INFORMATION TECHNOLOGY OPPORTUNITIES IN THE CONSTRUCTION INDUSTRY: A STRATEGIC BUSINESS PLAN

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Submitted to the Department of Civil and Environmental Engineering in Partial Fulfillment of the Requirements for the Degree of Master of Science in Civil and Environmental Engineering at the

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ABSTRACT

Over the past decades, the importance of information has exponentially increased as it plays a larger, more strategic role in the planning, performance, and the sustainability of competitive advantage for a company. Coupled with this fact is the necessity of accessible information among the participants within the construction process. A niche market is apparent to the company that is willing to provide the necessary guidance and expertise of how information technology can facilitate the construction process.

A strategic plan has been develop for the Clory Construction Consultants, Inc. (CCC). This plan is based on market research into information technology uses by construction companies and is based on the MIG hierarchy.

The results of the plan indicate a market share potential of 26% among the construction companies in the New England region. Financial forecasts which are based upon on this data, indicate first year revenues to be approximately $75,000.00 with a growth of 15% annually for the next five years. Gross margins after one year of operations are expected to be 40%, with a net income of $8,548.00

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Chapter 1

1. Introduction

Over the past decades, the importance of information has exponentially increased as it plays a larger, more strategic role in the planning, performance, and the sustainability of competitive advantage for a company. Coupled with this, information accessibility and sharing is readily available to the individual as well as the corporation due to advances in new technology economics, processor power, telecommunications, software design, and upgrades to the super-information highway. The United States Government, the founding pioneer in the Internet (originally a web of communication links primarily between government and educational research facilities), is trying to expand that "infrastructure" under the National Information Infrastructure banner through initiation and collaboration with private industry. As then Senator Al Gore Jr. expressed, the critical issue impeding the onset of the Information Age is the existing information links. In addition, private sector entities such as Microsoft™, Netscape™, and America-On-Line™, are developing and improving the “vehicles” in which we will travel the highway.

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1 Gore, Al Jr., “Infrastructure for the Global Village”, Scientific American, pp. 150-153, Vol 265, No. 3, September 1991 - Caption from article “To realize the full benefit of the information age, we need to take the next step: high speed networks must be built...so that as a nation we will invest in the critical infrastructure of the information superhighways.”
As information technology (IT) advances with increased functionality and cost performance, and as a vast majority of industries are exploring ways in which IT can facilitate improved processes, an understanding of IT’s role within the construction industry needs to be considered. Through initial observation, the construction industry appears to hold tremendous potential for IT implementation. It is an industry ideally suited to the concept of “virtual organizations”, since companies within this industry have characteristics of applying greater resources than they maintain in-house for each specific project. For example, Marshall Contractors Inc. of Rhode Island, achieved revenues of $360 million in 1995, while maintaining a total staff under 400. They accomplished this by subcontracting out all of the work needed to build a project (commodity based) while providing the bonding, supervision and coordination needed (service based). The need to coordinate these entities and share information is inherent and necessary to accomplish the project’s goals. Yet the construction industry has maintained traditional lines of communication and information distribution along contractual lines, as shown in figure 1-1.

[Diagram of information flow along contractual lines]

--- = Contract  
----- = 2-way Info.

Figure 1-1: Information Flow Along Contractual Lines.

The construction industry’s fundamental traits of being highly fragmented and highly competitive precludes information sharing of an industry wide scope, which in turn results in information hoarding by parties at the project level. However, projects are completed via some form of information distribution and thus, the industry functions - albeit not very efficiently. Although organizations such as the Associated General Contractors (AGC) and the Association of Builders and Contractors (ABC)
sponsor workshops in team-building exercises, in an effort to harness the potential of information for growth, adaptation to these measures are slow coming and the industry as a whole continues to utilize risk adverse, low-bid strategies with an "everyone for themselves" attitude.

The construction industry is on the verge of a surge of IT services that will revolutionized and possibly consolidate it. There are numerous progressive contractors, architects, and owners who are seeing beyond the old adversarial and cost inefficient ways of the past and embracing the IT revolution and what it can do for their business goals. For example, the Campanelli Corporation, a commercial real estate developer based in Massachusetts, recently built a distribution plant for Federal Express and utilized an e-mail platform for all project change orders and memorandums. In addition, these progressive firms are implementing such measures as partnering clauses in project contracts and umbrella insurance policies covering all participants in attempts to lessen claims, litigation, and ultimately costs. Underlying these behavioral modifications, there is a need for cost effective, information based communication platforms— not cheaper long distance telephone service. Therefore, the central focus and fundamental purpose of this thesis, is the identification of IT opportunities within the contractual relationships between construction parties and the creation of an enterprise that would educate the construction industry to the benefits of IT.

1.1. Purposes & Goals

The objective of this thesis research is to explore and evaluate the influence of information technology (IT) on companies within the construction field. Through evaluation of the strategic issues within this highly fragmented industry, it is hypothesized that tremendous opportunity exists for a company to offer IT and construction consulting services to the players in this field, with the hopes of attaining collaboration and information sharing among all project members. The goals of the research are summarized below:

1) to identify the market needs for IT services within the Boston, MA construction market,
2) to evaluate mainstream IT platforms with consideration given to the acceptance, adaptability, and maximization of efficiency by the construction industry, while minimizing costs, and
3) to write, for investor and principal consideration, a strategic business plan for Clory Construction Consultants, Inc. (CCC), a consulting firm that will provide the means and methods to address IT needs of the construction industry.

1.2. Thesis Organization

This thesis is structured in a way to walk the reader through the thought process of preparing a business plan. This process can be defined as having the following steps: product realization, market assessment, strategic planning, and business plan formulation. Generally speaking, the process is a reiterative one in which for example, if market projections won't meet the financial need, product re-evaluation is required. In this case, CCC will merge two service-based entities (construction and computer consulting) to address the needs of a specified market segment within the construction field. This thesis is organized in the following manner.

Chapter 2 provides, in two sections, background information on the construction industry and the mainstream IT offerings. The background analysis for the construction industry contains information regarding project delivery systems, current risk-shedding methods, and economic outlooks. The IT section discusses the current offerings from software manufacturers, the benefits of the Internet, as well as the pros and cons of customized software for a construction company. The formulation of the MIG (messaging, information and graphics) hierarchy of IT implementation by the construction industry is also
presented. Chapter 2 concludes with a discussion on evaluating IT in the strategic plan of a construction company through the use of existing strategic planning models.

Chapter 3 discusses a regional market study which attempts to identify current and future uses of IT within the future plan of a construction company. A breakdown of the research methodology, phone interview strategy, and results are provided.

Chapter 4 addresses the strategic issues faced by CCC as it looks to the implementation and the value-added benefit of IT for the construction industry. Several models are used including Michael Porter’s five forces model, Professor John Macomber’s 8 steps to success, and others. These models are used to identify the strengths and weaknesses of CCC’s strategic plan.

Chapter 5 is comprised of a business plan for CCC. This plan has eight parts and is based on the format offered in Jeffry A. Timmons’, New Venture Creation, 4th ed., 1994. The focus of this chapter is to illustrate the requirements and thoroughness needed for a start-up in the construction / computer consulting fields, with emphasis on the strategic planning required.

Chapter 6 offers conclusions as well as insights regarding business plan formation and strategic planning with regards to information technology.
Chapter 2 - The Construction & IT Industries

2.1. Introduction.

This chapter introduces the reader to two topics that are fundamental to the strategic planning process for CCC. First, it presents an introduction to the construction industry, and offers insight into the variation of project delivery methods, the basis of the project based relationships, and the importance of project team-building. It is through review of these relationships that the reluctance of the construction industry to the implementation of IT platforms may be understood. Secondly, a synopsis of the IT market segment is presented. This section identifies, in conjunction with the use of strategic models, the importance of IT to the world market and outlines the fundamental mission of the business plan - the education, incorporation, and use of existing information technology (hardware and software) to further enhance communication, information sharing, and collaboration amongst the construction project participants. In addition, the chapter presents the MIG hierarchy, a model of IT implementation and adaptability that outlines the needs encountered by construction industry participants.
2.2. Construction Industry - Analysis.

2.2.1. Background.

The construction industry has traits, that upon initial examination, would appear to be mutually exclusive or at best, extremely contradictory. According to recent estimates, the construction industry contributes approximately $507 billion or 8-10% to this nation's gross domestic product (GDP) \(^3\). However, this industry is also highly fragmented due to low barriers to entry, the absence of large market shares by industry leaders, as well as being highly litigious. Classic five forces analysis (See Fig 2-1) confirms that this industry is not very attractive for entry \(^4\). These two facts create a very interesting environment for the entrepreneur - a large market with very few large industry leaders although a plethora of regional competitors. To identify and obtain a better understanding of the opportunities for IT that exist within this industry it is useful to review the industry's working mechanisms.

![Five Forces Analysis of Construction Industry](image)

Figure 2-1: Five Force's Analysis of Construction Industry.

2.2.2. Delivery Methods.

The contractual arrangements used in the construction industry are derived from three models. These models include the design-bid-build method, the design-build method and the build-operate-transfer method. Within each of these models, or methods, derivations have been created to offer the parties benefits not available in the original. As the complexity of construction projects increase, the range of

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contractor services has evolved to include such things as financing, feasibility studies, sole-source responsibility, and operations.

The design-bid-build method, or traditional method, utilizes a tripartite model of contracting, in which the owner enters into separate contracts with the architect and the contractor (see Fig. 1-1). In short, the architect completely designs the project in accordance with the owner’s desires, prepares a set of plans, specifications, and other contract documents, and places this design package out to bid for competitive pricing by contractors. After selection of a contractor by the owner (using criteria such as lowest responsible price, unit pricing, shortest project duration, etc.) the project is built while observed for contract compliance by the architect. The contractor has no obligation to the owner or architect to enhance profitability, efficiency, or quality - except as deemed by the contract documents. The architect, in the capacity of fiduciary agent, typically acts on behalf of the owner looking out for its best interests. Such duties can entail cost reviews of the contractor’s requisitions, quality assurance, and the aforementioned design compliance.

Derivations of this style are construction management and project or program management. In each of these cases, the fiduciary relationship is between another entity or manager instead of the architect. These methods provide for specialized services required by the owner as well as early input into the design considerations. These services can include financial analysis, value engineering, constructability analysis, cost estimating or a myriad of other functions to complement the owner’s needs. The construction management type of contracting utilizes a third party that acts as administrator for the construction project. This entity acts as the owner’s representative and as such, has an “open” book policy during the project duration. All procurement operations, labor expenditures, and quality compliance / assurance decisions can be reviewed by the owner. The construction management process can be utilized in several ways:
1) It can perform the work strictly as an agency, whereby it does not utilize any of its own forces for construction, with the exception of on-site supervision. Actual construction activities are subcontracted out to a general contractor or multiple subcontractors - all contracts are between the owner and these construction participants. This type of arrangement typically has the manager working for a fixed fee. The fee can be based from a negotiated scope of work or percentage of the contract price.

2) The construction manager acts as a constructor. In this scenario, contracts for work are between the manager and its subcontractors. The “open book” policy still applies, however, the contract between the owner and manager may be lump sum or guaranteed-maximum-price.

Program management is similar to construction management, in that the fiduciary relationship is extended to the owner and the same contracting methods can be applied. The difference is that this method is best structured for multiple construction projects being procured by the owner. Two examples of such an arrangement are the Logan 2000 program and the Central Artery Tunnel (CA/T). In each of these cases, public owners, lacking the resources to manage such large projects, hire consultants to manage and oversee the construction of the multi-contract programs.

Generally speaking, the design-bid-build method is structured to prevent collaboration and the implementation of information sharing amongst the participants by the contractual language utilized. For example, contracts reviewed by the author contain clauses such as; two week lead for submittal review, correspondence channels to follow contracts channels, multiple copies of shop drawings, etc. For example, correspondence regarding design questions by a subcontractor must “flow” to the general contractor, to the architect, possibly to the design consultant and then an answer will follow the reverse path. Efficiencies, especially those based on IT, introduced into this system are typically inhibited - not rewarded.
The design-build method offers the owner the ability of “one stop shopping” or single source responsibility. Based, in part, of its appeal to minimize complexity, recent studies have indicated an increase in the use of design-build by owners\(^5\). In this arrangement, the owner will contract with a contractor / architect team. The team is selected on qualifications based on the owners needs and wants. Such qualifications may include previous experience on similar projects, financial soundness of the team, design innovation, etc. This team will design and build the project based on preliminary plans from the owner, usually 25% complete. Once the contract is released, the design-build team has free reign on any aspects of construction quality, schedule, and implementation not specifically outlined in the preliminary package created by the owner. It is this aspect that is most adverse in the design-build concept. Changes to owner intent, scope, and project conditions, are typically an expensive ordeal, thus once the contract is released, changes are discouraged. However, this method can allow for progress payments and this may be incentive for fairness in change order adjustment by the design-build team. It is argued that the fiduciary relationship with the architect, normally experienced in the design-bid-build method, is lost and therefore not recommended for inexperienced owners. Typically, the owner will utilize its in-house staff, or hire an outside consultant, to oversee the contract and verify compliance with their preliminary plans.

The turnkey method, an evolution of the design-build arrangement, operates in a similar fashion, except this method is applicable to certain project types where owner involvement is reduced even further. The name turnkey implies that once the contract is released, owner input is negated until such time as the project is completed and the “keys” are “turned” over. Examples of these project types are petrochemical plants, coal-fired electrical plants, and highway bridges. The turnkey team has complete reign over design conditions and has to meet performance criteria as dictated by the owner – million gallons per day, megawatt generation, bridge life expectancy, and so forth.

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These methods offer little incentive for cooperation and information sharing between the owner and the design-build team. Once the preliminary designs are set, these teams complete design and construction on their own account. Communication and correspondence channels are based on contractual lines. Although, one can imagine a disciplined and "free" exchange of information amongst the design-build's personnel, especially in the turnkey method, correspondence to the owner (or its designated representative) is maintained along contractual lines.

The Build-operate-transfer (BOT) method, first used in 1984 in Turkey, is the most complex contracting strategy in use, and is rapidly becoming popular in infrastructure and other civil works projects. In this method, the owner will select a team to design and build (from preliminary plans / specifications) a facility - very similar to the turnkey method. However, this team will also operate it for a specified concessionary period, and then upon completion of the concessionary period, transfer operations over to the sponsor / owner. The concessionary period is when the BOT team collects revenues from the project for its own cash flow usage. This highly complicated method, requires builder financing (typically leveraging expected operation revenues) as well as facility maintenance until termination of the concessionary period. A good analogy to better understanding this method is the role a developer plays in a project. The development team bases the costs of a project on the expected rate of return the project offers. They will contract the entire project becoming totally responsible for its success or failure.

Like the aforementioned methods, there exists little incentive for collaboration and free communications between the construction team and the owner. Information sharing is once again based on contractual obligations, not efficiency.

2.2.3. Relationships.

A review of the aforementioned project delivery methods indicates that barriers exits, and are primarily contractual in nature. These barriers inhibit the flow of information, and thus the implementation of IT and the efficiencies it can provide. These methods permit, as well as limit,
information exchange to the “hierarchy” of contractual obligations. For example, a steel erector is not permitted to contact the structural designer directly, but must make its inquiry through the general contractor, to the architect, and then to the designer. The benefits of IT to the construction industry, can not be fully realized until the participants see beyond the contractual-based flow of information. Yet, there are recent innovations that begin to address, not only this issue of information flow and information sharing, but the adversarial nature of the construction industry. These innovations or philosophies are strategic tools, and can offer a firm competitive advantages once implemented into the value chain. These methods are “game theory” strategic planning and “partnering”. Either of these methods, once implemented, can provide the mechanism for an expanded role of the use of IT in the daily activities of a company.

According to John McMillan, game theory is the study of rational behavior in situations involving interdependence. With this, several models have been developed in the hopes of understanding and predicting the tendencies of the participants in a given situation. Although McMillan readily offers that no model can predict, with perfect accuracy, an answer in a setting that has an infinite set of possibilities, it is the understanding and the placing of oneself in another’s shoes that is important. The most recognizable model in game theory is the “Prisoner’s dilemma” (see Fig 2-2) in which two prisoners are given options during their interrogations. The results of each individual’s decisions, in conjunction with their counterpart’s, will directly affect their sentencing.

<table>
<thead>
<tr>
<th>Prisoner #1</th>
<th>Confess</th>
<th>Don’t Confess</th>
</tr>
</thead>
<tbody>
<tr>
<td>Confess</td>
<td>8,8</td>
<td>15,0</td>
</tr>
<tr>
<td>Don’t Confess</td>
<td>0,15</td>
<td>1,1</td>
</tr>
</tbody>
</table>

Fig. 2-2 - Prisoners’ Dilemma.

7 Based on McMillan, Strategic Decision Making, p. 11-13, NYNY 1992, in which numbers within chart represent possible sentencing outcomes based on interrogation responses. Format “8,8” is the sentencing for prisoner 1 and 2 respectively.
The scenario plays itself out in the following manner. Both prisoner 1 and 2 are suspected of a crime and kept in separate cells. The district attorney offer each the following deal, “if you confess and your accomplice doesn’t, then you will be released and your friend will receive a long sentence”. The same scenario for #2 holds true as well. Also, “if both confess - each get long sentences, if neither confesses - a minor vagrancy sentence will be applied.” By understanding the logic each prisoner faces, the outcome is predicable. If Prisoner #1 believes #2 will look out for his own best interest and confess, then by reviewing his possible sentences (8 or 15) logic dictates that he should confess. Alternatively, if he believes #2 will not confess, his possible sentences (0 or 1) dictate that he still confess. The same logic holds true for #2’s review of his options. Thus, each prisoner confesses and receives moderate sentencing.

This model illustrates the concept of individual rationality versus collective rationality - the goal of the one versus the overall goal. If they were able to work together and cooperate (neither confessing), they each would receive light sentences. However, by each one thinking of their own well being, each sought self achieving goals and thus received harsher sentencing. In the construction industry, individual rationality is too often the standard thought process. Satirical perceptions of the participants in construction projects could be that architects are viewed as ego driven visionaries, contractor’s are cost- and quality-cutting thugs, while owners are unsophisticated children with deep pockets. These views do have some basis in reality, especially when one considers the adversarial relationships, built along contractual lines, inherent in the structuring of the original design-bid-build contract type. Further, the one-off nature of construction projects place barriers preventing the project team’s ability to practice methods of cooperation and project-oriented goals. Yet experienced owners and contractors are realizing the inefficiencies in the standard way of doing business via individual rationality. In accordance with the game theory attribute of predicting possible outcomes by others, these project players are changing the game in the best interest of all. For example, improvements in project relationships are evident in the changes and evolution of the contracting methods as outlined previously. Construction Management, design-build, and BOT contracting methods have evolved to:
1) provide consolidation of the project teams,
2) reduce potential for claims, and
3) provide an incentive for project-based goals.

Other efforts to promote collective rationality are incentive programs offered by progressive owners. Through financial means, team members begin to focus on construction operations and inefficiencies as opposed to project deficiencies. Typically the contractor or CM will have split savings clauses in their contracts as incentive to stimulate efficient construction operations. A split savings clause, used predominantly in lump-sum and guaranteed maximum (GMP) price contracts allows the builder and owner to share in any savings that is realized below the estimated cost or GMP of the project. For example, a builder quotes $100,000.00 to build a house, the actual cost of work completed is $80,000.00. Thus in this situation, the shared savings would be $20,000.00 and be split via some previously agreed upon percentage. Another example to introduce incentive into the project are umbrella or wrap-up insurance programs. These are designed not only to save the owner additional burden on solicited bids, but to alleviate potential claims (contractual and safety related).

Partnering is another approach used in order to gain collaboration among project participants. This concept is not based in contractual language, but rather driven by the owners and contractors in an effort to ensure that their particular project contract includes “an implied convenant of good faith”⁸. This system is currently being utilized in the Central Artery / Tunnel (CA/T) project in Boston MA. Through a series of workshops attended by key participants from all project entities, an understanding of the needs and expectations are clearly outlined in a partnering charter. The partnering charter contains goals that all parties strive to accomplish. Such goals may include; perfect safety performance, quicker review of product submittals, value engineering at all phases of construction, etc. Attempts are made at all levels of

the organizations to achieve these goals. To aid in the realization of these goals, the AGC recognizes seven key elements:

1) Commitment to the partnering charter by top management, as a symbol of leading by example.

2) Equity in establishing the goals of the charter. The key is that all participants voice their concerns over individual goals in an attempt for openness.

3) Development of charter goals through mutual adjustment.

4) Trust amongst the project members in behavior and motives for charter realization.

5) Implementation and formulation of strategies to attain charter goals by all parties.

6) Continuous evaluation of charter goals through scheduled meetings with key management.

7) Timely response to issues raised in contradiction and in conformance to the charter.

Throughout all of these contracting strategies, financial incentives, and team-building endeavors lies the need to clearly express and relay information to the other party members quickly and efficiently. It is hypothesized that as owner drivers currently strive for project-based orientation, they will be the harbinger of IT based communication tools for their project. Owner drivers are defined as those procedures or philosophies developed by the owner to be implemented in their projects. Such drivers may include the aforementioned Partnering charters, split-savings clauses, as well as the need for sole-source accountability, feasibility studies, operational services, etc. Yet, current IT usage remains hindered by the reluctance of all project participants to move beyond the contractual ties between the parties.

2.3. Information Technology.

The advances in computer and information technology have developed at an astounding rate. The evolution of mainframe computers the size of a room to a notebook computer with more processing
power than its earlier ancestor was achieved in approximately 35 years. Applications ranged from simple calculations performed by technicians with punch-card interface to multimedia programs a child can operate. IT can affect a company’s productivity - optimizing worker performance and capabilities; its strategic planning - improving customer interaction to achieve greater market share; and even its organizational structure - using telecommuting or concepts of virtual corporations. As illustrated in the mainframe / notebook example, portability, increased efficiency and accessibility are the industry goals.

Whether information is accessed remotely via modem or Internet or locally via LAN's, it must be distributed quickly and accurately.

This section of chapter two concerns itself with analyzing IT influence on the construction industry on a micro-level. A micro-level examination is the study of the affects of IT on the individual participants within the industry - not an industry-wide analysis. It introduces the MIG hierarchy - a model developed as a part of this thesis which represents a “hierarchy of needs” by the construction industry with regards to IT usage. Elaboration on current software platforms that will meet the constraints of the MIG framework follows.

2.3.1. MIG - Messaging, Information, Graphics

Goodman hypothesized that all information technology can be broken down into three components - messaging, information, and entertainment. Building on this work, I present a hierarchy of IT needs for commercial / construction enterprises, which I refer to as MIG - messaging, information, and graphics (Figure 2-3).

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9 Analysis found in thesis by: Thomas, Trevor, A Strategic Perspective on Establishing a Virtual Corporation in the CARICOM Region, February 1996.
10 Based on Williams, Frederick, The New Telecommunications, 1991, The Free Press, in which "telecommunications/information technology is used as a facilitator of procedures."
This hierarchy is structured on the basis of increasing cost of implementation and difficulty of implementation in addressing the tools most useful by the industry. By this it is argued that the most fundamental IT needs of a construction company may be achieved at the lowest costs, and thus at the lowest tier of the model. As sophistication increases, the needs are addressed at higher levels at higher costs than previous levels. This model assumes a difference between computer and IT usage. Computers usage is defined as operations and procedures performed to enhance individual performance and efficiently. IT uses computer to take the output generated and distribute same to other participants electronically. The following are summations of the properties of MIG.

Current research (see Figure 3.4 on page 36) indicates that messaging platforms are the most common first step in the evolution of a construction company’s information system. I argue that acceptance of messaging or e-mail systems are analogous to voice-mail and faxes. Voice-mail and facsimile machines have penetrated every aspect of business operations - they provide cost conscious value-added benefits to the user. The same argument can be made for e-mail systems. Platforms that provide transmission and reception of non-critical information via local area networks (LAN) or wide-area networks (WAN) are lumped into this tier. For the purpose of clarification, non-critical information shall include all correspondence that would be deemed not a part of contractual obligations. Such correspondence might include status inquiries, requests for information, and informal updating amongst the project team. Numerous commercially available platforms exists in the market. Such candidates include LAN e-mail based applications (Windows for Workgroups™, Lotus’ cc:mail™ and Microsoft Office™), as well as Internet servers (America-On-Line™, Prodigy™, and Compuserve™).
The second tier of MIG identifies those operations in which information transfer is required. Documents deemed necessary for contractual performance are included in this category. Examples include submittals, requests for information, change orders, project accounting or other official correspondence. The means by which this information is transmitted is more rigorous and formalized than the methods used in the messaging tier. In this case, two characteristics are necessary for optimum usage - editing and security procedures must be established, and similar platforms are recommended. A hypothetical case for information transfer, as defined above, is as follows:

A project manager, seeking an update of an Request for Information from the architect, is concerned that the two week response window is nearing the end. He or she drafts a letter placing the architect on notice that further delay will result in a claim against the owner for demobilization of the work force. Using Win-Pro™ by Lotus, the letter is sent to the Vice President of Operations for editing and the Controller for status updating (no editing privileges). The VP places his or her comments on the form and returns the document electronically. The Controller places a copy of the letter in the project's electronic folder. After incorporation of the VP’s comments into the document, the Project Manager “mails” it, with security restrictions in place to prevent alteration, to the architect, owner, and the project file. Response is immediate.

Although this example may seem adversarial, this business practice and the importance of such time constraints are common to the construction industry, and therefore this example shows the efficiency of such an electronic based system. The project manager never had to leave his or her desk to obtain a review by a superior, never had to print the letter on company letterhead, and never had to fax same - the PM was highly productive and cost effective. Currently, all the major software manufacturer’s produce systems with the aforementioned qualities. The information transfer may be handled via modem or WAN.
The last tier in the MIG hierarchy is graphics, and is arguably years away before its use is commonplace in the corporate environment. One obstacle to effectively achieving this tier, is the outdated hardware of the telecommunication conduits. Currently the communication lines are being upgraded to fiber optics which improve byte transmission and video conferencing speed. This level would provide means to transfer graphic data to project participants in the form of plans, shop drawings and the aforementioned video conferencing. Current means to achieve some of these goals are forwarding a floppy diskette or remote accessing such as file-transfer-protocol (FTP), an industry standard. With FTP, a company can retrieve plans from a host and download them onto their system using simple commands and modem connections. Another obstacle needing to be overcome is the information hoarding practiced by designers and architects. In this tier, the sharing of data requires a large degree of openness and commitment to a project-based orientation. The architect, who may feel threatened by the scrutiny of contractors and owner, typically protects and, according to current AIA documents, owns the drawings. Finally, video conferencing, (the ability to see counterparts during "phone" conversations) is currently being developed and refined by companies such as Picture-tel TM, MCI TM, and AT&T TM, to offer "stutter-free" transmission of images.

2.3.2. Existing Platforms

As previously mentioned, current hardware and software manufacturers continue to enhance performance and cost benefits to the user. Construction companies have a wide selection of commodities to choose from in their quest for IT-based operations. In an effort to gain a greater sense of the multiple offerings available, brief descriptions of various IT tools follow. It is assumed that the venture into IT-based operations begins with a minimum of computer assets such as workstations, modem lines, and most importantly the desire to use IT as a strategic tool. This section describes current methods of data transfer. It addresses the hardware options, as well as the latest software platforms.
2.3.2.1. LAN, WAN & the Internet

Initial ventures by construction companies into IT usually begin with their in-house systems. The decision to network, or link, their workstations depends on the amount information sharing they currently need to perform. The amount of information transfer needed, as well as who will receive the information, will dictate the method implemented. For example, small two or three person (workstation) operations can transfer data via floppy diskette. Although this may be viewed as an antiquated procedure, it remains a valid option for business lacking the necessary capital for IT expansion.

If information is to be transferred among several participants, or when the amount of data becomes too cumbersome to load on a single diskette, a local area network (LAN) is suggested. A LAN is a grouping of workstations (individual, independent computer terminals) that retrieve data from a single source, commonly referred to as a file server, see figure 2-4. The breadth of the network typically remains in-house, by that I mean the network connections are dedicated lines connecting the terminals to the server within the walls of the structure in which the business operates. Data on the server can be accessed by anyone sitting at a connected terminal and shared with anyone else on the network, providing they have access privileges. LAN's typical have some kind of log-on procedure as a measure of security to prevent unauthorized access. The log-on procedure may also limit user access to certain files contained within the file server.

Figure 2-4: LAN Configuration

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Diagram based on: Hunter, Phillip, Local Area Networks, - Making the right choices, p. 9, 1993, Addison-Wesley.
When data needs to be transferred to others outside of the home office, the use of a wide area network (WAN) to connect to these -site personnel is possible. Briefly, a WAN is a network that reaches terminals outside of the office to which to transfer data. The lines that transfer the information may be dedicated (physical conduit stretching between the two or more facilities), or common telephone line. Dedicated lines are used when the spatial relationships between the two sites are minimal or when the need for security is paramount. Security on a WAN prevents "hackers" from accessing the files via modem. Common conduits are classified as general telecommunication lines that may serve multiple purposes. For example, modem connections are phone lines temporarily dedicated to data or byte transmission as opposed to voice. These common lines are supplied by telecommunication vendors such as AT&T, MCI, etc. and remain the property of these vendors.

The most common form of a WAN is the Internet. This platform utilizes common lines (modem) to gain access and links or bridges multiple servers. The Internet, allows individuals access to sites sponsored by individuals, corporations, and institutions. Data may be transferred and received via e-mail, FTP, or other data transfer programs. For example, Netscape allows data to be downloaded onto the terminal from the Internet via pull-down menus.

2.3.2.2. Software Applications

This section addresses some the commercial platforms for data transfer via networks (LAN or WAN / Internet). Lotus Notes™ provides data transfer, security privileges, customization of protocols, and automatic updating of files (called redundancy). It may be either LAN or WAN based, but requires some programming knowledge to set up the transfer functions. Some of the programmable features of Lotus Notes™, are document transfer to specific individuals, automatic updating of lists (excellent for submittal tracking), and editing / review privileges. However, other commercial competitors are emulating these characteristics, such as the Microsoft Corporation with their Microsoft Network (MSN). This platform promises to be more user friendly. It offers the same features as Lotus Notes™, but is
structured similar to web servers, such as AOL, in that it is very graphic based. In addition to the features of Lotus Notes™, this platform also allows for web launching (access to the Internet), “chat” room correspondence, etc. It should be noted, that in conjunction with MIG theory, these platforms are in the information tier.

Although software manufacturers are developing programs to offer “everything” a business may need (security privileges, document access, updating) many larger commercial enterprises opt to have information tiered platforms customized for their operations. Examples of this are Bovis 2000™ and Wal-mart’s Wal-net™. Each of these companies have spent untold amounts to create exactly what they want in a system. These systems are generally connected via dedicated lines to prevent unauthorized access. Wal-mart, for example, utilizes satellite communication to link their stores and distribution centers. These applications are costly and usually necessitate in-house personnel to install and troubleshoot inevitable “bugs”. The implementation of customized software invariably creates barriers to information sharing. Those not in possession of the platform, can not receive, review or transmit information that may be essential to operations. For example, Hale and Dorr, a Boston based law firm, once utilized a custom application called OfficePower™, a word processing program. Unfortunately, training expenses, in-compatibility with other word processing programs, and MIS expenses to troubleshoot daily glitches in the system proved too horrendous. The firm is currently switching their word processing function to WordPerfect™.

2.4. Conclusion / Outlook

Several factors play a critical role in the adoption of IT in the competitive realm of the construction industry. The first being the need to overcome basing the flow of project information solely on the contractual lines of communication / hierarchy. As outlined in section 2.1, information flow continues to follow contractual lines - a very costly and ineffective manner, although there is an industry desire to overcome and see beyond these contractual restrictions. Yet claim documentation processes continue to enforce this practice. The second factor inhibiting IT’s acceptance is the ability to calculate
the benefits available to the project participant. Although no one can dispute IT advantages in terms of saving time and money, placing actual numbers on its rewards proves to be much harder. It is difficult to calculate the return on investment based on IT's value added benefit. Generally, a general contracting firm can expect net margins from a project in the range of 2 - 3%, with a high of 6%. This narrow margin can be eradicated if the project experiences cost overruns. With such narrow margins, construction company must pay close attention on cost management and therefore, an expenditure of several hundreds of dollars on a yearly basis is a very real gamble for a construction company to face.

Thirdly, the construction industry is unjustly viewed as unsophisticated commodity providers. Based in part on the nature of the service provided, a strategic view indicates no real value is added to the end user by the implementation of an IT based system. Yet, as with the fax machine, current trends in owner drivers may change that outlook. Lastly, the current nature of the entire industry must change to encourage collective rationality amongst all the project participants, with such drivers as Partnering agreements, umbrella policies, and education.

In this chapter we have reviewed the construction industry, its contracting mechanism for project procurement, current IT platforms, and the MIG hierarchy of IT implementation. The need to understand IT’s importance to the construction industry and how it may play a role in strategic planning is now discussed. To illustrate, Noolan's strategic grid is applied to a typical general construction firm (see Fig. 2-5). The subject firm is Standen Contracting Co., Inc. (Standen) of North Dartmouth, MA a general contractor with approximately $13 million in annual revenues. Standen acquires a majority of their work through advertised "Notice for Bidders", which is primarily lump-sum work. They utilize approximately twelve (12) computers networked together (LAN) to facilitate information sharing. Standen was chosen because of the author’s personal knowledge of the company as well as its conformance to CCC’s target customer (see chapter 3 for customer profile).

Noolan's strategic grid is a method of categorizing businesses by examining IT's strategic value in corporate planning. This model can be used as a strategic tool to evaluate an entire industry or on a case-by-case basis with regards to attaining competitive advantage. For example, use of this model to examine entry into the financial or banking market segments would indicate a very high level of IT commitment, while a comparison of two competing general stores may reveal a corporate philosophy of less IT dependency and more customer service. The categories Mr. Noolan uses are support, factory, turnaround, and strategic - definitions of each are found below.

**Support** - refers to companies not highly dependent on IT for either their operational functioning or their strategic positioning.

**Factory** - heavy reliance on IT for operational uses, but not essential for strategic positioning. For example, automobile manufacturers.

**Turnaround** - IT development critical to strategic planning, yet no substantial operational value at this time.

**Strategic** - utmost reliance on IT for operational as well as strategic operations.

Currently, Standen (light colored ellipse) is in the Support node with a tendency towards Factory. By this, no strategic importance is placed upon IT other than its use as a facilitator of current operations. The company utilizes IT through commercially available software programs for accounting, estimating and project correspondence. Only recently, have minor memorandums been transferred via e-mail - the first tier of the MIG hierarchy. By contrast, a residential home builder may be firmly set in the Support node (neutral ellipse). However, as one continues up the MIG hierarchy and applies those principles to this grid (shaded square), they evolve towards the Strategic node - as illustrated by the banking industry. The banking industry's complete dependence on IT for the transfer of financial data (ATM's, credit reports, credit cards, etc.) has evolved to making IT a strategic positioning and planning tool.
As the construction industry further develops its IT investment and uses it as a strategic tool to gain competitive advantage, the industry will become less fragmented and adversarial. Although the construction industry is "built" on the erection of steel, concrete, and labor, IT can both facilitate operations and guide corporate strategy. Once the contractual obligations are reduced and a free exchange of information is promoted, the industry will change and become even more of a "virtual" entity (see fig. 2-6). Participants will have easy 2-way access to project specific information (dashed lines). They may be directly bound to the project via some contractual arrangement (solid lines) or may contribute as consultants with a wide range of obligations. The key to IT's success in the construction industry, is a free flow of information to those individuals who have a need for it, regardless on which project they may be a part of, what their position is, or who they work for.

Figure 2-6: Future Information Flow on typical Construction Project.
Chapter 3 - Market Assessment

3.1. Introduction.

The formulation of a successful business plan begins by understanding the market segment in which the company plans to operate. Contrary to Ralph Waldo Emerson’s famous quote, ‘If a man can make a better mousetrap than his neighbor, though he builds his house in the woods, the world will make a beaten path to his door.”, market penetration and corporate growth depends not only on the “mousetrap” being a product that consumers want and can use easily, but getting the word out regarding the advantages of the new product. For example, VisiCalc, the first spreadsheet software, was soon surpassed in sales and eventually was absorbed by Lotus, who offered a more user-friendly package to the mass-computer market as opposed to business clients.\footnote{Timmons, Jeffry A., \textit{New Venture Creation}, Rev. 4th ed. Irwin, p. 48, 1994.} With this in mind, the market acceptance for Clory Construction Consultants to offer IT services to the construction industries needs to be studied in order enhance the feasibility of corporate growth. The goals of the market assessment, and ultimately the formulation of a potential customer profile are as follow:

1) identify the existence and use of IT within typical construction companies,

2) identify the optimum target clientele for IT consulting services, and
3) gain insight into the price sensitivity of IT consulting services.

When conducting a market survey, several options may be utilized. Established businesses may draw upon the expertise of professional marketing research consultants to identify the marketability of a new product or service. These professional consultants often use such sources as in-house databases, telemarketing, networking, and trade publications to identify market penetration, potential sales forecasts, and consumer price sensitivity. Larger firms may utilize their own in-house staff to perform market research. Unfortunately, these research options are beyond the financial reach of most first-time entrepreneurs. Hence, the market study for CCC was conducted using the recommendation in “New Venture Creation” by Timmons’, in which he recommends the first step in marketing research should be a complete search of library materials. However since the required information needed needs to be “highly specific” and “current”, he suggests another option, such as direct communication or surveys with market participants14. Hence, this chapter describes the methodology and results of CCC’s market research and assessment of introducing IT consulting services to the construction industry. In addition, it describes the “niche” market segment that offers the greatest promise of sustainable growth and profitability for CCC.

3.2. Methodology of Research / Survey.

To obtain market demographics and develop a customer profile for CCC’s IT consulting services, the author conducted a direct survey which was structured to meet the goals previously listed. The author believed that a written survey would offer many obstacles such as; 1) late survey returns, 2) lack of clear and exact answers to the questionnaire, 3) the impersonal nature of such surveys might reduce the number of respondents, and 4) the potential for completed surveys to be “lost in the mail”. With these factors in mind, the author chose to conduct a telephone survey. The decision to use a phone interview format to collect research data was based in part due to the informal nature of the subject. By this, it was hypothesized, that the IT manager, or more commonly a Senior Project Manager with interests in IT,

14Ibid., p. 108.
would be more willing to offer information on the company’s use (present and future) of this technology over the phone than with a mail-in questionnaire. Due to the nature of the subject matter of the survey, concerns over trade- or corporate secrets were alleviated. Further, by maintaining a human interaction with the interview subject, thoughts and comments were allowed to be fully developed leaving no chance of ambiguity.

The survey was structured to obtain specific information regarding IT use (current and future) within the construction industry. The questions utilized during each interview are shown in figure 3-1. A list of the companies contacted during the survey may be found in the appendix.

| Date: |
| Company: | Contact: |
| Describe Company, Markets, etc. - |
| Types of computers used - PC/Mac/Unix |
| Describe primary uses of computers at firm- |
| Are computers used for communication |
| Current software Applications being utilized - |
| Are systems networked - LAN/WAN |
| Who installed computers - in-house/out-source |
| Performance of computer consultant - |
| Expectation of information sharing (IT) among parties in future? |
| Feasibility of IT based information sharing in industry? |
| Largest barrier to information sharing in industry? |
| Do you practice partnering or other team based project delivery procedures? |
| Anticipated upgrades to existing systems? |
| Assume IT based system... features utilized? |
| Suggesting price sensitivity of hardware, consulting service, etc.? |

Figure 3-1: Phone Questionnaire
To limit the vastness of research possibilities, it was decided to focus the efforts of the phone interview on a random sampling of construction companies with a base of operations in Massachusetts. This segment proved appealing for two reasons:

1) Personal knowledge of the construction companies within this geographic region could be utilized to narrow the field to those participants within the targeted revenue range, and
2) communication to the subjects in this region would reduced the financial burden of conducting the survey.

Companies to be included in the survey would have yearly revenues between $5 million and $25 million in sales. It was hypothesized that those companies with revenues below the lower threshold would be in the start-up phase of organizational development and therefore inclined to live “day to day” with little strategic outlook for the future or would be one person operations. Personal experience of the author indicated these “start-up phase” organizations, typically sole proprietorships, invest heavily in efficient IT tools and products such as cellular phones, laptop computers, etc., and generally do not gain their product information from paid consultants but rely on various trade magazines and media advertisements instead. At the higher limit, it was assumed that companies with revenues higher than $25 million yearly revenues would have greater capacity to invest retained earnings in organizational information infrastructure components, and that they would not only be investing in IT but also in in-house personnel for the administration and expansion of applications. The use of in-house management information system (MIS) personnel by these companies would preclude CCC’s services at this early stage of its development.

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16 Discussion adapted from Minzberg, Henry H., Structuring Construction Organizations, Chp. 3-6,
3.3. Results of Survey.

The data obtained from the phone interviews is represented in graphical form below. Thirty regional general construction / construction management companies were contacted, of which eighteen were cooperative and participated in the survey. These companies were highly diversified within existing markets ranging from general contracting to such niche markets as marine construction, and ADA (American with Disabilities Act) renovations. The subjects generally considered IT development paramount to future success, and outsourced the maintenance and installation of computer technology. It was discovered that a full 100% of the respondents to the survey utilized computers in some capacity. This fact allows the MIG hierarchy model to be applied to the respondents in attempts to identify the tier to which they belonged.

An interesting development occurred regarding the revenue range CCC hoped to target as potential clients. The hypothesis to target companies within the $5 million to $25 million window proved to be in error. It was discovered that the threshold to utilized custom programming and in-house capabilities generally surfaced at companies who had revenues greater than $15 million. Reluctantly, CCC's target market was adjusted and redefined to reflect this window of opportunity - a reduction of 25% of expected market.

It must be stated that this survey and the conclusion reached should be considered a rudimentary inquiry into the use of IT by the construction industry. Further investigation to provide a normal distribution curve of the respondents' answers is suggested, and therefore the following information should be regarded as a first-order estimation.

The first set of data (Fig. 3-2) presents the percentage of companies which use their IT systems in some tier of the MIG hierarchy. A full 71% of the respondents only used their computer systems for applications such as word processing, accounting, payroll, etc. The remainder have ventured into some
phase of the MIG model and expressed continued efforts and costs expenditures into developing additional uses of IT.

Figure 3-2: IT usage by Respondents.

The second set of data (Fig. 3-3) represents the breakdown of IT use by revenues. Only those companies which utilize their computers as a tool of IT and are currently in some tier of the MIG hierarchy are included in this graph. As stated above, the initial assumption regarding the revenue range of the potential clients for CCC proved to be inaccurate. The equal percentages of respondents to the ranges "between $15 and $25 million" and "greater than $25 million" validate a conclusion that companies beginning to invest in IT at a lower revenue level than originally assumed.

Figure 3-3: Revenue Distributions.

The third set of data (Fig. 3-4) shows what stage in the MIG hierarchy, those companies with IT investments occupy. As in figure 3-2, only the 29% of companies that utilized their computers for IT use
are included in this graph. In conjunction with the information presented earlier, evolution into the top tier (Graphics) is not easy to implement due to procurement costs and current hardware restrictions. Although the sampling did not reveal any use of IT tools to facilitate "graphics", it is suspected that companies with larger revenues exists and are in this tier - but they are outside of CCC’s target clientele.

Figure 3-4: MIG Hierarchy.

Finally, the forth set of data (fig. 3-5) concerns the means and methods of IT software and computer hardware installation. As previously outlined, CCC will offer complete IT / MIS services to this industry, and as such, it is critical to estimate the market size for these services. A majority of the respondents utilized in-house personnel. Thus, once the company grows, the marketing strategy for CCC will be changed to target a different “decision maker”. The minority of companies used outside personnel to install and advise the subjects of IT advances, etc. and it is these companies that will be targeted. Thus, the total market share CCC is expecting to target is approximately 26% - a tremendous opportunity. This figure is based upon number of respondents utilizing out-sourced consultants versus the total number of contacted companies.
3.4. Conclusion.

This section presents CCC’s customer profile and relevant opinions of the survey respondents. The profile identifies deficiencies with the survey, in the hopes that future readers build upon this data.

3.4.1. Customer Profile.

The telephone survey data, in conjunction with the above analysis, provide sufficient insight into the Massachusetts construction industry to develop a preliminary customer profile. A customer profile is a list of client characteristics that CCC will use as criteria to identify and target potential customers. CCC’s customer profile is:

- General contractors and construction managers with annual revenues or contract values between $5 million and $15 million.
- Companies running IBM compatible (or DOS-based software) platforms. The survey identified only 5.5% of the respondents using Mac-based applications.
- Companies who out-source their computer support as well as software advice.
- Progressive companies that acknowledge the importance and the benefits of IT. The survey identified six (6) companies that did not utilize IT, yet understood the importance of IT but were tentative regarding implement due to lack of knowledge.
- Companies that participate in trade shows, subscribe to trade publications, etc. This characteristic allows “mass-marketing” by CCC.
The survey has several deficiencies which need to be addressed in the future through direct solicitation. These deficiencies are:

1) The price sensitivity of IT applications to the construction company. The companies surveyed were privately owned and simply did not wish to reveal the costs associated with IT.

2) Acceptance of project-based philosophies and procedures such as Partnering. Although not part of this interview format, the attitude to these beliefs may be a catalyst for IT.

3.4.2. Subject Opinions.

In addition to the above data and conclusions, there are other findings, that are worth noting. Several survey participants were willing to press their personal viewpoints of IT usage in the construction industry. These opinions are held with high regard because they are based on personnel experiences with implementing IT within several firms. They also tend to validate the theories and hypothesis employed in this thesis. A majority of these individuals requested anonymity, therefore for the sake of simplicity, identification of these respondents and their companies will remain confidential. With this, a summary of the collected viewpoints follows. Please note that these opinions are those of survey subjects:

- Reluctance to use IT is partially based on unsophisticated nature of contractors and owners.
- Need for “paper trail” in contract litigation to document claims required.
- Control over construction aspects difficult to let go, specifically by the Architects and their nature and motivation to maintain sole possession of drawings.
- Ease to applying IT is best demonstrated by the “one-man, back of the truck” contractor who, by nature, is extremely mobile. They are already employing very advanced techniques for information transfer. (By this the respondents probably mean cellular fax communication via laptop computers.)
- Security issues are a major concern.
• All IT implementation will be owner driven and ultimately required by contract. Acceptance predicted within 10 years.
Chapter 4 - Strategic Plan for Competitive Advantage

4.1. Introduction

This chapter presents strategic planning concepts available to the entrepreneur and how they can be applied. A multitude of manuals and texts are available on the subject of strategic planning. These include Michael Porter’s “Competitive Advantage” - which presents management theory and strategic tools to better understand the competitive nature of companies, such as SWOT analysis - a company’s evaluation of the industry in which it participates to identify its Strengths, Weaknesses, Opportunities, and perceived Threats.

The first portion of this chapter presents John Macomber’s “Strategic Planning for Contractors: 8 Steps to Success” and uses it to analyze CCC’s strategic plan. Mr. Macomber’s process is similar to the SWOT analysis. The second portion of this chapter will test the conclusions reached in the first half by using Michael Porter’s tools of strategic analysis.
4.2. Eight Steps Planning.

According to John Macomber, strategic planning can be broken into eight steps\textsuperscript{17}. Figure 4-1 presents the “steps” and the planning process. This process is reiterative - meaning at any point in the process, new information may change the decisions of previous steps. This is especially relevant after the implementation phase (referred to as the “Do It” step), were a wrong assumption or inaccurate market assessment may result in poor product or service performance. These steps are categorized into three parts - observation, planning, and implementation. Because CCC is in the planning stage of corporate development, only the first category (observation) can be applied, which include the mission statement, the environmental scan and internal scrutiny.

4.2.1. Mission Statement.

The first step in this strategic planning model is the formulation of a mission statement. A mission statement is a road map of the corporation’s activities that company employees can easily understand and rally behind. The statement should be no more than a paragraph in length, yet it should contain enough detail to specifically outline the corporation’s objectives. A mission statement that is too broad or encompassing of too many objectives should be discouraged. For example, the Turner Corporation’s mission statement reads:

*Turner will be the recognized leader in providing building construction services, both nationally and in every location in which Turner operates.*

*We will achieve this by consistently exceeding our commitments to and the expectations of clients, design professionals, subcontractors, and vendors, and the community at large.*

*These services will be delivered by team-orientated, responsive, innovative, reliable, ethical and skilled staff who participate in a world-class training and development program and benefit from a career employment opportunity.*

This statement, although implemented by a multi-billion dollar company, is too encompassing and optimistic to be a driving force for its employees. The strength of the mission statement lies in its ability to; 1) communicate the company’s goals to all of its employees, 2) act as a barometer in achieving these goals, and 3) be revised in the event of changes in strategy. Companies may have a multitude of sub-statements which identify specific areas of concentration - a concept that Turner should utilize for their building construction, construction management, real estate, and corporate divisions.

Previous sections of this thesis have presented CCC’s objectives, product / service, customers, and region of operations - necessary information for the formulation of a mission statement. Therefore, its

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statement could read, “Clory Construction Inc. will provide construction and information technology consulting services to the construction companies with revenues between $5 million and $15 million in annual revenues with operations based in the New England region.” This statement flies in the face of the objectives outlined in the previous paragraphs. It doesn’t offer insight into which type of construction companies, whether or not it will be operated as a not-for-profit organization, nor what the driving concept for employees is. Fortunately, the development of the mission statement is evolutionary and can be revised upon reflection of other data collected from the environment and the internal characteristics of the firm, as well as Porter’s strategic analysis tools.

4.2.2 Environmental Scan

The second step in Macomber’s model is the environmental scan. The purpose of this step is to analyze and account for the external factors which may influence corporate planning. Examples of these external factors could be: regional economic conditions, market growth, labor and material supplies, etc. Although the list of external factors that influence a firm’s development is endless, this examination should attempt to identify those items which are most important and can be utilized in achieving competitive advantage. In analyzing the “environment” in which CCC plans to compete, we must examine both the construction and computer consulting industries, as well as general information. It has been hypothesized that there exists a need to offer these combined services to the participants of the construction industry - this step will validate this assumption. Each industry is characterized by diversification and fragmentation, and each can experience tremendous growth. The construction industry is highly dependent on the economy with growth percentages appear to rise and fall in harmony with the prime rate. Conversely, the computer industry has not stop growing. Since IBM’s introduction in the early 80’s of the personal computer, the industry has attained multi-billion dollar status.

Change between the two industries are remarkably opposite. The construction industry is slow to change. Processes, products, and philosophies are generally the same since World War II. By contrast,
the computer industry appears to change overnight, with new models and software platforms becoming, in affect, obsolete within a few years, if not sooner.

Regionally speaking, the New England area contains the most innovative, well-renown, and dynamic computer science / engineering companies throughout the nation. These industries can provide the skills that be cultivated to potential strategic partners while, the network of MIT graduates are a viable means to gain IT expertise. Although CCC is not based on cutting edge technology, the resources available to develop into a custom programming supplier are readily available.

4.2.3 Internal Scrutiny

The third step in the strategic planning model is internal scrutiny - a candid look at the strengths, weaknesses, and needs of the company. This examination should include the resources available to the company as well as those resources needed. Two examples of these resources are management qualifications and sources and use of funds. By understanding all of the traits of a company, a strategic plan may be developed to enhance its strengths while addressing its weaknesses.

CCC is founded by Eric Clory, a New England native, and a Master of Science degree candidate in Civil and Environmental Engineering from the Massachusetts Institute of Technology. In addition to his graduate degree, he holds a BS in Building Construction Technology from Wentworth Institute of Technology. His work background includes positions in residential carpentry, land surveying, and general construction project management. He has been intimately involved in or supervised many project types including; natural gas line construction, industrial coating (painting), residential renovations and new commercial construction. Most recently his duties as project manager has exposed him to estimating, scheduling, project accounting, and word processing software packages. Specifically he is proficient in Timberline Estimating™, Suretrak Project Scheduler™, as well as most commercially available spreadsheet and word processing programs. These characteristics of the founder, provide CCC with a keen insight and a thorough understanding of the workings of the construction industry.
However, construction insight is essential for only one half of CCC’s services. Expertise in IT and its associated components is needed to fulfill the mission of the company. Though Mr. Clory has a basic understanding of the hardware utilized for electronic information transfer, as well as most major software applications, the company will need the benefits of an experienced computer engineer to facilitate, implement, and maintain the systems required to begin evolution into the MIG hierarchy of IT needs. The ideal candidate will have experience in network engineering, as well as computer sales, and most importantly understand the mission of educating and exposing the construction industry to the computer industry. As the founder is a graduate from MIT, the network of fellow graduates, especially those with computer technology skills, may provide the solution to CCC’s IT deficiency. This network may also provide a means of marketing as well as possible clients.

4.3 Strategic Planning

Strategic planning should be viewed as preparing to take a hiking trip - without the proper amount of preparing and packing, the trip will not be enjoyable. This section applies strategic planning tools to CCC’s mission, as adapted by Michael Porter. The tools presented are the value system, generic strategy model, segmentation matrix, and five forces analysis. Conclusions and validations of each tool, as applied to CCC, are presented.

4.3.1 Industry Value Chain.

The industry value system is a means of displaying all the participants within a product or service flow through graphical representation, see figure 4-2 below. Commonly referred to as a value chain, each participant is listed if he or she adds some value to the product that is beneficial to the end user. For example, house construction is a simple illustration. The suppliers provide building materials to carpenters and other trades who take the materials and add their value - constructing. The end user assess the value added benefits and decides what he or she is willing to pay for this value. Too many “middle-
man" may decreases the value added benefits of the product to the end user while at the same time increasing costs in the form of mark-ups and thereby increasing the total "retail" price.

The value system graphic representation is important for two reasons: 1) the identification of niches, or roles for product or services that may be overlooked or exploited; and, 2) the identification of the direct influencing forces (in the form of other companies) to the subject company. Common terminology refers to companies that provide raw materials to the subject company as being “up-stream” while those to which the companies supply to are considered “down-stream”. The importance of understanding the relationships between the upstream and downstream entities is important when considering the amount of influence they can exert (see section 4.3.4. for five force analysis).

Figure 4-2: CCC Value System.
The above graph is representative of CCC position as well as its relationships within the industry value system. The solid arrows represent direct contact as well as the service sales path. The dashed lines indicate the participants which can be involved in a typical construction project. As the product is constructed, value is added from left to right through input by vendors, engineering, production, sales, etc. Information transfer that facilitates this evolution is generally right to left, and along contractual lines. The sphere of influence CCC hopes to capture within the value system, is represented by the shaded circle. Here, it is anticipated that CCC’s services provide the means to allow a free exchange of information, which in turn, creates a more cost effective communication system, and thus lowers cost down stream. According to Porter, the best strategy to realize this sphere of influence would be to develop alliances or coalitions among the members of a construction project and cultivate an understanding of the mission.

4.3.2. Generic Strategy

The generic strategy grid is a model used to describe the tactic or philosophy utilized in bringing a product or service to market. There are four categories that a subject company can utilized in determining the classification of its marketing or sale strategy, see figure 4-3. Along the horizontal axis are the categories low cost and differentiated. Low cost refers to a pricing strategy where cost are key to obtaining competitive advantage. The category of differentiation refers to a strategy of providing unique and varied services (or products) to a market segment regardless of the price per unit. The vertical axis of the chart likewise contains two categories, they are narrow and broad. A narrow focused strategy is one in which a company’s offerings is targeted towards a specific market segment or group. Conversely, the broad category represents a companies willingness to target multiple market segment.

A company’s strategy is aligned with the market when is matches what the market is willing to bear. Competitive advantage may occur when this happens, as opposed to another company with misaligned strategies. For example, the market demands low unit costs for #2 lead pencils - a product everyone utilizes. If the pencil manufacturer is asking a premium unit cost, the generic strategy needs to
be reevaluated. They are practicing a differentiated / broad strategy versus a low cost / broad strategy. Alternatively, Mercedes Benz provides luxury sedans to a specific market segment - those who appreciate high quality versus cost savings. In this case Mercedes’ generic strategy is aligned with their target customer base - they have implemented differentiated / narrow strategy.

![Figure 4-3: CCC's Generic Strategy.](image)

The most effective method to obtain competitive advantage from the services offered by CCC is to implement a differentiated / narrow generic strategy. CCC’s strategy is differentiated due to the unique services it combines - IT with construction consulting. There exists many consulting companies (construction and computer) that provide services to this industry, however, inquiries revealed none can do so with the unique blend of CCC. Yet, this differentiation must have some value to the end user, but not so much as to place a higher price than the market can sustain or absorb. Thus, as presented in the graphic, the block representing CCC’s strategy is close to the low cost category. The price CCC is able to charge, although the user is obtaining a unique service, is directly related to the market conditions and inherent characteristics of the constructor industry. The low operating margins that many construction companies live by, demands this type of strategy. As market share grows, in conjunction with the sensibility of IT in the construction arena, the strategy may shift to being more differentiated. In this case, customized platforms and therefore the increase value to the end user may lead to increases pricing.

CCC must implement a narrow strategy. The characteristics of the company illustrate that expertise resides only in the construction market. Unlike General Motors, whose core competency to build automobiles can extend from the economy to the luxury to the truck markets. CCC’s product is targeted to only a small niche of the computer industry’s market. Fortunately, it is this obscurity of the market that allows the business opportunity to exist.
4.3.3. Segmentation Matrix.

A segmentation matrix presents information regarding market segments and assess the appropriateness of the strategic plan to target these segments. It is a very user friendly graphic in that there are no set parameters or guideline for use. The user groups various characteristics about markets or customers in general and “plots” them against another useful parameter. Once the parameters are established, they are assessed against the company’s strategic plan or current operations. Occupied blocks represent current activities, or endeavors, in that particular segment. Any voided area represents potential opportunity. A user can then evaluate the appropriateness of the company’s strategy and may in fact find a complete contradiction to a mission statement, or unforeseen opportunity.

CCC’s segmentation matrix may be found in the appendix. To summarize, CCC plans to operate in the New England region, servicing active participants in the construction process whose revenues are between $5 and $15 million annually. These findings are consistent with the parameters discussed in Chapter 3. Yet, there exists tremendous opportunity for growth. To illustrate, there exists companies whose revenue lies outside of the target threshold that may be interested in CCC’s concepts. These companies can be searched out without large allotments of time and moneys.

There exists other opportunities that may be beneficial to pursue once CCC becomes established and obtains a comfortable market share. One segment worth investigating is the possibility of CCC utilizing its knowledge of information technology, to provide construction consulting services to “non-IT” inclined construction participants (hatched areas on the segmentation matrix). Data such as claim preparation, scheduling expertise, etc. can be created by CCC and transmitted via IT to normal fax machines while correspondence can take place over the telephone! Another example comes from the fact that the business opportunity is believed to be valid and potentially profitable. CCC can then “franchise” the idea and the associated intellectual property to others via some form of strategic alliance thereby expanding the market regions (striped areas). Although these other segments seem appealing, and worth investigate upon incorporation of the company, they do not justify uncontrolled attempts at growth.
4.3.4. Five Forces Analysis.

This model was first presented in this paper in Chapter two. It presents the attractiveness of an industry or corporate strategy by evaluating the factors which affect it. These factors (clockwise from top, then center) are: barriers to entry, buyer power, threat of substitution, supplier power, and threat of rivalry. Each with their meaning is listed below:

- **Barriers to Entry** - As the title implies, this is an evaluation of how difficult it is to "break" into the industry, or what barriers must be overcome. Examples of some issues to take into account would be capital requirements, special skills needed to perform work common to industry, ease of marketability.

- **Buyer Power** - This means the amount of influence buyers of the product have over the company. For example, Massachusetts Electric has a very low buyer power coefficient, while Ford Motor Company has a high coefficient.

- **Threat of Substitution** - This simply means the ability that the company's product or service can be substituted with another completely different product. An example of high threat of substitution would be the example of the pencil manufacturer. A buyer can simply purchase a pen.

- **Supplier Power** - As with buyer power, this is the amount of influence suppliers can exert to the company.

- **Threat of Rivalry** - This characteristic evaluate the direct competition of the company.
This diagram indicates the CCC's business opportunity is fairly attractive. Each evaluation criteria follows:

- There are moderate barriers to entry due to the skill level of experience needed for the construction and IT industries. Costs are somewhat minimum to start-up.

- The company has to deal with high buyer power. This is attributable to the characteristics and financial resources of the construction industry in general. Buyer's need not buy if the price, service, and expertise is not what is expected.

- It would be unrealistic to think this is the only mechanism for the construction industry to incorporate IT into its operations. However, research indicates that no other company is performing these tasks specific to the market, therefore this parameter is considered to be of moderate concern.

- Supplier power is low due to the fact of how little need there is for materials. Although CCC plans to offer hardware and software products to its customers, the tremendous amount of competition in the computer industry alleviates any concerns of obtaining the necessary equipment.

The threat of rivalry currently is low. However, this will change as demand for IT increases within the construction field.
4.4. Summary.

The focus of this chapter has been to outline and develop the strategic plan for CCC. To summarize, the characteristics of the industry in which CCC plans to operate is appealing. Firstly, it must acquire the expertise of a computer engineer who, like the author, realizes the potential of this opportunity. CCC must maintain a differentiated, narrow strategic in its pricing and customer identification in order to stay true to its core competency. The company should maintain its operations in New England due to its familiarity with the local climate, but needs to keep a look out for opportunity outside this region.

As initially outlined, the strategic planning process is reiterative. Therefore the mission statement can now be revised to reflect the results of these studies.

“Clory Construction Inc. will seek and obtain expertise in the fields of construction and information technology in order to provide, for a profit, consulting services to the construction project participants who have annual revenues between $5 million and $15 million with operations based in the New England region.

The company will utilize its own expertise to seek new opportunities in the construction consulting field as well as expand its market share through strategic alliances throughout the nation and beyond.”
Chapter 5: The Business Plan

5.1. Introduction

This chapter presents the strategic business plan for the start-up company - Clory Construction Consulting (CCC). It is intended to be a stand-alone document for the purpose of soliciting investor and/or principal consideration. The information presented in this chapter is based in-part on the data generated previously in this thesis, therefore acceptance of the redundant nature of information contained herein is requested. This chapter follows generally accepted business plan formatting, specifically, as adapted from Jeffry Timmons' "New Venture Creation". It contains the following elements:

1. An executive summary, which is a one page description of the company, product, and financial needs of the company. This section is designed to elicit the interest of potential investors and/or future principals and entice them to read the more detailed plan.

2. The business opportunity section lays the groundwork of the product or service with regards to the industry in which the venture hopes to compete and general data such as industry market share.

3. The company and the product section provides the information pertaining to the company's structure, incorporation status, and location, as well as a detailed description of the product/service including costs, implementation, and future expansion.
4. The market analysis section provides a summary of the competitive market segmentation targeted for venture growth. In addition, it identifies the optimum client for CCC’s services.

5. Company strategy and operation plans are offered with specific attention given to the forces of competition, as well as sales tactics to be employed.

6. Financial data is summarized in this section with particular emphasis on the company’s first year pro-forma, and scenarios predicting corporate feasibility. Detailed charts of five year projections are contained in an appendix of this plan.

7. The qualifications and professional expertise of the management team are offered in an attempt to alleviate any fears of venture failure perceived by the reader. Personal resumes and letters of qualifications are contained in the appendix.

8. The assumptions used in the formulation of this plan are offered to the reader in attempts to alleviated issues of overly optimistic projections and market threats.

5.2. Executive Summary

Clory Construction Consultants, Inc. (CCC), will provide cost effective solutions to the information needs of the construction industry. Conceptualized by an SM graduate in Civil and Environmental Engineering from the Massachusetts Institute of Technology (MIT) as a part of a graduate thesis, the company offers construction consulting and information technology (IT) consulting services. These two distinct services offered by the company are an effort to distinguish it from the competition.

The construction consulting service offers advice on all aspects of construction operations required at the project management level and higher. Typical services include scheduling, estimating, cost-accounting, and claim documentation and preparation. In addition to the aforementioned, the company offers workshops in Partnering - a process in which all project participants work unilaterally to common, non-contractually based, goals. These services are structured to facilitate the incorporation of information technology - the second service offered by CCC.
The company’s IT consulting services are offered based on the MIG hierarchy - a philosophy developed during graduate research at MIT. This hierarchy is a guide to address the implementation of IT needs of businesses. In short, as a company evolves in its IT usage it will progress from Messaging to Information to Graphic IT applications. By offering the tools (computers and software applications) and expertise (via a yet to be named principal) the company feels it can capture a substantial market share in New England’s construction industry.

The company will act as a distributor of computer technology, thus overhead and inventory costs are substantially reduced, additionally, it will lease office space, equipment, etc. in an effort of continuous expense containment. The initial capital investment of $10,000.00, secured with an SBA 7(a) loan, is used for corporate start-up costs, seminars, marketing, and office expenses. The addition of a computer science expert to the company with an equal investment contribution will enable the company to being operations by year’s end.

The company anticipates first year revenues to be approximately $75,000.00 with a growth of 15% annually for the next five years. Initially, the principals’ salaries will be set at a minimal level for basic living needs with net profits to be distribute at the end of the fiscal year. Gross margins are expected to be 40%.

5.3. The Business Opportunity

It can be argued that the construction industry is a paradox. It is responsible for approximately 10% of the US GDP, an annual value of $510 billion, yet is it also one of the most highly fragmented and adversarial industries in the US. Further, project delivery systems, such as the design-bid-build and design-build methods, have yet to provide the contractual mechanisms for the promotion of information flow in such a way that would enable companies to take advantage of information technology (IT). However, there is light on the horizon. The adaptation of team-based project delivery procedures are
resonating from construction leaders, the academic world, and progressive owners. They wish to alleviate the tendency of practicing business in a “zero-sum game” environment. A window of opportunity exists to educate and provide IT services to those entities in the construction process (Contractor, Owners, and Architect) and enlighten them that a cost effective means exists to incorporate information technology in the day-to-day aspect of construction operations.

Research indicates 49% of construction companies in the New England region currently utilize some form of IT as defined by the MIG hierarchy - a theory that IT inclusion into the business environment follows a pattern of messaging, information transfer, and finally, graphical representation of data including video conferencing. Additionally, the majority of these companies are out-sourcing their computer consulting services. CCC will be in a position to not only offer expertise in computer applications, such as network installations, system upgrades, etc., but can also tailor these recommendations to best suit a company who’s business is in the construction field. This specialization of service is common amongst other professions who are carving a niche in the construction industry. For example, lawyers and accountants are promoting themselves as “construction claims experts” and “claim analysis auditors”.

5.4. The Company and Product

Clory Construction Consulting, Inc. (CCC), a Massachusetts corporation (December 1996), offers IT consulting service and sales which meet the specific needs of the construction industry. Based in Boston, MA, the company is a collaboration of construction and IT knowledge and provides to the construction industry a new vision to incorporate IT into the operations of a firm, regardless of size or core business. The company currently employs one person, founder Eric M. Clory, as construction advisor. It is anticipated that the challenging aspect and uniqueness of the corporate mission will inspire others, specifically computer science professionals, to join.
The unique characteristic of the services offered by CCC is founded in the inherent knowledge of needs of the construction industry and how IT can address those needs. By understanding the needs of the client, CCC can select applications from standard IT offerings - thus offering a lower cost than custom software applications. Additionally, as the company grows, “custom” software may be offered through joint ventures and strategic alliances with software manufacturers such as Primavera or Timberline. The potential for this service is tremendous. Currently companies with a computer (s) are serviced by computer oriented companies with little understanding of the operations of their customers. This is understandable, since an outsider can not be expected to understand the need of a construction firm to speed up its submittal process, to share design changes more rapidly and efficiently, to distribute Architect directions in a more effective manner, and so on. Some may suggest that computer consultants currently perform this advisory role, by promoting faster hardware configurations or “hot” software applications to augment business operations. However CCC adamantly refutes this statement. The time has come for the IT industry to differentiate itself with regards to the markets it serves in a cost effective and tailored manner. The IT industry now provides advise and services to construction companies in ways analogous to taking a sports car to a diesel mechanic, or having a brain surgeon suggest remedies for an ear infection. The construction industry has specific needs that up until now are not being adequately met.

CCC realizes the competition in just the “computer consulting” or in the “construction consulting” fields is fierce. A recent investigation into several trade magazines provides illustration of several national construction consulting firms which offer services from scheduling and estimating assistance to claim preparation. Additionally, the competition and growth of the computer consulting industry is tremendous. Thus to differentiate itself in this environment, the Company will offer both construction and IT consulting services to industry as follows;

1) IT based consulting services, provide recommendations to incorporate cost-efficient IT platforms into the client’s environment. By identifying and providing current IT platforms and systems already in production - as opposed to costly or customized applications, customers can benefit from the
market’s overall acceptance, ease of hiring trained employees (or finding new employees with the similar experience on the system), and costs benefits captured by not employing a first mover strategy.

2) Construction consulting services are project-based teachings and philosophies that progressive owners are asking for. The Company will offer seminars in Partnering procedures, safety audits, as well as the standard offerings by the competition. These include: seminars in scheduling and estimating, business development and strategic planning, and claim preparation.

5.5 Marketing Plan

This section contains information which this plan is based upon and is divided into two sub-sections. The market research portion contains graphs presenting the feasibility and market need of CCC’s services. The client profile portion outlines the produce flow-out or sales plan and the target profile client CCC will target in order to get its services to market

5.5.1. Market Research & Analysis

To obtain market demographics and develop a customer profile for CCC’s construction and IT consulting services, a direct phone survey was conducted. The survey was structured to obtain as much information as possible regarding IT use (current and future) within the construction industry. To limit the vastness of research possibilities, it was decided to focus the efforts of the phone interview on a random sampling construction companies with a base of operations in the Massachusetts area. This segment proved appealing for two reasons:

1) Knowledge of the construction companies within this geographic region could be utilized to narrow the field to those participants within the targeted revenue range, and

2) this is the base of operations for the CCC company.

The customer base will have yearly revenues between $5 million and $25 million in sales. It was proven through data collected from the survey that those companies with revenues below this threshold would be
in the start-up phase of organizational development and therefore inclined to live “day to day” with little strategic outlook for the future or would be one person operations. Additionally, it was discovered that companies with revenues higher than $25 million yearly revenues would have greater capacity to invest retained earnings in organizational information infrastructure components. These companies would not only be investing in IT but would do so by incorporating in-house personnel in the administration and expansion of applications. The use of in-house management information system (MIS) personnel by these companies would preclude CCC’s services at this early stage of its development.

The figure below represents the breakdown of IT use by revenues. Only those companies which utilize their computers as a tool to promote IT as defined by the MIG hierarchy are included in this graph. As is obvious, the window of opportunity for CCC’s products are in the range stated previously. The equal percentages of respondents in the ranges “between $15 and $25 million” and “greater than $25 million” validate a conclusion that companies beginning to invest in IT at an earlier revenue range. Greater than a third of all companies surveyed can be classified as CCC’s target customer which translates to tremendous opportunity for growth and expansion.

As previously outlined, CCC will offer complete IT / MIS services to this industry, and, as such, it is critical to estimate the market size for these services. As evident in the graph below, a majority of all
the respondents who expressed expansion into MIG platforms utilized in-house personnel. Although 59% used in-house personnel, this still leaves 41% of the respondents who outsourced to consultants. Even though companies tend to be loyal to their consultants, CCC believes it can penetrate the market because of its insight into the types of information needed within the construction project. Fortunately, CCC believes that of the total subjects surveyed (respondents and non-respondents), 25.8% can be viewed as potential clients which is an acceptable market share.

![Diagram showing 59% in-house and 41% outsourced](image)

IT Consulting Means.

5.5.2. Customer Profile

The knowledge that CCC has the potential to service 41% of the market is only one small part of the puzzle. The company will utilize only specific marketing media to promote its services. The goal of the marketing plan is to target specific customers while conserving cash reserves and avoiding leveraging the company to the point of sacrificing cash flow.

The optimum client will be a company which regularly engages in construction practices with annual revenues between $5 million and $15 million. This is a key point, due to the fact that CCC has tailored its recommendation to companies that are faced by construction issues and pitfalls which thus is its only means of differentiation. In addition, because this target company will have a philosophy of encouraging efficiency through technology, they must be made to understand that IT is only a tool - albeit
a tool that in and of itself can create competitive advantage regardless of occupation or core competency. Finally, these companies must have a base of operations within a three hours drive of Boston, MA. It is essential that, during the formative years of CCC, it is necessary to keep operations and the associated expenses to a minimum.

5.6. Company Strategy & Operations Plan

This section presents the strategic and operating plans of CCC. The strategic planning section presents the sales tactic CCC plans to employ to gain market share, as well as, a discussion of the competition. This discussion identifies the threats faced by CCC as well as the method it will employ to deal with these threats. The operations planning section discusses the methods and expenditures of CCC’s management operations.

5.6.1. Sales Tactics

As evident below in the product flow-out diagram, the Company will directly promote its services by using trade magazine advertisements and participating in trade shows and associations.

![Product Flow-out Diagram]

The decision not to concentrate all marketing efforts directly on the customer lies in the disadvantages of “cold calls” and limited marketing staff. Thus, the Company feels that the ability to canvass a large market (41%) can only be obtained via the aforementioned methods which are cost-effective and the most
effective, when supplemented by direct contact. The solid lines in the diagram above indicate CCC’s direct involvement and concentrated marketing efforts. The dashed lines are secondary influences CCC hopes to capture which would expand the customer base. The circles represent tertiary marketing results of other construction participants learning of CCC’s services through word-of-mouth efforts.

CCC will position itself to provide the consulting service to existing systems as well as supply the necessary new hardware to accomplish the client’s goal. Licensing agreements can be negotiated with Microsoft™, Lotus™, and other software manufacturers to permit the distribution of their products. Further, as the cost of technology is decreasing, the ability for a corporation and the individual to purchase or lease equipment is increasing. It is this second point that forms the foundation of CCC’s strategic plan.

5.6.1.1 The Competition

Currently, there exists many entities that can compete in this market, however it seems as though the needs of the construction industry remains “below the radar” of these IT-based service companies. A recent review of construction trade publications revealed many organizations offered specialized services to the field. These companies promote efficiency and cost containment though claims documentation, estimating services, etc. No one advertised and promotes the benefits of IT services to streamline operations. Additionally, reviews of the computer industry’s trade magazines and its IT-based companies presents a picture of promoting data storage, information accessibility and sharing, and processing speed while not addressing the specific need of the construction industry.

The services offered by CCC will not be protectable intellectual property, patentable, nor innovative, but they will be tailored to an industry and will be able enjoy first-mover advantages. It is anticipated that the unique services offered, coupled with the secondary and tertiary efforts from marketing will allow growth while minimizing operating costs. During the first three years of operations, the Company is anticipating 15% annual growth in revenues.
Eventually, the market will mature and competition will arise. Once established and a secure market share is obtained, CCC can gear its efforts into expanding computer solutions via customized programs. The addition of a computer science department to the corporate structure will design, through collaboration with industry, new software platforms that will enhance productivity, interface with other major software packages, and, with respect to CCC's core competency, enable information sharing amongst the construction project's participants. As stated previously, there exists no direct substitution or competition to the Company's services, yet these threats have been realized and addressed in long term planning.

5.6.2. Operations

The company must not over leverage itself during the first few years of its endeavor. Thus a debt to revenue margin of 30% is established as a ceiling. To operate and take advantage of economic swings, CCC, as discussed previously, will obtain strategic alliances with computer and software manufacturers. These alliances will allow a greater buying power than can possibly be realized on the open market. In addition, these alliances will allow access to all the mainstream IT platforms and configurations, which will lower consumer costs. The value of such relationships not only benefits CCC but also its clients. The clients will have confidence of the products they are purchasing through software support systems, and if need be, computer manufacturing warranties.

Current market conditions indicate that computer consultant's billable rate ranges from $50 to $125 per hour depending, of course, on system complexity, company reputation, and the consultant's experience. CCC plans to achieve 87% of its revenues through consulting means - which will be achieved through a billing rate of $75.00 per hour. This translates to only 13% of revenues coming from the highly competitive software / hardware industry. This provides a comfortable margin considering the majority of CCC's clients will most likely have some form of computer technology in use. The majority of product sales will take the form of system upgrades, Internet or e-mail components, and ultimately, video-conferencing products.
5.7. Financial Analysis

The Company plans to keep all costs not associated with adding value to the end user at a minimum. Therefore, several operating assumptions are made to aid in the development of pro-forma statements. These assumptions are as follows:

- Office and warehouse space is kept to a minimum (500 sf max.) and therefore a token allowance for leasing and equipment is provided.
- Owner / partner withdrawal during the first years shall be kept to a minimum and held as retained earnings for the company.
- Interest on all loan payments shall be 8.5%.
- All fees attributable to the strategic alliances are contained in the revenue price. No mark-up allowance is presented.

With these assumptions in mind, several scenarios are presented in order to further elaborate on the viability of Clory Construction Consultants, Inc. A fully detailed five year pro-forma of income sheet statements can be found in the appendix.

5.7.1. Scenario Number 1

This is the best situation the Company can find itself in during its first year of operations. The company has approximately 850 billable hours, which translates to 15 hours per week or 2 client visits. Additionally, the company realized $10,000 from the products sold via its strategic alliances. This scenario allows the company to enjoy a 40% gross margin or an 11.3% net profit.
5.7.2. Scenario Number 2

In this situation, the company’s consulting revenues are reduced to a value of $40,000.00. The revenues attributed to product sales remains constant, however, due the competitive advantage obtained through its alliances. With this change of revenues, the salaries drawn is decreased to $25,000.00 per year. In light of this situation, the gross margin drops to only 30% with a net income of $1,203.00.

5.7.3. Scenario Number 3

This is CCC’s worst scenario, however due to market forecasts for 1997 and the continued growth of the computer industry, it seems highly unlikely. In this situation, the first year consulting revenues are estimated at are only $50,000. In addition, the strategic alliances, and thus the revenues generated, are none existent and are reduced to zero (0). In this case, the gross margin drops to 30% with results in a negative net income of ($1,203).
5.8. The Management Team

The founding member of the company is Eric Clory, a graduate student at the Massachusetts Institute of Technology, from the Civil and Environmental Engineering Department. He holds a BS in construction engineering from Wentworth Institute of Technology (1994) along with a minor in business administration. Prior to conceptualizing the Company, his background included construction project management positions in various capacities within the past 3 years. In addition, Mr. Clory formerly was a party chief for 3 years for a land surveying firm. He is currently vice-president of Colonial Builders, Inc., a residential contractor in south-eastern Massachusetts with annual revenues of approximately $75,000.00.

Résumés of corporate officers may be found in the appendix.

5.9. Assumptions, Risks, Potential Threats.

CCC wishes to present to the reader the risks, assumptions, and threats faced by this endeavor.

- Expertise in computer science is currently being sought. The core to CCC’s mission is to educate construction parties to the benefits of information technology. Without such an expert on staff, credibility in this venture is lacking.

- The construction industry is very economic dependent. A barometer used by many economists, as an indication of an economy’s health, is the number new housing starts. CCC core customers are in construction, thus by substitution, CCC’s health is very dependent on the economy as a whole.

- As previously stated, the growth of this market will mandate others to mimic CCC’s services. Once this happens, other companies with greater buyer power, may take some of
the 41% market share CCC hopes to capture. Therefore, the success of CCC will result in establishing solid, long-term relationships with its customers.
Bibliography


Thomas, Trevor, *A Strategic Perspective on Establishing a Virtual Corporation in the CARICOM Region*, MIT, February 1996.

Tulacz, Gary J., “Design-Build comes into its Own as Industrial, Public Jobs Expand”, *ENR - Top 100*, June 10, 1996.

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Financial Data

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## CCC Segmentation Matrix

<table>
<thead>
<tr>
<th>Customer</th>
<th>Revenues</th>
<th>New England</th>
<th>South West</th>
<th>Central</th>
<th>West</th>
<th>International</th>
<th>Region Consulting Typ</th>
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<td>Const.</td>
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<td>Const.</td>
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<td>General Contractor</td>
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- = Strategic plan to target segment
- = Possible expansion of Construction Consulting services
- = Expansion by Alliances.
# Income Statement

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<td>Sales Revenue (IT Products)</td>
<td>1,500</td>
<td>5,000</td>
<td>2,500</td>
<td>1,000</td>
<td>10,000</td>
<td>11,500</td>
<td>13,225</td>
<td>15,209</td>
<td>16,425</td>
</tr>
<tr>
<td><strong>Total Revenue</strong></td>
<td>11,250</td>
<td>37,500</td>
<td>18,750</td>
<td>7,500</td>
<td>75,000</td>
<td>86,250</td>
<td>99,188</td>
<td>114,066</td>
<td>123,191</td>
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<tr>
<td>Cost of Goods (materials)</td>
<td>750</td>
<td>2,500</td>
<td>1,250</td>
<td>500</td>
<td>5,000</td>
<td>5,700</td>
<td>6,498</td>
<td>7,408</td>
<td>7,926</td>
</tr>
<tr>
<td>Cost of Goods (labor)</td>
<td>5,250</td>
<td>17,500</td>
<td>8,750</td>
<td>3,500</td>
<td>35,000</td>
<td>39,900</td>
<td>45,486</td>
<td>51,854</td>
<td>55,484</td>
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<tr>
<td>Cost of Goods (other)</td>
<td>750</td>
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<td>1,250</td>
<td>500</td>
<td>5,000</td>
<td>5,700</td>
<td>6,498</td>
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<td>7,926</td>
</tr>
<tr>
<td><strong>Cost of Goods Sold</strong></td>
<td>6,750</td>
<td>22,500</td>
<td>11,250</td>
<td>4,500</td>
<td>45,000</td>
<td>51,300</td>
<td>58,482</td>
<td>66,669</td>
<td>71,336</td>
</tr>
<tr>
<td>Gross Profit</td>
<td>4,500</td>
<td>15,000</td>
<td>7,500</td>
<td>3,000</td>
<td>30,000</td>
<td>34,950</td>
<td>40,706</td>
<td>47,396</td>
<td>51,855</td>
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<tr>
<td>Gross Margin</td>
<td>40.00%</td>
<td>40.00%</td>
<td>40.00%</td>
<td>40.00%</td>
<td>40.00%</td>
<td>40.52%</td>
<td>41.04%</td>
<td>41.55%</td>
<td>42.09%</td>
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<tr>
<td>Selling Expenses (Seminars, Shows)</td>
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<td>2,500</td>
<td>1,250</td>
<td>500</td>
<td>5,000</td>
<td>5,000</td>
<td>8,300</td>
<td>9,000</td>
<td>9,500</td>
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<tr>
<td>Research &amp; Development</td>
<td>150</td>
<td>500</td>
<td>250</td>
<td>100</td>
<td>1,000</td>
<td>1,000</td>
<td>1,500</td>
<td>2,000</td>
<td>2,500</td>
</tr>
<tr>
<td>General &amp; Administrative</td>
<td>1,500</td>
<td>5,000</td>
<td>2,500</td>
<td>1,000</td>
<td>10,000</td>
<td>10,000</td>
<td>3,000</td>
<td>3,500</td>
<td>4,000</td>
</tr>
<tr>
<td>Interest Expense</td>
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<td>425</td>
<td>213</td>
<td>85</td>
<td>850</td>
<td>850</td>
<td>850</td>
<td>850</td>
<td>850</td>
</tr>
<tr>
<td><strong>Total Expenses</strong></td>
<td>2,528</td>
<td>8,425</td>
<td>4,213</td>
<td>1,685</td>
<td>16,850</td>
<td>16,850</td>
<td>13,650</td>
<td>15,350</td>
<td>16,850</td>
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<tr>
<td>Profit (loss) before taxes</td>
<td>1,973</td>
<td>6,575</td>
<td>3,288</td>
<td>1,315</td>
<td>13,150</td>
<td>18,100</td>
<td>27,056</td>
<td>32,046</td>
<td>35,005</td>
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<tr>
<td>Provision for taxes (35%)</td>
<td>690</td>
<td>2,301</td>
<td>1,151</td>
<td>480</td>
<td>4,603</td>
<td>6,335</td>
<td>9,469</td>
<td>11,216</td>
<td>12,252</td>
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<tr>
<td><strong>Net Income</strong></td>
<td>1,282</td>
<td>4,274</td>
<td>2,137</td>
<td>855</td>
<td>8,548</td>
<td>11,765</td>
<td>17,586</td>
<td>20,830</td>
<td>22,753</td>
</tr>
</tbody>
</table>

**Notes:**

- Sales projections based on 15% growth in total revenues for first three years, 8% after.
- Expense assumptions to be 1% less than sales revenues due to volume discounting.
- Figures ignore annual / deflations rates (as well as currency exchange rates).
Clory Construction Consultants, Inc.

**Balance Sheet**

<table>
<thead>
<tr>
<th></th>
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<th></th>
<th></th>
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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Cash</td>
<td>10,000</td>
<td>48</td>
<td>5,828</td>
<td>9,733</td>
<td>11,179</td>
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<tr>
<td>Accounts Receivable</td>
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<td>7,500</td>
<td>21,563</td>
<td>24,797</td>
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<td>30,798</td>
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<tr>
<td>Inventory</td>
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<td>1,250</td>
<td>2,250</td>
<td>3,000</td>
<td>3,500</td>
</tr>
<tr>
<td><strong>Total Current</strong></td>
<td>10,000</td>
<td>7,548</td>
<td>28,640</td>
<td>36,780</td>
<td>42,680</td>
<td>37,637</td>
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<td>PP&amp;E</td>
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<td>1,650</td>
<td>1,925</td>
<td>2,225</td>
<td>2,950</td>
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<tr>
<td><strong>Total Assets</strong></td>
<td>10,000</td>
<td>9,048</td>
<td>30,290</td>
<td>38,705</td>
<td>44,905</td>
<td>40,587</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Liabilities &amp; Equity</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Accounts Payable</td>
<td>0</td>
<td>5,000</td>
<td>5,700</td>
<td>6,498</td>
<td>7,408</td>
<td>7,926</td>
</tr>
<tr>
<td>Accrued Expenses</td>
<td>0</td>
<td>4,500</td>
<td>12,825</td>
<td>14,621</td>
<td>16,667</td>
<td>16,850</td>
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<td><strong>Total Current Liabilities</strong></td>
<td>0</td>
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<td>18,525</td>
<td>21,119</td>
<td>24,075</td>
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<td>Long-Term Debt</td>
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<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td><strong>Total Liabilities</strong></td>
<td>10,000</td>
<td>500</td>
<td>18,525</td>
<td>21,119</td>
<td>24,075</td>
<td>17,834</td>
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<tr>
<td>Paid-in-Capital</td>
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<td>Retained Earnings</td>
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<td>8,548</td>
<td>11,765</td>
<td>17,586</td>
<td>20,830</td>
<td>22,753</td>
</tr>
<tr>
<td><strong>Total Equity</strong></td>
<td>0</td>
<td>8,548</td>
<td>11,765</td>
<td>17,586</td>
<td>20,830</td>
<td>22,753</td>
</tr>
<tr>
<td><strong>Total Liabilities &amp; Equity</strong></td>
<td>10,000</td>
<td>9,048</td>
<td>30,290</td>
<td>38,705</td>
<td>44,905</td>
<td>40,587</td>
</tr>
</tbody>
</table>

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