get them to come into course alignment.

See Footnote⁴¹ for more discussion on cybernetics.

See Footnote⁴² for more information on Deming

See Footnote⁴³ for more information on Gregory Bateson

12. Appendix 4: The Elements of a Project

The following outline will help with Planning and Execution as well as the development of an Owner-Focused Execution Strategy. Each project is different so the list for your project may be different. This outline includes a description of some of the problems we have observed as well as potential solutions.

Planning Phase:

1. **Initiation** – All projects begin with an idea or vision. A team must be formed and given initial mission and instructions.
 - a. **The Mission of this Element:**
 - i. Start the process – Conception/Germination/Ideas/Vision/Needs/Wants/Concept
 - ii. Understand the Values you want to gain.
 - iii. Generate good ideas.
 - iv. Test Ideas: Is the idea a good fit for the organization and its strategy. Look at the upside as well as the downside. Look at the site. Test to make sure that ideas and vision is feasible and viable. Check assumptions. Do a quick market study. Examine risks and problems. What does the ROI look like? Often this can be completed intuitively by highly experienced practitioners but it's wise to check assumptions.
 - v. Document the vision.
 - vi. Create a mission.
 - vii. Get an initial plan
 - viii. Get the initial team together.
 - b. **Input Required to start this element:**
 - i. Germination – Hey, we need something!
 - ii. Ideas, Vision
 - iii. Experience and lessons learned from past projects
 - c. **Primary Deliverables:**
 - i. Project Mission including statement of values
 - ii. Initial plan that describes a project that is viable for the owner's goals. This plan will be used in the next phase.
 - iii. Get the initiation team together that will take the project forward.
 - d. **Primary Problems that are seen during this stage:**
 - i. Initial description is incomplete and/or viability was not tested.
 - ii. Initiation team is not up for the task.
 - e. **Solution:** Test the ideas for viability. Never stop looking for better ideas. Choose a team with expertise and honesty. Feasibility and viability testing are necessary or the owner can end up wasting time and money. Make sure the initial planning produces an initial roadmap and destination that will result in project success. This phase blends into the planning and design phases, the deliverable from this phase may be edited and changed based on learning and feedback. Use a professional CM and modern technical systems. Make sure there is a project leader that is fully dedicated to the owner's goals (an owner-leader).

2. Initial Planning (including the Project Business Plan)

- a. **Mission of this Element:** Produce a plan that supports the owner's goals of total mission success at lowest possible cost and risk. his plan must communicate the intent to the team in order to promote the vision and eliminate issues that increase costs and cause other problems.
- b. **Input Required to start this element:** the deliverable from the initiation phase.
- c. **Primary Deliverable:** the following items are synergistic; they work together to create a total plan:
 - i. Procure and Assemble initial services team
 - ii. The overall vision/plan
 - iii. Needs analysis
 - iv. The Business Case(s)
 - v. Project Execution Strategy
 - vi. Project Organization Plan
 - vii. Define Business Environment
 - viii. Set the Ground Rules
 - ix. Contract Design
 - x. Program
 - xi. Initial Schedule
 - xii. Initial Budget
 - xiii. Feasibility and viability
 - xiv. Contingency Plans and Resources
 - xv. Expand the team as required
 - xvi. Contracts with service providers in next phase
- d. **Primary Problems that are seen during this stage:**
 - i. Incomplete planning leads to poor design, change orders and added cost.
 - ii. Owners fail to state that they want total mission success at lowest cost and risk.
 - iii. If the planning fails to support the owner's goal of total mission success with lowest cost and risk then the project will likely fail to achieve this goal.
- e. **Solution:**
 - i. Don't settle for sloppy plans.
 - ii. Use an Owner-Focused Execution Strategy that is designed to achieve total mission success with lowest possible cost and risk.
 - iii. Don't settle for a poor set of contract documents.
 - iv. Make sure there is a project leader that is fully dedicated to the owner's goals (an owner-leader)
 - v. Use a professional CM and modern technical systems.

3. Planning and Design –

(This element will be in compliance with the Project Execution Strategy so the following details will be somewhat different based on the actual strategy used.)

- a. **Mission of this Element:** Produce a complete plan and design that supports the owner's goals of total mission success and lowest possible cost and risk. The design and planning

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must communicate the intent to contractors to promote the project's completion and eliminate issues that increase costs and cause other problems.

- b. **Input Required to start this element:** the deliverable from the initial planning phase.
- c. **Primary Deliverable:** the following items are synergistic; they work together to create a total plan:
 - i. Iterative revision of the overall vision/plan
 - ii. In depth and detailed needs analysis
 - iii. Iterative revision of the Business Case(s)
 - iv. Iterative revision of the Project Execution Strategy (and organization, and business environment)
 - v. Program Details by Architect
 - vi. Design (and Redesign and Redesign) resulting in final design
 - vii. Manage the Design
 - viii. Iterative revision of the Schedule
 - ix. Iterative revision of the Budget
 - x. Iterative revision of the Feasibility and viability
 - xi. Expand the team as required
 - xii. Value Engineering
 - xiii. Contingency Plans and Resources
- d. **Primary Problems that are seen during this stage:**
 - i. If the design or any other planning item fails to support the owners goal of total mission success with lowest cost and risk then the project will fail to achieve this goal.
 - ii. Incomplete design leads to change orders and change orders cost too much.
 - iii. Design that fails to get honest input from the contractors will end up costing too much.
 - iv. Design is often late with respect to schedule.
- e. **Solution:**
 - i. Better Planning in accordance with the Project Execution Strategy.
 - ii. BIM – today BIM or Building Information Model provides a best solution for better planning of the facility.
 - iii. Manage the design.
 - iv. Bring in the contractors during the iterative design process.
 - v. Make sure there is a project leader that is fully dedicated to the owner's goals (an owner-leader)
 - vi. Use a professional CM and modern technical systems.

Execution Phase:

4. Procurement

(This will be in compliance with the Project Execution Strategy so the following details will be somewhat different based on the actual strategy used.)

- a. **Mission of this Element:** Procure resources to support and execute the project. The procedures should keep costs and risks to a minimum. This includes all strategies and procedures including solicitation, pricing and contracts.
- b. **Input Required to start this element:** the deliverable from the Planning and Design phase. This is often an iterative process wherein procurement occurs in phases and must interact with Design and Planning.
- c. **Primary Deliverable:**
 - i. Form the team
 - ii. From the owner's perspective the owner needs to contract with primary service providers that can provide overall management, planning, design, and execution of the project in a way that promotes the owners goals.
 - iii. From the General Contractor's perspective, the GC needs to procure all of the services of the sub-trades and material suppliers.
- d. **Primary Problems that are seen during this stage:**
 - i. Project delivery method fails to support owner's goals.
 - ii. Contracts fail to support owner's goals.
 - iii. Owner fails to get best pricing due to a number of factors.
 - iv. Procurement sits on a foundation of planning and design and problems in these areas can mean that procurement does not support total project success.
- e. **Solution:**
 - i. Use an Owner-Focused Execution Strategy that is consciously designed in every detail to support owner's goals. This Owner-Focused Execution Strategy will provide a procurement strategy that is designed to support goals.
 - ii. Update and use contracts to fit the Project Execution Strategy.
 - iii. Use an Owner-Focused Execution Strategy that is consciously designed in every detail to support owner's goals.
 - iv. Make sure there is a project leader that is fully dedicated to the owner's goals (an owner-leader).
 - v. Use a BIM solution that supports the Project Execution Strategy.
 - vi. Use other technologies that ensure best pricing.

5. Execution of the Construction Process [Do the Work/Manage the Work]

(This will be in compliance with the Project Execution Strategy so the following details will be somewhat different based on the actual strategy used.)

- a. **Input Required to start this element:** the deliverables from the design and planning phase and the deliverables from the procurement phase.
- b. **Primary Aim of this Element:**
 - i. To safely produce the deliverable described by the Design documents and or contracts in accordance with contracts (the contracts should fully support all elements of the Project Execution Strategy).
- c. **Primary Deliverable:**
 - i. Initiation and execution of the construction process resulting in total mission success at lowest cost and risk.
 - ii. Manage the Construction Process:
 1. Know the course → *Understand the Goals and how to maximize value*
 2. Impel action → *Get the team to move and act toward success*
 3. Acquire information → *Including progress & cost during project activities*
 4. Analyze the information → *How does it compare to plan?*
 5. Make Decisions → *Based on the information and analysis*
 6. Lead the Team → *Motivate and direct action based on the decisions*
 - iii. Deliver the completed project in accordance with the plan.
- d. **Primary Problems that are seen during this stage:**
 - i. Initial costs too high by 10 to 30%
 - ii. Lack of management information – leaders are unable to acquire information including progress & cost during project activities
 - iii. Cost Overruns, costs out of control
 - iv. Change Orders (contracts not properly prepared to protect owner)
 - v. Schedule Overruns
 - vi. Quality Issues
 - vii. Liability
- e. **Solution:**
 - i. Use a Construction Management System that supports the Project Execution Strategy.
 - ii. Make sure there is a project leader that is fully dedicated to the owner's goals (an owner-leader)
 - iii. Use BIM
 - iv. Use a great team that includes an Agency Construction Manager.
 - v. Success in managing the execution of the construction process requires that the manager successfully plan, initiate, and coordinate all project events and activities to achieve total mission success with lowest cost and risks. When things go wrong the project leader needs to know so that s/he can make decisions and act. Therefore great execution requires a clear picture of the operational condition of each activity while it is in process.
 - vi. Use execution technology that gathers, analyzes, and reports the operational condition of each activity while it is in process.

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- vii. Use funds control technology.
- viii. Integrate gathered information with schedule in real time. Report to team.
- ix. Use good contracts.

6. Deliver the completed facility

- a. **Input Required to start this element:** the deliverables from the Execution of the Construction Process phase.
- b. **Primary Aim of this Element:**
 - i. To deliver the facility described by the Design documents and or contracts in accordance with contracts.
- c. **Primary Deliverable:**
 - i. The completed facility
 - ii. All information needed to operate and maintain the facility.
 - iii. Tax Benefit Report
- d. **Primary Problems that are seen during this stage:**
 - i. Poor quality
 - ii. Poor information
 - iii. Late delivery
 - iv. Cost overruns, Change orders, and claims
 - v. Quality Issues
 - vi. Liability issues and law suits
- e. **Solution:**
 - i. Use a Project Execution Strategy that is designed to eliminate these problems.
 - ii. Use BIM for the information transfer.

7. Manage and Operate the completed facility

- a. **Input Required to start this element:** the deliverables from the Execution of the Construction Process phase.
- b. **Primary Aim of this Element:**
 - i. To manage, operate and maintain the facility.
- c. **Primary Deliverable:**
 - i. Operations
 - ii. Maintenance
 - iii. Upgrades
 - iv. Tax Benefits
 - v. Continual updating of information needed to operate and maintain the facility.
- d. **Primary Problems that are seen during this stage:**
 - i. Poor information leads to high costs for management, operations, and maintenance of the facility.
 - ii. Difficulty in upgrading the facility.
 - iii. Paying too much tax.
- e. **Solution:**
 - i. Use an Owner-Focused Execution Strategy that is designed to eliminate these problems.
 - ii. Use a system that provides the tax benefit study.
 - iii. Use BIM coupled with Computer Aided Facility Management

13. Appendix 5: Facts about the Business Environment

Following are some characteristics of the construction environment that need to be fully understood in order to create an effective strategy that supports the owner:

1. Most business people including contractors use strategy to improve their financial position. In construction, contractors do this at the expense of the owner. Owners need to use countermeasures to protect their assets.

- **Question 1:** What percentage of contractors have over-charged on a change order? Obviously the answer is close to 100%. It does not matter if the over-charge is intentional or unintentional the results are that owners pay too much. Contractors use the strategy of over-charging on change orders as a primary way of increasing profits. What most owner's fail to understand is just how sophisticated contractors have become at this simple ploy
- Contractors, like all businesses, are motivated to maximize profits and keep risks to a minimum. Contractors use well developed strategies during the course of each project to extract maximum revenue and profitability from the owner. **Every classic text on strategy highlights deception as core to good strategy.** Contractors are good strategists with respect to deception and owners that fail to use countermeasures will pay too much.
- Most owners do not understand the extent to which the construction business environment is a game; *a game wherein the prize is the owner's money*. Many owners fail to employ an effective strategy of effective countermeasures and therefore pay too much. Owners need to protect their core assets. This is called "security" in every other business. Every rational business uses security systems and information management systems in order to keep value from walking out the back door.
- **One ploy used by contractors** is to convince owners that they do not need an expert owner-focused leader or owner-focused execution strategy because they, as general contractors provide this expertise, and owners can fully trust them. It is surprising how effective this simple strategy has proven to be.
- Another ploy: contractors have convinced project owners that they are generally more honest than normal population (i.e. they never fudge on tax returns or manufacture back up for a change order).
- **Question 2:** What countermeasures do you employ to protect your financial assets?
- **Question 3:** Why would you sign a contract that specifies a methodology that is not in your best interest? It's your money, it's your project, and you can and should specify the methodology.

2. Dishonesty is a normal human characteristic that all businesses must consider. Studies show that over 50% of people will cheat to gain one extra dollar.

- I would never say that all contractors are dishonest. In fact many contractors are far more honest than the average in other businesses. Here is what I know: While there are honest people and dishonest people it is impossible to be 100% accurate at distinguishing between the two. Dishonest people often appear very honest and even basically honest people sometimes cheat. When it comes to effectively managing a construction project you need to employ strategies that protect you from potential dishonesty. When you do this, honest contractors understand and work with you while dishonest contractors make loud earnest protests! (Oh, my ringing ears!)

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- Dan Ariely, author of “*How Honest People Cheat*”, the Alfred P. Sloan Professor of Behavioral Economics at MIT Sloan School of Management says: “There are two basic concepts of cheating”:
 1. **Some “people are fundamentally dishonest** and actively look for opportunities to cheat. They make cost benefit calculations [potential gain compared to risk of getting caught and potential downside or punishment]. On the basis of the cost benefit calculation, the would-be thief decides whether to rob the place [or present false documents to over-charge in a change-order request].”
 2. **Other “people are basically honest.** They are not out there scoping for chances to cheat, but circumstances tempt them. They ‘borrow’ a pen, take an extra splash of soda from the soft drink dispenser, exaggerate the value of a television on a property loss statement [insurance fraud].”⁴⁴
- A recent study, performed by Dan Ariely, at MIT, Princeton, Yale, the Harvard Business School (where the students take ethics classes), and UCLA showed that over 50% of people cheated in order to be paid one extra dollar. The study came to several interesting conclusions:

1. When tempted most people will cheat.
2. Cheating doubled when the experiment was changed so the test subjects were not paid directly but were paid indirectly [as is the case with a change order].

The study’s conclusion: “Nonmonetary exchanges [such as the paperwork used with change order requests] allow people greater latitude to cheat – leading to crimes that go well beyond pilfered pens to back dated stock options, and falsified financial reports... Such latitude is the force behind the Enrons of the world.”⁴⁵

- **What about construction?** With respect to dishonesty a change order request is the type of transaction that can be falsified that leads to double rates of dishonesty. It is naïve to think anything else.
- The retail industry reports that their greatest amount of theft occurs from their own employees and that this number is on the rise.⁴⁶ How would you compare the loyalty of a direct employee to that of the independent contractors (and their employees) used in construction that are directed and rewarded to maximize gain at the expense of the owner?
- **Bloomberg** recently reported a study of graduate school students: “56 percent of MBA students acknowledged cheating, compared with 54 percent in engineering, 48 percent in education and 45 percent in law school.”⁴⁷ 56% of our future business leaders cheat? *Does this mean that business students cheat more than law students or are they just more apt to admit it?*
- “Said Paul Danos, dean of Dartmouth College’s Tuck School of Business: “Of course, there are businesses that cheat and people who cheat...”⁴⁸
- **BusinessWeek** in 2007 reported that 34 MBA students at Duke University were disciplined for cheating after these students had agreed to an honor code and had been taught ethics. “From the moment they set foot on campus, graduate business-school students are inundated with handbooks on business ethics, classes on the subject, and at many campuses, copies of a school honor code. At Duke University’s Fuqua School of Business the preamble of the honor code is displayed prominently in each classroom and students must read and sign a copy of it before they even apply to the school.” The report says that cheating is on the rise in spite of ethics classes, honor codes, and stiff penalties.⁴⁹
- **Good cheaters are able to convince others that they are basically honest.**

3. All business organizations need leadership. In construction owners need leadership that is effectively focused on Owner's Success.

- Owners typically abdicate leadership to contractors and CMs who are more interested in their own success than the success of the owner. These conflicted leaders use their position to increase profitability for their companies at the expense of the owner. (and they feel completely justified in this because it is business as normal)
- In other cases owners give leadership positions to people are loyal but not qualified.
- Using a CM at Risk does not solve this problem! See **Error! Not a valid bookmark self-reference.**

4. Managing a construction/development team requires expertise:

- Patrick Lencioni, author of “The Five Dysfunctions of a Team” states the problem succinctly: **“Teams are dysfunctional** because they are made up of human beings with varied interests and frailties. When you put them together and leave them to their own devices, even the most well-intentioned people will usually deviate toward dysfunctional, unproductive behavior. And because most leaders and managers are not schooled in the art of building teams, small problems are left untreated and spiral further and further into ugliness... Team members put their individual needs before the collective goals of the team.”⁵⁰
- Patrick is talking about teams in a normal business setting.
- The problems in construction are compounded because the team is made up of a disbursed set of independent contractors and information is not well managed. The construction business environment is complex and not transparent. Important transactions are hidden. The status of important tasks are unknown to project leaders.

5. As with all business one must consider the relationships. The development environment has Inherently Adversarial Relationships

- Owners, contractors, sub-contractor and the designers all compete for money and have disputes over responsibilities and potential liabilities. This is a part of the field of play that must be understood and you must employ strategies and countermeasures to level the playing field.

6. The development environment is full of Conflicts-of-Interest:

- Each party that works on a project has an aim of gaining as much value as possible from the ongoing set of transactions. In fact most parties seek to create new profitable transactions called change-orders (even while verbally saying that they hate change-orders). Each party seeks to limit liability.
- Project owner's engage in a construction project with the aim of gaining maximum value from the project. For the owner, the aim of construction management is to achieve total mission success with lowest cost and risk.
- But each of the dozens of contractors on the project has an oppositional aim, which is to gain maximum value from the project *for themselves*. From the point of view of a contractor or CM at Risk the aim of construction management is to provide a means of engaging in the project with lowest risk while extracting as much added revenue and profit from the owner as humanly possible.
- Each of these contractors use well developed strategies perfected over hundreds of past projects to achieve their primary aim of gaining more profit from the project by forcing the owner to pay more. Contractors educate themselves on how to gain more revenue. And yes they are always balancing

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today's negotiation with future potential negotiations. Potential of future business does not ensure honesty.

- General contractors and CM's at Risk have two primary motivations that always take precedence over the owner's goals: The profit motive and the need to avoid problems and liability.
 1. As seen above, you cannot rely on ethical behavior to counter these motivations.
 2. These parties behave in ways that supports their needs (not the owner's needs).
 3. You cannot rely on information received from a contractor because all information received from a contractor is biased in support of their primary motivations.
 4. The remedy is to use effective countermeasures within an owner-focused execution strategy.
- Obviously typical and traditional management systems are not able to make the contractors behave in support of the project owner's goals. Rather such systems support the contractor's goals.

7. Asymmetry of Information. All business people need accurate timely information. In real estate development owners often lack needed information while the contractors hoard it.

- During a project, the contractor has most of the information. But even the contractors don't have as much information as they should. (This paper will describe technical information systems that gather and report needed information).
- Why? Each construction project is organized into a unique multilayered hierarchy of independent contractors that is several layers deep. This organization is temporary, limits communications and transparency, prevents project leaders from directly observing most of what is important on a project, and allows contractors to safely alter the information presented up line so that the presented information only supports the contractor's interests: The information presented has three purposes:
 1. Support the contractor's profit motive,
 2. Increase change orders thus increasing contractor's revenue,
 3. Avoidance of taking responsibility for problems and limitation of liability.
- Using the typical system all movement of communications and money is inefficient because it travels through the hierarchy using a bucket brigade and there is high rate of mistakes and mischief.
- The information that owners actually see and use is problematic:
 1. Contractors play a masterful strategy game when it comes to information:
 - A.** Contractors only present information that is to the contractor's advantage.
 - B.** Contractors hide other information.
 - C.** Alternately Contractors deluge owners with too much information that is structured to hide the truth. Later they can point out that, in fact, they had presented the information.
 - D.** Contractors manufacture and alter information to support the story they want to tell.
 - E.** Remember, your general contractor may be totally honest, but this GC is subject to the same informational disadvantage from all of the sub-contractors.
- Why is lack of needed information a problem? Without relevant timely information:
 1. Owners cannot make good decisions or win negotiations.
 2. Owners cannot determine what is real and what is not real.
 3. Owners typically cannot analyze the information (due to lack of tools, expertise, or time).
 4. Owners end up paying too much and bearing too much risk.

8. In order to achieve your goals you must state those goals. On most development projects the Owner's Goals are typically not correctly stated (and therefore not well supported)

- The way project goals are typically stated and enforced fails to fully support the owner's full interests.
- Owners engage in projects to gain maximum value from the project for themselves or their constituents. The owner's aim is to achieve total mission success with lowest cost and risk. But the contract documents typically do not state this type of goal in a way that enforces behavior so the project team works toward other goals.
- On most projects the owner's goal is typically stated as merely achieving completion on time and on budget, which is a source of endless problems because the budgets are set too high in the first place. You should have a budget and it should be accurate, but it is important and prudent that you set up a strategy that is designed to achieve project objectives at the lowest possible cost. The project team must understand this and be made to support it through incentives.

9. Fuzzy Owner Plans

- A project takes time and the plans are incomplete during much of the process. Even the best plans have errors. This is normal and should be expected. But owners typically sign a contract that allows this normal part of real life to become a major cause of costly problems when contractors use this to gain revenue from change orders. Contractors are merely playing the game that the owner agreed to. But owner's can avoid this by setting up the game's methodologies to mitigate these problems.

10. Asymmetry of Negotiating Power

- Construction involves a great deal of negotiation and contractors are master negotiators. Contractors perform negotiations on many projects every year and they develop strategies based on hundreds of negotiations. They even go to school to learn better skills. They play "dumb like a fox" as well as the best actors. They pretend to lose even when they win giving the owner an emotional win even as the owner pays too much. See Appendix 9: The Fundamental Theorem of Construction Negotiation.

11. Contract Documents Fail to Support the Owner's Interests

- Most contracts that are signed by project owners are written to create a situation that contractors can take advantage of. The owner is the party that is initiating the project, paying the money, and will own the final product; therefore the owner has the power to dictate terms. When an owner signs a traditional contract, the owner has placed the contractor into a monopoly position during the project and the contractor will use this monopoly in a very calculated way to increase revenue through change orders.⁵¹ While most attorneys do not understand these issues, there are attorneys that do.

12. In life, business and especially construction, Chaos and Variance is normal. Effective strategy can support and protect the owner, but in most cases owners end up paying expensive change orders by default.

- Variance between plans and reality is normal. The world is chaotic and operational conditions and events change every moment quickly making plans and schedules obsolete. Future events are impossible to predict. Mistakes happen. It rains. Deliveries are late. People get sick. Communication is not perfect. People cover up their mistakes.

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- This causes several problems. One source of problems is that contracts are written and processes are supported wherein normal variances from plan becomes an opportunity for contractors to increase profits through change orders. (This problem is easily solved.)
- In order to manage in the real world you need to know when something goes wrong so that you can make decisions and take corrective action. You need effective systems that acquire and report the needed information.
- A strategy must be employed *and supported by contracts* that ensures that variance and change is properly managed to not harm the owner.

Game the System: Means working within a system for purposes outside the system's intended purposes. On a project initiated by a project owner the intended purpose of the system is to achieve total mission success at lowest cost and risk. But, in the absence of a collaborative execution strategy, contractors do everything in their power to work toward gaining as much money as possible from the owner and transferring as much liability for risk to the owner as they can. It's called *gaming the system* because the contractors act as if they are in full support of the owner when they are not. Academy awards should be presented to every contractor that has survived for 3 years. Contractors play "dumb like a fox" with the best of them. It's a poker game and the contractors are master players.

Again, your general contractor may be totally honest, but this GC is subject to the same exposure to "gaming" from all of the sub-contractors.

The best way to prevent this is to change the game.

Protect the Core

Owners need to understand that contractors consider the business aspects of a project to be like playing a game of poker. Contractors are simply doing their best to win as much money as possible from the owner. Just like other master poker players, contractors use strategies; Deception as a core piece of their strategy. To some contractors it's a friendly game and they will be your buddy during the game. Others will fight tooth and nail. The better players seem like your best friend.

To protect their core financial assets, owners must use strategic countermeasures and systems that support the owner. If owners leave it up to contractors the contractors will use their own systems and strategies that are designed to support the contractors' need for additional profit and avoidance of liability (while they complete the project). This is human nature and nothing will change it. But owners have a choice to employ strategies that help them gain value even while working with contractors.

14. Appendix 6: The Causes of High Costs

*"A system must be managed. It will not manage itself. Left to themselves in the Western world, components become selfish and competitive. We can not afford this destructive effect..."*⁵²

~ William Edwards Deming

Restating Deming for real estate development: A construction production system must be managed. It will not manage itself. As a project owner, if you fail to manage the components (*such as independent contractors and employees*) they will become selfish (*taking or wasting your money*) and competitive (*they will not act like a team that supports the project goals*). We cannot afford this destructive effect... (*because it results in costs that are 10% to 30% too high, late finishes, poor quality, and increased costs from change orders.*)

Nearly every source of information about projects is saying that current management practices are inefficient, which causes owners to pay 10% to 30% too much for their projects. Projects are failing to achieve mission success at low cost and risk. The failures are substantial and cause harm to project owners.

The cause of high costs is the way the game is played and the solution is to improve the game and make sure we have a level playing field.

It is the system of project management that fails. It is the system, *that project owners and leaders consciously and unconsciously support*, that is the problem. The good news is that we do not need to make big changes to create the desired results. The system fails in several ways.

The causes are simple to state:

1. Strategy (Owners fail to use a strategy that creates success)

Strategy is the means used to accomplish goals; it is both the plan, in the form of a description of the course to be taken, and it is the actual actions taken based on our decisions as we steer the course toward the goal.⁵³

There is the way we *plan* to accomplish the goal, there are *actions* performed during the process, and afterward we can look back and see the *actual strategy employed* and how successful it was.

The fact that projects cost 10% to 30% too much and have a high rate of failure is evidence that the strategy used for most projects is poorly realized as a plan or in actual execution. We can look back with 20/20 hindsight at thousands of projects and see that the results of almost every project could have been improved with better strategy. The job now is to develop and use a better strategy for next projects.

The fact that a project returns a large profit is not evidence that the project's *execution strategy* was particularly excellent. In many cases even though the developer paid too much for construction, the final market value was high enough to turn a profit. It's a great outcome but what if the market had a downturn? Perhaps you made 35% on your last project? It could have been 45% with a better execution strategy. Think about the fact that developers can make high profits with great success for many years in a row and then when the market hits a bump they get into trouble. It is important to keep improving strategies. Many project owners believe they have good execution strategy but in fact their project strategy is not as good as it could be. How many times have you as a developer been totally satisfied with execution?

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In many cases project owners rely on the contractors to produce and the project execution strategy. The record shows that owners pay too much when they abdicate this power to contractors. This is like having the fox design the security for the henhouse, which can lead to poor results for the hens while the fox gets fat. Suppose you were to set up a casino and let the gamblers run it for you? Do you think you would maximize your return or do you think the gamblers would rake in the most?

Note to contractors: *I'm talking about your competitors, not you.*

If you are a contractor, setting up each project to maximize your revenue is good strategy. And once you are on a project, negotiating to gain large profits from change orders is great strategy, after all you have a monopoly and the project owner is at a disadvantage!

New technology always creates the need for new strategy. It would be ridiculous for the military to not take strategic advantage of radar, satellites, and information technology. Likewise it's ridiculous and costly for developers to not use available modern technologies.

Countermeasures:

Use an Owner-Focused Execution Strategy.

An Owner-Focused Execution Strategy incorporates all planning and execution into a cohesive plan that is designed to achieve total mission success at lowest cost and risk. Effective strategies are now available to project owners because the industry knows more about effective strategy, we have made great headway with lean construction, and we now have technologies that leverage and enable effective strategies (even stodgy generals are able to change military strategy when presented with technological innovation). Details on how to form an Owner-Focused Execution Strategy are contained in this paper.

Clearly understand and state your Goals.

Too often projects are started and completed using an incomplete statement of the owner's goals. Owners engage in projects to gain maximum value from the project *but this is rarely stated* in a way that promotes collaborative team behavior toward this core goal. The keystone of the overarching project execution strategy is a statement of goals. This statement must be included in the project documents, contracts and plans in a way that produces collaborative team behavior that supports these goals.

Tame the Fox.

The right strategy motivates the contractors to help owners achieve their goals. The right strategy will improve the profitability of contractors while improving the value gained by owners.

2. Leadership Issues (Owners don't use an Owner-Focused Leader)

Every team needs leadership. In most cases projects do not have leadership that is effective at achieving the owner's goals. This occurs for several reasons:

- A. The owner abdicates leadership to those who have conflicting profit motives and agendas. These leaders lead the team in a way that maximizes their profitability.
- B. The owner fails to use a leader that can and will promote the owner's goals.

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- C. Leaders lack the operational information they need make decisions and steer the process toward success. Even when a leader is fully supportive of the owner that leader must have good intelligence.
- D. Sometimes owners choose leaders that are trustworthy but lack needed domain expertise.

The Countermeasure is to use Owner-Focused Leadership:

Projects need leadership that is dedicated to achieving the owner's goal of total mission success at lowest cost. We call this "Owner-Focused Leadership" to distinguish it from other types of leadership provided by those that have conflicts of interest or are not totally dedicated to the owner's interests.

3. Information (Owner's Lack Needed Information)

To properly manage and coordinate a complex set of dependent activities a manager must know the operational condition of each activity while it is in process. When there is variance from plan or things go wrong, the project leader needs to know so that s/he can make decisions and act.

Because the work team is geographically disbursed, project leaders are typically in the dark about many of the operational conditions of key elements of the project and this leads to increased costs and risks. Factual information is not gathered, analyzed and reported to the managers and leaders that would support the goals of the owner. Small problems become big problems.

Contractors, like all businesses, work to increase revenue and reduce their risks. When projects are set up in the typical manner contractors would be foolish to give owners 100% accurate timely information because if they did they couldn't maximize their increase in revenue with change orders and they would be held responsible for their mistakes. In addition, (and for the same reasons) few contractors use available systems that can gather, analyze and report detailed information from the entire hierarchy. Contractors can profit from confusion.

Owners are at a disadvantage because they lack important information which cripples their ability to oversee the project, they are not alerted to costly problems, and they cannot negotiate project issues such as change orders and claims from a position of knowledge.

Countermeasure: Make sure the Owner-Focused Leader gets the needed Information

This typically means that projects need to use technology systems that gather, analyze, organize and report factual information to project owners, owner-focused leaders, as well as other project leaders. There are affordable systems that do this (even as they simultaneously reduce project costs). Using such systems the information is presented in an easy to read dashboard so that leaders are alerted to issues and their root causes. Advantages include making better decisions on time, negotiating from a position of full knowledge, upfront reduction of costs, improved facilities management, and even cost savings on future taxes. Information transparency can save money while lack of information increases costs. What you don't know *will* hurt you.

4. Integration (Failure to create, manage, and lead the project's entire Construction Production System as an integrated organization)

Traditionally, the forces and entities brought together to complete a project are segregated in their purposes and actions. The typical organization fails to act as a unified organization. Instead the components compete and many try their hardest to increase owner's costs.

Countermeasure: Employ Leadership, Execution Strategy, and Information Transparency

Common Sense Project Execution

What we need is execution that delivers total mission success. This kind of execution is only accomplished through Leadership overseeing Executable Strategy performed by a disbursed but Collaborative Team that acts as a unified integrated unit. This unified integration is accomplished by applying 4 strategic principles: Owner-Focused Leadership, Owner-Focused Execution Strategy, Information Transparency, and Financial Streamlining that creates an environment that allows the leaders to *fully see* what is happening so they can steer the process. Just as a symphony's conductor needs to be able to see and hear the musicians as they play in real time in order to organize the professional musicians to properly execute the composer's plan, an owner-focused leader needs to see operational intelligence about all project activities in real time to execute the Project Execution Strategy and achieve total mission success.

5. Money (Owners and financiers fail to have good control of their money)

Traditionally, owners and financiers allow the contractors to control funds that do not belong to them with very little oversight. This results in innumerable issues that all combine to disadvantage the owner and financiers. Financial control is an important part of a sound business strategy.

Countermeasure: Control the money! (Failure is costly and increases risks)

Managers and leaders are crippled without good information and strategy.

- Poor strategies lead to poor results just as a poor roadmap with bad directions leads to getting lost, arriving late, and perhaps being robbed (if you head into the wrong alley).
- Leaders cannot consistently make good decisions when they only have poor information.
- Leaders of construction firms that have goals that are oppositional to the owner's goals will not consistently make decisions that are in the owner's best interest.
- These causes combine to harm project results. (Negative synergy into downward spiral).
- The solutions work synergistically to make things better.

Until these issues are corrected project owners will continue to pay too much.

Using traditional methods Project Owners experience several problems:

1. **High Costs** – Project owners typically pay 10% to 30% too much, even with competitive bids
2. **High Risks** – which lead to project failures – many projects fail to deliver the results owners want
3. **Change Orders are out of control** – which increases costs even more!

The problems have causes and the causes have solutions. Causes Include:

Causes	→	Results
1	The systems and methods used by practitioners of construction development are inefficient and wasteful.	<ul style="list-style-type: none"> Costs are 10% to 30% too high (proof is provided) Owners pay unnecessary costs that are built into bids Risks are too high resulting in many failures Schedules are out of control – this impacts nearly 100% of projects with 40% going over schedule
2	The independent contractors that perform the designing and making of construction projects are focused on their own goals and profits and are competitive with the owner and each other	Some contractors work to take advantage of the typical inefficient and wasteful system in order to increase their profits at the expense of the owner. Owners often find themselves in a poker game wherein the contractors seek to gain more of the owner’s money.
3	Most owners fail to use an effective Execution Strategy for their projects that would produce mission success at lowest cost and risk.	This results in execution that does not fully support the owner’s goals and owners pay too much.
4	Owners Fail to use Owner-Focused Leadership	<u>Results are determined by leadership.</u> Abdicating leadership to those who have conflicting motives results in execution that does not support the owner’s goals.
5	Lack of Good Operational Information <ul style="list-style-type: none"> Contractors and owners do not have the accurate timely information they need for effective management and leadership 	Without a rich timely feed of information that provides transparent operational intelligence, contractors and owners cannot be fully effective. This results in mistakes, high costs, risks, and failures.
6	Asymmetry of Information: <ul style="list-style-type: none"> Contractors control most of the information <i>that is available</i> Owner’s lack needed factual information 	Information is power. When owners do not acquire needed information they give away their power. This results in execution that does not fully support the owner’s goals and costs become too high. Without needed information owners are at significant disadvantage in all negotiations.

15. Appendix 7: Types of CM (READ THIS)

Many owners are confused by the term Construction Manager or CM. There are two types of construction management that should to be examined.

Agency CM and CM at Risk.

1. Agency CM: (ACM)

Wikipedia provided the following definition:

"Agency" CM is a fee-based service in which the construction manager is responsible exclusively to the owner and acts in the owner's interests at every stage of the project. The construction manager offers advice, uncolored by any conflicting interest, on matters such as:

- Optimum use of available funds;
- Control of the scope of the work;
- Project scheduling;
- Optimum use of design and construction firms' skills and talents;
- Avoidance of delays, changes and disputes;
- Enhancing project design and construction quality;
- Optimum flexibility in contracting and procurement.

Comprehensive management of every stage of the project, beginning with the original concept and project definition, yields the greatest possible benefit to owners from Construction Management.

2. CM at Risk

CM at Risk is a project delivery method that is preformed by a General Contractor and should never be confused with Agency CM.

The essence of the CM at Risk method is that during the design phase (or pre-construction phase) of the project the General Contractor acts as an advisor or consultant to the owner, ostensibly acting like a construction manager.

Ostensible: outwardly appearing as such but not necessarily so; professed as being something it is not; *pretended*.

Then during the construction phase the CM at Risk becomes a general contractor. While a CM at Risk provides guidance and advice during the preconstruction phase, it cannot be said that this advice is free of conflict of interest due to the profit motive of the CM at Risk when it becomes a general contractor.

CM at Risk is a concept that was developed by General Contractors to compete against the practice of Agency CM. CM at Risk was essentially developed as *a sales and marketing tool* to eliminate those pesky agency CMs that were always asking annoying questions and keeping GCs from gouging.

Construction Management: A purpose driven definition for project owners.

The purpose of Construction Management is to improve all aspects of project results in support of the project owner's best interests and objectives. This includes:

1. To improve all aspects of project execution from initial concepts through completion and use.
2. To plan the execution of a project (i.e. to create a Project Execution Strategy).
3. To drive execution to achieve project objectives as efficiently as possible and in accordance with the plan; making adjustments as necessary.
4. To manage the design process to make sure the design and all plans fit the owner's objectives.
5. To provide compliance monitoring and reporting.
6. To reduce costs to lowest possible cost.
7. To reduce risks and to provide and implement strategies that optimize risk mitigation.
8. To create and monitor the schedule – get the project completed on time.
9. To protect and improve the project owner's assets.

There are dozens of forces that seek to hinder an owner's ability to achieve objectives.

Construction Management is the force that brings these oppositional elements into control.

If your projects are not being managed in this way you are not getting the return on investment that you deserve and you are being exposed to unnecessary risks.

The Rolls of a Construction Manager:

Management: "the art of getting things done through people" ~Mary Parker Follett (1868–1933)⁵⁴

Construction Management is an integrated and managed approach to planning, design, and construction.

Expert –

A construction manger is an expert in the profession of construction management. It is important that your CM is an expert in the following:

1. Construction itself
2. Project management
3. Construction management
4. Design management
5. Procurement
6. Contracts
7. Technology
8. Permitting
9. Etc.

Planner – (create the Project Execution Strategy)

A CM must be a planner. He or she must be able to create an optimum and detailed plan that is designed to achieve the owner's objectives.

Administrator –

A CM must be able to gather, organize and report all of the important information.

Leader and Manager – Promoting the Upside –

A construction manager must be a leader. The CM must be able to make good decisions and then motivate and persuade others to perform. A CM must be able to direct, control, and coordinate the team (including contractors, suppliers, consultants, designers and even the owner) for the purpose of accomplishing the owner's objectives.

Risk Manager – Protecting against the Downside –

A CM must be a Risk Manager. Risks are potential negative impacts (hazard) that have a probability of arising from present or future processes or events. Risks are analyzed based on probability of occurrence and probability and variability of the negative impact. Construction projects are full of risks that negatively impact the project owner. Risk Management is a process that begins before the project starts and continues until the last claim or hazard is resolved. Risk Management integrates recognition of risk, assessment of risk, developing strategies to manage risk, and executing those strategies.

Some risks have a 100% probability of occurring. Some of these risks have been ignored in the past because we did not have the tools to manage these types of risk.

In ideal Risk Management a process is employed that recognizes all risks and prioritizes the risks so that one can first handle the risks with the greatest potential loss and the highest probability of occurrence and lower hazardous risks are handled in descending order.

1. Understand Context
2. Identification of Risks (identify risk of loss from various sources)
3. Analysis of Risks
4. Prioritization of Risks
5. Create Risk Mitigation strategies
6. Implement
7. Monitor

Information Management:

Construction Management starts with information and is an information management process.

The quality of every decision is dependent on the accuracy, completeness and timeliness of the information used. Leadership is dependent on the quality of the decisions. You can only manage and lead based on information.

The entity that manages and controls the information will control every negotiation.

It is important for a project owner to use a Project Execution Strategy that engages the power of information gathering and management to benefit the owner. There are web-Based project organization tools are able to gather and report valuable, factual, and unbiased information to project leaders.

16. Appendix 8: Notes on Technology for Construction

*The ability to make timely decisions
is limited or enhanced by
the timely acquisition of relevant information.*

As discussed in the body of the paper we believe and argue that use of technology is required in order to achieve total mission success at lowest cost and risk. Why? Just four reasons:

1. Construction is an information intensive process. Technology is simply better for managing information.
2. Technology is needed to communicate information as needed to lead a project at its most efficient rate. Gaps in information lead to gaps in production, which is waste.
3. The industry is already using technology and would become less efficient if the technology were to disappear.
4. There are technologies that directly and mechanically reduce project costs because they directly improve the financial environment of projects for all parties and make the financial processes more efficient. Such technologies are guaranteed to directly reduce the costs paid by the owner. The cost reduction is mechanical and systematic. It is impossible to achieve total mission success at lowest cost and risk unless you take advantage of such technologies.

No system can claim to be lean that does not take advantage of opportunities to eliminate waste.

Most advancement in human efficiency has come about through technology. This is particularly true of construction and information technologies.

If you can add technologies that enable increased efficiency costs will decrease.

The goal is to use the optimal technologies; i.e. the ones that will help to achieve the goals without adding cost or needless work and that the contractors will use. Use of technology is an integral part of the Project Execution Strategies we promote.

If project owners want to achieve their aims they need to make conscious decisions about using specific technologies that will support their goals and leverage their leadership. In 9 out of 10 cases abdicating this decision will result in loss.

There are several technologies that enhance project management, execution, and organization of a project. Many of these technologies pay for themselves and improve the owner's bottom line. There is at least one technology that has a record of reducing project costs by a significant percentage (5% to 15%) while simultaneously improving management, execution, and organization.

Why do we need technology?

To properly manage and coordinate a complex set of activities a manager must know the operational condition of each activity while it is in process. When things change or go wrong the project leader needs to know so that s/he can make decisions and act.

Good information is also necessary when negotiating.

There are forces and structures in construction that make the typical “Plan – Do – Check – Act” cycle (the Shewart Cycle) difficult.

1. Construction projects do not occur within the typical manufacturing environment.
2. Most tasks, events and activities occur outside the project leader’s ability to directly observe or control.
3. Field managers, foremen, and superintendents (the individuals that are in charge of tradesmen that are performing tasks) are somewhat isolated from the total production system (this is not a factory line and they are not employees of the owner). They are charged with first maximizing value for their own company and second with producing a product for others (this concept is absolutely core to understanding the construction process when using independent contractors).
4. The greedy side of human nature is highly present in all business including construction. As we have seen in too many business cases greed takes precedence over ethics. This is a force of human nature that must be understood and systems must be employed to counter this force. The people doing most of the work are not employees of the owner; they are independent contractors with their own profit motive. They do not have a long career with the owner. Some or most of them only have a few days to satisfy their primary goal of gaining additional profits from the owner.
5. **Project Structure.** The organizations assembled to complete projects are organized into a multi-layered hierarchical structure of independent contractors. In most cases, 95% to 100% of the work is completed by independent contractors with the General Contractor performing less that 5% of the work and subcontractors performing the remainder. Each sub can have multiple layers of subs below themselves. (So even if you fully trust the G.C. do you know and love every sub?)
6. **Communication System.** Project organizations have typically used an old fashioned bucket brigade system to move information. This is slow, inefficient, and results in poor information reaching those project leaders that are most interested in achieving the owner's objectives. The bucket brigade system is a source of harm to project owners.
7. **Differing Objectives.** Each independent contractor has agendas and objectives that differ from the owner's objectives. The most obvious issue is that every independent contractor desires to extract maximum profits from the project while the owner desires to pay the lowest possible cost.
8. **Transitory Nature of the Project and its Relationships.** The contractors and subcontractors need to make their money on this project. There is no guarantee of continued relationship. On the next project they know that if they are not the low bidder that they will be history. (Where this is not true, i.e. generals ands subs form longer working relationships then there are other problems).

There are issues in the typical construction environment that prevent obtaining the information that would support the owner's interests:

1. **Poor Information Management at the Contractor level.** Each independent contractor has problems within their own company with the organization and communication of information. Even if they had a desire to send the information (and often they don't) they would have trouble organizing and sending it. Their "in-baskets" are out of control. (One expert that has worked with over 100 Fortune 500 companies and thousands of MBA executives says that at least 90% of these executives have out-of-control in baskets. These MBA executives are highly organized compared to the typical subcontractor.)
2. **Contractors seek to hide or change Information.** Each of the dozens of independent contractors is internally motivated to hide information or to alter information that they do send. Their communication strategies are based on objectives such as: *prepare the owner for the next big change order or to make sure we are not exposed to liability*. The info that does get to the leader's in-basket is not designed to help the leader make decisions to improve the owner's results – just the opposite.
3. **Poor Information Management for the Project Organization.** Most project organizations don't use a good system to gather, analyze, store, and report the information needed to support the project owner's interests. Even if every contractor and vender sent in every bit of information, what would a project leader do with a 16 inch stack of disorganized information arriving in the in-basket each day? As a matter of fact this tactic is often used by contractors to obscure valuable information. Bottom line is that without good technology most project information is disorganized unstructured data that is not useful to a leader.
4. **The Bucket Brigade** system used to move information across the project's hierarchical organization is slow and inefficient. Info is lost, delayed, and altered.
5. **Technology systems used by GCs are designed to support the GC's interests.** This is one of the most important items a project owner can learn in this paper.
6. For all the reasons stated, the GC has problems getting useful information from their sub-contractors.

So... The owner, owner's agent, or owner-leader is not prompted or alerted in time (if at all) because the information is late or never arrives. The information needed for decision making is hidden, inaccurate, or altered. This results in major waste and paying for large change orders.

What is the Solution?

1. **Use modern technology systems that solve these core problems by directly reducing project costs, gathering and reporting intelligence, and improving management, execution, and organization. With such systems the owner-leader can do a better job, waste is eliminated, and the system pays for itself on the first project.**
2. **Use all of the solutions contained in the paper.**

Choosing Technologies:

Choosing the technologies that will be used on a project is an important decision because while some technologies support the owner's goals of low cost and risk many others do not. Some technologies cost too much. Many technologies don't perform as advertised. Other technologies are specifically designed for contractors use as they negotiate change orders. Project owners should avoid totally relying on use of the technologies and information provided by a general contractor.

A project owner can gain the full benefits of technology without learning how to use it by hiring an Agency Construction Manager (ACM) that understands and operates the technology. The ACM will deliver full information reports to the owner as requested.

If a project owner does not have specific technology expertise in-house s/he should hire that expertise.

Cortexion has specific expertise in helping owners to make good choices with respect to technology. We have evaluated dozens of technologies. We have created and coded our own technologies. The full evaluation reports take up hundreds of pages.

Please call James Conlow of Cortexion to discuss this. 510-601-0800

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17. Appendix 9: The Fundamental Theorem of Construction Negotiation

The purpose of this appendix is not to provide instructions for negotiation but merely to make a couple of points about negotiation. The Fundamental Theorem of Construction Negotiation is stated at the end of this appendix. I wrote The Fundamental Theorem of Construction Negotiation to be somewhat tongue in cheek.

Why do we negotiate during construction projects?

It's primarily because the parties are each working to improve the value they will gain.

From a project owner's point of view *the aim* of engaging in a construction project is to gain maximum value from the project.

But each of the dozens of contractors on the project have an oppositional aim which is to gain maximum value from the project *for themselves*. (I don't care how you contract or how much trust you have in the contractor, that contractor will always negotiate for highest and best value gain for themselves. This is true of your children and your spouse, why wouldn't be true for your contractor?)

Each added dollar that accrues to a contractor reduces the value gained by the owner.

Example negotiation:

Let us say that a widget needs to be added to the project.

Let's say that adding the widget increases the value of the project by \$1,000 dollars.

The widget costs the contractor \$300.

The contractor has signed a contract stating that he will only mark up things like widgets by 5%.

By contract he should tell the owner that the widget will cost the owner \$315.00.

But the contractor has a few pieces of information:

1. He knows that no matter how much he quotes the owner will drive down the price. This is true even when he has good back up proof. (The owner also negotiates for highest and best value too).
2. The contractor knows that the owner has no way of knowing whether the contractor is paying \$300 or \$900 or \$1500 for the widget. (Really, you don't)

If the owner pays \$1000 he has a break even and has not gained in value.

If the owner pays \$900 he will gain \$100 of value.

So the owner of the contracting firm and his project manager plan their strategy. They make a plan that will provide the owner with an emotional win even as he pays too much...

The contractor's project manager plays his normal game. He requests a change order for \$1,092.50. (\$950 times 1.15 equals \$1092.50). He manufactures proof for his "claim" and attaches this "back-

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up” to the change order. (this so-called back-up is counterfeit but it’s done in a way that can’t cause trouble).

The owner does the normal thing; he calls the Principal of the contracting firm “Oh my God! You’re killing me you SOB!!! That price is way too high.”

Contractor Principal: “I’ll look into it, Sir.” (He’s not really influenced by the owner’s anger; as a contractor he has been screamed at by the best in the business. It’s just business as normal. Ho Hum.) He hangs up the phone and smiles...

Later the Contractor Principal calls the Owner back, “Hey man, I’m really sorry but as you know we do most projects with a 15% mark up so my PM was confused. He should have only marked up your change order by 5% not 15%. The actual price should be \$997.50”

Owner: “No Way!!!!!!!!!! I’m not paying that much!”

Contractor Principal: “Well look, were great friends and I really like working with you. So how about I do this one for cost? That would be \$950.00...?”

Owner: “Well that still seems high, but OK. How’s the wife and kids?”

Contractor Principal: “Well Marge has been a bit cranky with the economy and all; it’s hard to make ends meet...”

Owner: “Yes, it’s tough all around... Can you make it to Golf on Tuesday?”

So what happened here? The contractor is playing a friendly game of poker. The owner probably even knows he’s being taken advantage of. But he thinks the contractor probably made \$100 dollars on the change order (not \$700, which is over 300% profit!).

What is Negotiation in construction?

It’s a poker game. In the construction poker game the contractors are doing everything in their power to get the pot as large as possible and then take it all. (This is absolutely true! It’s true in every situation and when it’s not true it’s because the contractor made a mistake.) By the way, the owner is also trying his or her best to get the most value for the least cost... It’s the game, don’t be naïve!

The big problem is that without transparency the contractors are able to take advantage of their inherent information advantages and can even falsely manufacture information to produce a poker hand that results in winning change order pots that are higher than they should be. (It happens every day in every city!)

In this game, on the typical project, the contractors have all the cards and they can manufacture more cards whenever needed. The owner’s answer is to use the strategies delineated in this paper.

The Fundamental Theorem of Construction Negotiation. ⁵⁵

1. *People negotiate in order to increase the value they gain or to limit loses.*
2. *Everything in Construction is a negotiation. This means that everyone involved is seeking to increase the value gained for themselves from the project. Every word uttered is part of the negotiation.*
3. *Negotiation occurs when two or more parties communicate toward coming to an agreement that involves exchanges of value. Each party seeks to maximize gain (or at least minimize loss). Each party uses a set of persuasive strategies to communicate position with respect to the exchange. Each party uses their power in order to gain more value.*
4. *Knowledge is Power.*
5. *If all other negotiating skills and power are equal then every time you negotiate from a position of information disadvantage you will have a high probability of losing value, and every time you negotiate from a position of information advantage you will have a high probability of gaining value, and every time you negotiate from a position of information equality you will have a high probability of gaining a fair outcome. Fair is in the eye of the beholder. Negotiating skill and other points of power will tend to change the probabilities. But negotiating skill is not as powerful as a set of factual information.*
6. *Just as every text on Strategy details the use of deception, one must remember that the person you are negotiating with is using deception and that you must employ countermeasures. You don't need to be deceptive, but you must make sure that the other guy's potential deceptions cannot work. Most deceptions involve information. Many deceptions are undetectable unless you have information.*
7. *Contractors often use self-deception so strongly that it becomes impossible to detect their deceptions (even with a lie detector). In other words they have so convinced themselves that they are justified and righteous in their claims that they can even fool a lie detector. The cure for deception is the facts.*
8. *The best countermeasure is intelligence. Yes every kind of intelligence you can think of, but mainly relevant accurate timey information.*
9. *A majority of people cheat in negotiations in order to gain value.⁵⁶ This is true of husbands and wives as well as business issues.*
10. *There are saints and saints don't cheat. On the other hand saints rarely become contractors (if you think you have found a saintly contractor be very very careful...).*
11. *The most successful contractors are the craftiest negotiators. In fact, many contractors have this as their primary skill even above their ability to produce good construction work. Most people, even seasoned business professionals are naïve amateurs by comparison when it comes to negotiating on construction. Don't let that good ol' boy personality fool you.*
12. *Contractors always negotiate in a way to maximize value; this means that sometimes contractors are totally honest as a ploy to use deception later to gain a bigger prize. Don't be fooled.*
13. *If you want to gain maximum value you must make good decisions based on the most relevant, accurate, and timely information.*

18. References and Footnotes

I wrote this paper so that project owners and others in the industry can become aware of a strategy that will help owners achieve total mission success at lowest cost and risk. It is not meant to be a scholarly paper. I am not a scholar; I am a practitioner and my job is to help project owners achieve the results they desire and deserve.

I am providing references for direct quotes as well as concepts that I know were discovered by others. I am also providing comments about other concepts. It is my intent to be honest in giving credit where credit is due. If I've failed, I apologize, please let me know and I will add the footnote.

There are some things that are factual and commonly known. It is factual that contractors are in business to make a profit. It is factual that many companies bend or break the rules in order to increase profits. There have been thousands of articles pointing this out. While I could site dozens of articles, I do not believe I need a reference for such concepts. The primary audience for this paper will find such concepts self-evident.

Many of the concepts in this paper were developed, discovered, or learned while directly working in the construction industry (including residential, commercial, industrial, and medical) as a laborer, a carpenter, a foreman, a superintendent, a construction manager, an estimator, a general contractor, a designer, a sub-contractor, as a developer, and as a consultant to the largest real estate investors in the world. Some things are learned because an old-timer tells you something. Some things are learned at your father's knee or in your mother's lap. Some things are created on the fly as a solution to a problem and then it becomes a normal practice.

If the Founding Fathers of the United States of America had stopped to provide references for the things that they found to be self-evident we would never have achieved the revolution that created the United States of America.

¹ Patrick Lencioni (author of "The Five Dysfunctions of a Team"). Jan. 18, 2006. This quote is from an interview, "Dealing with Dysfunctional Teams" performed by IT Business Edge.
<http://www.itbusinessedge.com/item/?ci=11020>

² James P. Womack and Daniel T. Jones. 1996, 2003. *Lean Thinking*. Free Press. Page 207

I have struggled to come up with a statement that describes my passion for the Project Execution Strategy that we promote. I have needed a "how" and "what" description of the differences between traditional wasteful construction (that literally robs money and value from project owners) and the integrated way that we promote (that is designed to make sure value flows to the owner). One day as I was reading the book, "*Lean Thinking*" by James P. Womack and Daniel T. Jones, I came across the following text: **"there is a higher form of craft, which is to proactively anticipate problems in a team context and to prevent them while constantly rethinking the organization of work and flow of value to remove muda."** [Muda is waste and waste is anything that reduces the value that can be gained by the project owner]. I love this sentence, but it does not apply to construction so I borrowed the meaning and structure to produce the following:

"There is a higher form of project execution in which the team proactively anticipates problems and acts to prevent them while constantly improving the organization of work to reduce waste and promote the flow of value to the project owner."

I have worked many times on construction teams that work toward this ideal. It is exciting and fun, everyone begins to feel energized, the change orders and arguments disappear. At the end of the project there are no law suits.

In fact using these methods we have completed hundreds of projects without a single lawsuit. Contrast this with a conversation between a developer and the CEO of one of the largest construction companies. Developer: “How many projects do you complete without lawsuits?” CEO: “None – it’s the nature of the business.”

I believe that everyone should read “*Lean Thinking*” by James P. Womack and Daniel T. Jones

³ http://www.thephoenixprinciple.com/quotes/2004/11/isaac_asimov_th.html

⁴ Professor Arthur C. Nelson. 19 December 2004. *By 2030 the US will have re-built almost half its built environment* http://www.citymayors.com/development/built_environment_usa.html

⁵ Deming, W. Edwards. 1993. *The New Economics for Industry, Government, Education*, second edition.

⁶ Deming, W. Edwards. 1993. *The New Economics for Industry, Government, Education*, second edition.

⁷ Phil Landesberg. Nov/Dec 1999. “In the beginning, There Were Deming and Juran” *The Journal For Quality and Production*

⁸ Deming, W. Edwards. 1993. *The New Economics for Industry, Government, Education*, second edition.

⁹ Deming, W. Edwards. 1993. *The New Economics for Industry, Government, Education*, second edition.

¹⁰ David Brooks. January 19, 2006. *A Nation of Villages*. The New York Times

Also see:

Arthur C. Nelson. December 2004. *Toward A New Metropolis: The Opportunity to Rebuild America*. A Discussion Paper for The Brookings Institution.

http://www.brookings.edu/~media/Files/rc/reports/2004/12metropolitanpolicy_nelson/20041213_RebuildAmerica.pdf

City Mayors also did a story on this:

http://www.citymayors.com/development/built_environment_usa.html

¹¹ The term: “**The Construction Production System**”. This terminology is based on applying the Lean production System to construction. Several authors have used this term and I am not sure of its origin.

¹² “**A facility has a total lifecycle**. Depending on how a project owner defines goals, it is the role of construction management to manage the entire Construction Production System to optimize and improve all elements of the project’s total lifecycle.” This is the author’s definition and it is based on several inputs over my career: 1. From 1987 through 2001, I had had the joy of working with a specific developer, Bob Bristow of Britannia Development, who was interested in creating high quality buildings that focused on total lifecycle. 2. For several decades there has been a growing awareness that the industry needs to focus on total lifecycle. 3. The federal tax system has recognized total lifecycle for decades and in 1997 the law changed in a way that creates accelerated cost recovery for professionals that know the law. 4. Once you recognize total lifecycle and know that total lifecycle is important it becomes necessary for those who manage the Construction Production System (that is Construction Managers) to have awareness and focus on this total cradle to grave lifecycle (or lifespan as some call it).

The strategy described in this paper is one of total integration in a way that is similar to the way Toyota thinks of their “sold vehicles” as part of the production system. Among other benefits this mindset can enhance service, new sales, and reputation. See Chapter 2 “Introduction”, page **Error! Bookmark not defined.** of the paper, which describes Deming’s description of the production system as totally integrated.

There is much discussion of the concept in the literature.

Here are two sources that dislike the concept:

<http://www.maxwideman.com/guests/plc/intro.htm> In this article Edmund Fish criticizes the concept. He seems to state that when the facility is delivered to the user that the project is over. Edmund Fish is a smart guy and this article should be read.

<http://maxwideman.com/issacons/iac1012/sld008.htm> Again this set of slides hits the same chord. In this opinion, when the product is turned over then the project is over. Transfer of “care, custody and control” (slide 11) ends the project.

- 13 University of Chicago Press. <http://www.press.uchicago.edu/cgi-bin/hfs.cgi/00/251036.ctl>
- 14 FMI/CMAA Sixth Annual Survey of Owners http://cmaanet.org/foundation_research.php
- 15 Soad Kousheshi, P.E. and Eric Westergren. Building Information Modeling and the Construction Management Practice: How to Deliver Value Today? (http://cmaanet.org/bim_article.php)
- 16 Michael P. Gallaher, Alan C. O’Conner, John L. Dettbarn, Jr. and Linda T. Gilday. "Cost Analysis of Inadequate Interoperability in the U.S. Capital Facilities Industry" Published by National Institute of Standards and Technology.
- 17 **Bottom Line equals Final Value minus Costs.** This is a restatement of standard financial equation.

Bottom Line – The last line on the income statement or the final amount of profit for the accounting period after all expenses and adjustments.

Herman W Meyer. GLOSSARY of FINANCIAL TERMS. July 2006

Bottom Line refers to the bottom line of an Income Statement. The bottom line shows the Net Income Available To Shareholders. When a company talks about increasing the bottom line, they mean doing things to either increase the revenue or decrease expenses so the company's income increases.

<http://www.catalystconsultingpartners.com/glossary.html>

- 18 See Appendix 1
- 19 FMI/CMAA Sixth Annual Survey of Owners http://cmaanet.org/foundation_research.php
- 20 U.S. Construction Labor Productivity Trends, 1970-1998 Authored by Richard L. Tucker, Carl T. Haas, Ph.D. P.E. John D. Borcharding, Ph.D. Eric Allmon Paul M. Goodrum, PE; The Center for Construction Industry Studies; The University of Texas at Austin; <http://www.cdc.gov/elcosh/docs/d0100/d000131/d000131.html>
- 21 David Brooks. January 19, 2006. *A Nation of Villages*. The New York Times
- 22 Fred Nickols. 2000. *Strategy: Definitions and Meaning*. http://home.att.net/~nickols/strategy_definition.htm
- 23 James P. Womack and Daniel T. Jones. 1996, 2003. *Lean Thinking*. Free Press. Page 19
The concept described is paraphrased from *Lean Thinking*.
- 24 James P. Womack and Daniel T. Jones. 1996, 2003. *Lean Thinking*. Free Press. Page 21
- 25 Dan Ariely. *How Honest People Cheat*. Harvard Business Review. February 2008

Also see Appendix 5 part 2 of this paper.

- ²⁶ Robert K. Greenleaf. 1977. *Servant Leadership*.
The concept of servant leadership is worthwhile. The book “Servant Leadership” by Robert Greenleaf should be studied by all leaders.
- ²⁷ I need to give credit to Gregory Bateson for the description of decision making. In several lectures Gregory Bateson spoke of how information impacts decision making. The discussion in the box on decision making is basically my opinion about decisions based on my learning from Gregory and others. I sat down and wrote it from memory.
- Here’s a quote that says much the same thing: “The need for a decision arises in business because a manager is faced with a problem and alternative courses of action are available. In deciding which option to choose he will need all the information which is relevant to his decision; and he must have some criterion on the basis of which he can choose the best alternative.”
<http://www.fao.org/docrep/W4343E/w4343e06.htm>
- Here are some websites I like on the subject of Decision Making:
http://en.wikipedia.org/wiki/Decision_making
http://www.mindtools.com/pages/main/newMN_TED.htm
http://www.viterbo.edu/perspgs/Staff/MFranz/chap4_fast/index.htm
Particularly good site:
<http://www.virtualsalt.com/crebook5.htm>
- ²⁸ Glenn Ballard and Gregory A. Howell. *An Update On Last Planner*.
Glenn Ballard, Iris Tommelein, Lauri Koskela and Greg Howell. *Lean Construction Tools and Techniques*
There are several references to Last Planner™ at <http://www.leanconstruction.org/>
You will need to learn Last Planner from the sources lists at the Lean Construction Institute website.
The terms “last Planner” and “Last Planner System” are trademarked by the Lean Construction Institute.
- ²⁹ James P. Womack and Daniel T. Jones. 1996, 2003. *Lean Thinking*. Free Press. Page 19
The concept described in the paper is paraphrased from *Lean Thinking*.
- ³⁰ Beth Scott. *BSA-IDC Study Illustrates Economic Gains of Reducing Software Piracy in the European Union*.
Business Software Alliance
<http://w3.bsa.org/eupolicy/press/newsreleases/BSA-IDC-Study-Illustrates-Economic-Gains.cfm>
- ³¹ Robert L. Philips, “The Management Information Value Chain” Perspectives, Issue 3
<http://pages.stern.nyu.edu/~abernste/teaching/Spring2001/MIVC.htm>
- ³² James P. Womack and Daniel T. Jones. 1996, 2003. *Lean Thinking*. Free Press. Page 19
The concept described is paraphrased from *Lean Thinking*.
- ³³ James P. Womack and Daniel T. Jones. 1996, 2003. *Lean Thinking*. Free Press. Page 21
- ³⁴ Publication: “National Building Information Model Standard, Version 1- Part 1, Overview, Principles, and Methodologies.” National Institute of Building Sciences. Facilities Information Council. National BIM Standard. Page 149 (<http://www.facilityinformationcouncil.org/bim/>)

- ³⁵ Publication: “National Building Information Model Standard, Version 1- Part 1, Overview, Principles, and Methodologies.” National Institute of Building Sciences. Facilities Information Council. National BIM Standard. Page 18 (http://www.facilityinformationcouncil.org/bim/pdfs/NBIMSv1_p1.pdf)
- ³⁶ Finith Jernigan, *BIG BIM, little bim*, 4 Site Press, first edition
- ³⁷ On Feb 2, 2008 Wikipedia had the following entry for the introduction to Lean Construction:
“Lean construction is a translation and adaption of lean manufacturing principles and practices to the end-to-end design and construction process. Unlike manufacturing, construction is a project based-production process. Lean construction is concerned with the holistic pursuit of concurrent and continuous improvements in all dimensions of the built and natural environment: design, construction, activation, maintenance, salvaging, and recycling. This approach tries to manage and improve construction processes with minimum cost and maximum value by considering customer needs.(Koskela et al. 2002)

The term "Lean Construction" was coined by the International Group for Lean Construction in its first meeting in 1993.”

- ³⁸ Jefferey K. Liker, Michael Hoseus. *Toyota Culture, The Heart and Soul of the Toyota Way*. Page 531
Author’s Note: One of the principles of lean production is **continuous improvement** of the production process in service of the aim of the production system and within the environment of the production system you are working in. Construction and automobile manufacturing are different enough with respect to aim and environment that a direct transplanted will not work. From the author’s point of view the aim of the construction production system is that the project owner achieves total mission success with lowest cost and risk (*I fully understand that this is not the aim of the contractors; that in fact without applying lean principles the contractors actually have an oppositional aim*). The production environment of Construction is different from Toyota’s. The product produced is different. The “thinkers” and “doers” working on solutions of continuous improvement are different. It is natural for the principles and techniques used for Lean Construction to look somewhat different from Toyota’s. Construction’s best practices are very different from Toyota’s best practices of automobile manufacturing. Thus in this paper you will not see the same list of “rules” or “principles” that you would see if looking at a description of the Toyota Production System. In fact some are radically different. Just consider the fact that an employee of Toyota that is guaranteed lifetime employment is a very different animal from a construction sub-contractor that is brought onto a project for a short duration and only has that short duration in which to make a profit.

With respect to the preceding paragraph the Author’s opinion differs somewhat from other thinkers in the domain of Lean Construction.

- ³⁹ This is the author’s opinion
- ⁴⁰ James P. Womack and Daniel T. Jones. 1996, 2003. *Lean Thinking*. Free Press. Page 292
- ⁴¹ Cybernetics. In the box on Cybernetics I derived the definition of cybernetics from the following quote: “The term cybernetics stems from the Greek κυβερνήτης (kybernetes, steersman, governor, pilot, or rudder — the same root as government). Cybernetics is a broad field of study, but the essential goal of cybernetics is to understand and define the functions and processes of systems. Studies of this field are all ultimately means of

examining different forms of systems and applying what is known to make artificial systems, such as business management, more efficient and effective.” <http://en.wikipedia.org/wiki/Cybernetics>

There are two types of cyberneticists; those who study things in a scholarly way and those that apply cybernetics to make what ever system they are working in more effective and efficient.

“Cybernetics is the interdisciplinary study of the structure of complex systems, especially communication processes, control mechanisms and feedback principles.”

“Cybernetics is a broad field of study, but the essential goal of cybernetics is to understand and define the functions and processes of systems. Studies of this field are all ultimately means of examining different forms of systems and applying what is known to make artificial systems, such as business management, more efficient and effective.”

<http://en.wikipedia.org/wiki/Cybernetics>

“Its focus is how anything (digital, mechanical or biological) processes information, reacts to information, and changes or can be changed to better accomplish the first two tasks” (This definition by Kelly, Kevin (1994). Out of control: the new biology of machines, social systems and the economic world. Boston: Addison-Wesley. ISBN 0-201-48340-8.)

Jay Wright Forrester is listed as one of the primary Cyberneticians
http://en.wikipedia.org/wiki/Jay_Wright_Forrester

Cybernetics is closely related to the work of Peter Senge (The Fifth Discipline). “Senge recognizes that the origins of systems dynamics lie in subject domains traversing the physical and social sciences (see J.W. Forrester’s work). System dynamics emerged from and embraces certain concepts of engineering and management, and the tools and techniques of cybernetics...” Robert Lo Flood. *Rethinking the Fifth Discipline: Learning Within the Unknowable* page 28

Peter Senge Peter was a protégé of Jay Wright Forrester http://en.wikipedia.org/wiki/Peter_Senge Jay Wright Forrester was a cyberneticist.

42 Deming, W. Edwards (2000). *The New Economics for Industry, Government, Education* - 2nd Edition. MIT Press. ISBN 0-262-54116-5.

43 Gregory Bateson

“One of the threads that connects Bateson's work is [his] interest in systems theory and **cybernetics, a science he helped to create as one of the original members of the core group of the Macy Conferences**. Bateson's take on these fields centers upon their relationship to epistemology, and this central interest provides the undercurrents of his thought.” http://en.wikipedia.org/wiki/Gregory_Bateson

Many people, including myself, believe that Gregory Bateson will someday be known as one of the greatest minds of the 20th century. I think in time he will be thought of in the same league as Einstein and Deming.

“Gregory Bateson was one of the most influential systems thinkers of the twentieth century.” “Bateson is a profound influence on many management thinkers, including Chris Argyris and Peter Senge.”
<http://www.users.globalnet.co.uk/~rxv/people/bateson.htm>

“Gregory Bateson [1904 - 1980] - Anthropologist, Social Scientist, **Cyberneticist** - known as Gregory - was one of the most important social scientists of this century. Strongly opposing those scientists who attempted to ‘reduce’ everything to mere matter, he was intent upon the task of re-introducing ‘Mind’ back into the scientific equations - writing two famous books Steps to an Ecology of Mind, and Mind & Nature as part of this task.

From his point of view Mind is a constituent part of ‘material reality’ and it is thus nonsensical to try to split mind from matter. Before being championed by the counter-culture of the 1960’s Bateson had been busy in the 20’s and 30’s as an anthropologist in Bali, and in helping to found the science of cybernetics among many other things. Adopted by many thinkers in the anti-psychiatry movement because he provided a model and a new epistemology for developing a novel understanding of human madness, and also for his invention of the theory of the double bind.

He helped to elaborate the science of cybernetics with colleagues Warren McCulloch, Gordon Pask, Ross Ashby, Heinz von Foerster, Norbert Wiener, etc. He inspired several different models and approaches in the area of psychotherapy, notably that of the MRI Interactional school of Weakland, Jackson, and Watzlawick, and many other later schools of family therapy [including that of the Milan school of Palazzoli], and he directly influenced family therapists such as Brad Keeney, Tom Andersen, Lynn Hoffman and many others.”

<http://www.oikos.org/baten.htm>

“Bateson defines information as "a difference that makes a difference".

Hold your hand perfectly still, palm upwards and resting comfortably on a table. With your other hand, drop a small coin into the palm. You will feel the impact, and if the coin is cold, you will feel the coldness of the metal. Soon however, you will feel nothing. The nerve cells don't bother repeating themselves. They will only report to the brain when something changes. Information is difference.

A lizard hunting insects operates on the same principle. The lizard's eye only reports movement to the lizard's brain. If the hunted insect settles on a leaf, the lizard literally cannot see it. But the moment the insect starts to move, whop, the lizard can see it again, and the tongue flickers out and catches it.

But there are differences and differences. Information is difference that makes a difference. You were probably aware, as you dropped the coin into your palm, your eyes told you automatically, without your brain even asking, what the value of the coin was; but you were probably not aware what date it was minted. This is because (unless you are a numismatist) the value of the coin makes a difference to you whereas its date doesn't.

What is it that makes a difference to a lizard, to a numismatist, to you? Surely not the same things. What is information for the lizard is not information for you, and what is information for you is not information for the lizard.

This is why the perspective of information is important. Perspective defines what counts as information at all, perspective defines to whom the information makes a difference.”

<http://www.users.globalnet.co.uk/~rxv/people/bateson.htm>

⁴⁴ Dan Ariely. *How Honest People Cheat*. Harvard Business Review. February 2008

“Dan Ariely is the Alfred P. Sloan Professor of Behavioral Economics at MIT Sloan School of Management. He also holds an appointment at the MIT Media Lab where he is the head of the eRationality research group. He is considered to be one of the leading behavioral economists. Currently, Ariely is serving as a Visiting Professor at the Duke University, Fuqua School of Business where he is teaching a course based upon his findings in Predictably Irrational.

Ariely was an undergraduate at Tel Aviv University and received a Ph.D. and M.A. in cognitive psychology from the University of North Carolina at Chapel Hill, and a Ph.D. in business from Duke University. His research focuses on discovering and measuring how people make decisions. He models the human decision making process and in particular the irrational decisions that we all make every day.”

http://en.wikipedia.org/wiki/Dan_Ariely

⁴⁵ Dan Ariely. *How Honest People Cheat*. Harvard Business Review. February 2008

⁴⁶ National Retail Security Survey, November 2002. As reported by About.com
http://retailindustry.about.com/od/statistics_loss_prevention/l/aa021126a.htm

“The study, conducted by the University of Florida with a funding grant from ADT Security Services, Inc., a unit of Tyco Fire and Security Services, discovered that retail security managers attributed more than 48.5 percent of their losses to employee theft, up from 46 percent the prior year. Internal theft by employees cost retailers a record \$15 billion.”

⁴⁷ Emily Sachar. September 25, 2006. MBA Students Cheat More Than Other Grad Students, Study Finds. Bloomberg Press.

⁴⁸ Emily Sachar. September 25, 2006. MBA Students Cheat More Than Other Grad Students, Study Finds. Bloomberg Press.

⁴⁹ Alison Damast. April 30, 2007. Duke MBAs Fail Ethics Test. Business Week.
http://www.businessweek.com/bschools/content/apr2007/bs20070430_110466.htm?chan=top+news_top+news+index_businessweek+exclusives

CHEATING ON THE RISE

“Business-school leaders have reason to be concerned. Fifty-six percent of graduate business students admitted to cheating one or more times in the past academic year, compared to 47% of nonbusiness students, according to a study published in September in the journal of the Academy of Management Learning & Education (see BusinessWeek.com, 10/24/06, "A Crooked Path Through B-School"). Donald McCabe, the lead author of the study and a professor of management and global business at Rutgers Business School, says the large number of students implicated in the Duke case is above average. "It's certainly not the biggest, but it's one of the bigger ones," he says of academic scandals involving all kinds of students.

One of the larger cases in the past five years was a cheating scandal in a physics class at the University of Virginia in 2002. The school eventually dismissed 45 students and revoked three graduates' degrees. In 2005, Harvard Business School rejected 119 applicants accused of hacking the school's admissions Web site (see BusinessWeek.com, 3/9/05, "An Ethics Lesson for MBA Wannabes").”

⁵⁰ Patrick Lencioni (author of “The Five Dysfunctions of a Team”). Jan. 18, 2006. This quote is from an interview, “Dealing with Dysfunctional Teams” performed by IT Business Edge.
<http://www.itbusinessedge.com/item/?ci=11020>

⁵¹ Barry LePatner, “Broken Building Busted Budgets” University of Chicago Press 2007

⁵² Deming, W. Edwards. 1993. *The New Economics for Industry, Government, Education*, second edition.

⁵³ Fred Nickols. 2000. *Strategy: Definitions and Meaning*. http://home.att.net/~nickols/strategy_definition.htm

⁵⁴ <http://en.wikipedia.org/wiki/Management>

⁵⁵ James Conlow wrote this. It’s based on my 30 years experience as a construction negotiator as well as all the instructions I have received over a lifetime.

⁵⁶ See footnotes **Appendix 5, item 2 of this paper.**