Systematic Prioritization of Considerations in Making

Offshore Software Development Outsourcing Decisions

by

Bo S. Kim

Submitted to the Department of Electrical Engineering and Computer Science

in Partial Fulfillment of the Requirements for the Degrees of

Bachelor of Science in Electrical Engineering and Computer Science
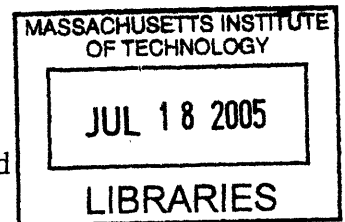
and Master of Engineering in Electrical Engineering and Computer Science

at the Massachusetts Institute of Technology

May 19, 2005   [June 2005]

Author_____
    Department of Electrical Engineering and Computer Science
                                        May 19, 2005

Certified by_____
                              Michael A. Cusumano
                                Thesis Supervisor

Accepted by_____
                              Arthur C. Smith
        Chairman, Department Committee on Graduate Theses

Systematic Prioritization of Considerations in Making
Offshore Software Development Outsourcing Decisions
by
Bo S. Kim

Submitted to the
Department of Electrical Engineering and Computer Science

May 19, 2005

In Partial Fulfillment of the Requirements for the Degrees of
Bachelor of Science in Electrical Engineering and Computer Science
and Master of Engineering in Electrical Engineering and Computer Science

ABSTRACT

Offshore outsourcing of software development projects has become increasingly prevalent over the past decade. In order to avoid potential pitfalls in outsourcing, companies must carefully select who to outsource to. Although general guidelines exist for those companies to consult, they are not customizable to the unique needs of each company and project. By assessing the type of a company's outsourceable project and its in-house capabilities regarding the project, the main outsourcing goal of the company is first determined. Depending on the goal, the essential issues to be considered in making outsourcing decisions are then prioritized systematically. Case studies have been conducted to support the set prioritization patterns, followed by an examination of current limitations and possible future work.

Thesis Supervisor: Michael Cusumano
Title: Professor, MIT Sloan School of Management

Table of Contents

List of Figures and Tables

I. Introduction

A. Evolution of offshore outsourcing

Since the mid-1990s, outsourcing has become a heated topic of interest around the globe. Yet contracting out parts of one's business is not merely a recent phenomenon. For example, in the 1980s, many large integrated circuit (IC) design companies in the United States made the decision to outsource the manufacturing of their IC chips to fabrication facilities located outside of the country [28]. These facilities were targeting to gain economies of scale by fabricating large quantities of chips for numerous different companies. Even earlier, starting in the late 1970s and into the early 1980s, mainframe computer hardware and software systems were more expensive than now. So many companies outsourced out their non-core operations to other firms with fabrication facilities. And since those firms specialized in performing operations for many different companies, they were able to leverage economies of scale through their investments in computer systems [6].

The effect of outsourcing is not only prevalent in the company outsourcing its operations. Rather, the effect is often noticeable throughout the industry. For instance, the decision of IC design companies in the U.S. to outsource the manufacturing of their chips offshore has allowed them to maintain a financial competitive edge as an industry. The industry continues to attract much investment capital today, and it is interesting to note that most IC design companies that enter this active market do not own fabrication facilities [28]. Starting with business

plans that already include the outsourcing of chip fabrication, they save themselves the need to establish and raise capital for their own facilities. They transfer that unused capital and time into supporting and further activating their development of innovative chip designs, which is the main purpose behind design companies when striving to reduce their costs in producing their designs [6].

If outsourcing indeed has been existent in the economy throughout the past couple of decades, why then has it become such an intense topic of debate and discussion just recently? An explanation for this is that, although manufacturing operations, such as for the IC chips, have long been outsourced offshore, the outsourcing of non-manufacturing operations is a rather recent evolution within the concept of offshore outsourcing. As the boundaries for economies continue to expand beyond geographical borders that separate the different nations of the world, it is becoming increasingly more plausible for companies to look for resources, in this case human talent, which they can use in their company operations. Certainly, the technology and business talents sought after are those that are lower in cost compared to the ones available within the country. An evidence of the companies' eagerness to outsource is often characterized by economic experts using the observed fact that although the U.S. economy is going through recovery, job growth measured in terms of the increase in the number of jobs is not occurring at a notable rate [6]. Instead of creating more jobs to handle the increased demand of their products, companies are looking to outsource the duties to be performed to workers offshore, who often serve as more cost-effective options for the companies.

B. Characteristics of software development outsourcing

As it has been with numerous non-manufacturing functions, the outsourcing of software development has become active over the last 10 years. Prior to outsourcing their software development offshore, many of the companies experimented by outsourcing some aspects of their development to domestic companies. These domestic companies were, and continue to be today, those that most often specialize in one or a limited number of technical skills. Such practices were especially effective in reducing the development costs, and efficient in the sense that software development tends to require a culmination of many different sets of technical skills, depending on the projects being worked on at the time [27]. The alternative to outsourcing would be to continuously alter their own company's pool of workers, which runs the risk of creating rifts in both the continuality of a company's momentum and worker morale.

Thus originally, software development outsourcing was an outcome of a company's desire to fulfill its goal of focusing more heavily on its core development functions by outsourcing, and in turn reducing the costs involved with, its non-core development activities. But much like other functions, software development outsourcing has further evolved into contracting out even core development activities. Regarding the primary reasons for this evolution [6], there are three that are noticeable among the rest, with the first one being the most obvious:

1. Less costly development; India is currently the undisputed leader in providing quality development talents at lower costs

2. More complex software development; Europe and Russia are where many companies are recently turning to

3. Specialized software development; China and Mexico are utilized for Asian and Spanish language development, respectively

The effect of such evolution in software development outsourcing can be detected through the activity of the IT industry as a whole. Noticing the potential increase in the demand for offshore outsourcing, a number of global enterprises, such as IBM, HP, EDS, and Accenture, have developed products designed specifically to provide outsourcing services to their clients. For instance, Accenture, with its Global Delivery & Sourcing service, offers development, deployment, management, and enhancement of its customers' applications [7]. And EDS, through its Applications Outsourcing Services under its Applications Services Portfolio, guides its customers in evaluating outsourcing options and managing the transition of work offshore [8].

C. *Potential pitfalls of offshore outsourcing*

Despite the compelling advantages that moving operations offshore can bring about, the abundance of potential pitfalls that exist in outsourcing cannot be overlooked. Figure 1 below is according to a recent survey of companies that have not seen positive outcome through their decisions to outsource [14]:
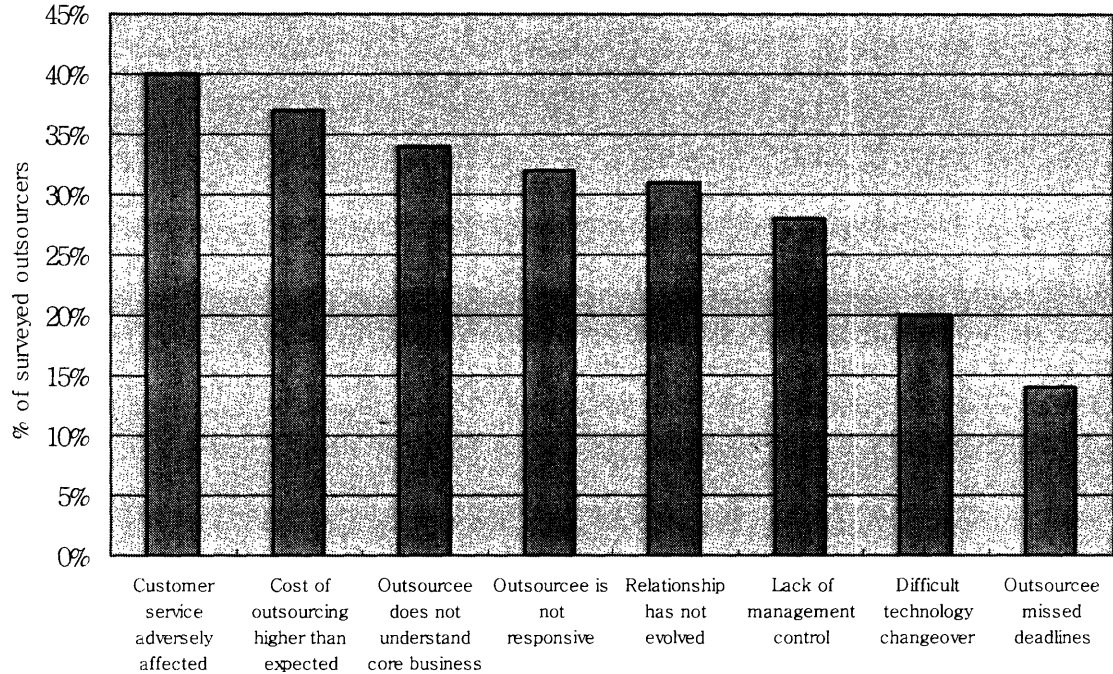
Figure 1: Potential pitfalls of offshore outsourcing

From Figure 1 above, it can be noted that the pitfalls range widely, from negatively

affected customer service to lack of relationship evolution between the outsourcer

(the company outsourcing their operations) and the outsourcee (the offshore entity

performing the operations outsourced by the outsourcer).

By observing the nature of the pitfalls, it can be argued that many of them are

avoidable through strategic preparation and planning prior to outsourcing, and also

through proper management after the outsourcing contract is made. For example,

the pitfall of the cost of outsourcing being higher than expected can be kept away

through careful assessment of all possible costs of outsourcing, which is not simply

the worker's salary, on the part of the outsourcer. Also, the lack of management

control can be prevented through setting up an effective structure that can regularly

examine the work done by the outsourcee.

Due to such general understanding that the main pitfalls can possibly be circumvented through measures actively taken on the part of the outsourcer, many experts on offshore outsourcing, such as consultants that specialize in consulting a company through the process of deciding to outsource, have drawn up guidelines that companies should abide by when looking to outsource their, and often a part of their core, operations offshore. For instance, ITX Corp., an IT consulting and services provider based in New York, warns its potential customers of outsourcing pitfalls through publishing "Outsourcing: Guidelines for Success [9]." Similarly, QualityLogic Inc., a software services company based in California, devotes a section from a series of its newsletter issues to "Four Steps to Successful Software Development Outsourcing [11]."

The guidelines are most generally a checklist that a company should use in evaluating the opportunities that they have to outsource offshore, prior to taking them into effect. In essence, unless a company can "check off" most, if not all, items on the checklist, that company would be advised not to uptake outsourcing operations. For instance, one of the checklist items relates to the topic of communication: Can continuous communication with the outsourcee take place? Is the outsourcee capable of needed language skills? Is the outsourcee responsive to communication delivered?

D. *Complexity of outsourcing decisions*

The guidelines, as mentioned above, do in fact contribute to making the outsourcing decision process be conducted more smoothly for a company. Yet, the average checklist that is currently available today is far from being capable of acting as the sole solution to easing the complexity that characterizes the outsourcing of core development functions. And as an increasingly greater number of companies that develop software are looking to outsource their development, they are coming to realize the existence of those complex issues. The what, how, and to who to outsource are decisions that cannot, and should not, be made effortlessly. The main contribution to this complexity originates from the fact that there are a variety of essential factors, beyond the checklists' coverage, that are capable of significantly affecting a company's decision to outsource.

The first of those factors is, of course, the type of outsourceable software development project. A project can be categorized based on its business value to the outsourcer and its technological characteristics. Another factor is the outsourcer's in-house capabilities regarding the outsourceable project. Consideration of the previous factors then help the outsourcer determine what it can gain most out of outsourcing offshore, which becomes its main outsourcing goal. And since the nature of such factors involved in outsourcing decisions are likely to vary greatly between different outsourcers, outsourcing decisions inevitably become subjects of complexity.

E.   Purpose of my thesis

The factors contributing to the complexity of making outsourcing decisions are, though implied, not offered any remedy through currently existing guidelines. Although the guidelines for sure indicate very essential items to be considered, the checklists fail to emphasize which of the many items they mention must be regarded as being critical.   For instance, one of the checklist items refers to the issue of conflict: Is the outsourcee already working for a competitor?   Is there business knowledge to be lost through outsourcing (technology, intellectual property, etc.)?   If a company needing to complete a routine project, which is often not geared towards long-term IP capture, finds a potential outsourcing partner that superbly meets all other items on the checklist, but has a team of developers working for a competitor doing customer service, it should not let that item of conflict negate the entire possibility of forming an outsourcing relationship with the potential outsourcee.   On the other hand, if that outsourcee lacks the communication skills necessary to interact with the customers, the possibility of a relationship would be limited, unless an effective method exists in which the interaction can be not affected by the language barrier.

Such relative importance of the items, lacking from the current checklists, is not, as a matter of fact, due to any inherent shortcoming of the checklists themselves. Rather, the checklists, for the purpose of meeting the needs of all the companies looking for advice in making outsourcing decisions, cannot incorporate such information, which is highly dependent on the factors of complexity mentioned above. Since those factors vary widely from one company to the next, the generic checklists

cannot account for all the different cases.

There in turn is a need for a "weighted" checklist, which takes into consideration the complexity factors. The relative weights placed on each of the items will be determined by a company's main outsourcing goal, which itself is dictated by the type of project that the company is looking to outsource and the company's in-house capabilities with regards to what the project requires. The main purpose of my thesis, therefore, is to enable companies with software development projects, particularly those that are new to the realm of outsourcing, to be able to access a more customized checklist of guidelines that are more relevant, and thus more accurate, to the nature of their own software products.

Experts predict that the growth of offshore outsourcing will continue at 30% per annum [14]. Thus, even beyond software development practices, outsourcing is a phenomenon that is only expected to become more prevalent as the global economy continues to expand. Software development is often regarded as one of the most difficult functions to outsource, due to the aspect of "design" that is involved. Therefore, by examining the focal considerations that must be made by companies that practice software development when making outsourcing decisions, it is my hope to open insight into both the feasibilities and reservations of outsourcing other functions offshore. I believe that it will be an essential step towards allowing prudent decisions to be made by companies to utilize the resources, while avoiding the pitfalls, of offshore outsourcing.

II. Factors of Systematic Prioritization

A. Generic current checklist

Currently available checklists are often provided by academic researchers [17, 18], software development outsourcees [9, 11, 19], law firms handling outsourcing contracts [6, 22], and developer support communities (online) [16, 21]. The common ground covered by the various outsourcing guidelines gives rise to a typical checklist, of business considerations to be made when a firm is looking to outsource its software development offshore, consisting of the following items, presented in a format close to those provided in [6] and [16]:

1. Short-term and long-term costs/risks:

- Will there be overall cost saving due to the outsourcing?

- Have non-salary costs, such as management, knowledge transfer, and software licenses, additionally been accounted for?

- What new liabilities arise through the outsourcing?

- What are the relevant economies of scale?

- Are there up front and unrecoverable costs, such as advertising and R&D, that are independent of project scale?

2. Quality:

- Does the outsourcee have a strong reputation of successful delivery?

- Is there previous similar work delivered by the outsourcee?

- Has there been a quality assessment performed on previous work?

- How is quality measured and assured?

- Is there a success criteria defined?

3. Conflict:

- Is the outsourcee already working for a competitor?

- Is there business knowledge to be lost through outsourcing (technology, intellectual property, etc.)?

- Is the development environment secluded?

- How is the access to products and business knowledge controlled?

- Are both network security and physical security enforced?

4. Communication:

- Can continuous communication with the outsourcee take place?

- Is the outsourcee capable of language skills?

- Is the outsourcee responsive to communication delivered?

- What issues of cultural discrepancy exist?

- What processes are implemented to allow effective communication?

5. Management:

- Is there an official project management process?

- Is there a certified software development lifecycle methodology?

- What data is collected how to measure performance?

- Can service levels be accurately measured?

- In the case that the outsourcee fails to deliver, is there a back-up plan?

6. Skill set:

- Does the outsourcee already possess the skills needed for work?

- Is substantial training necessary?

- How is the competence of the skills ensured?

- Are there past projects proving the possession of the skills?

- What complementary and new skills are expected to be available?

7. Human resources:

- Is the outsourcee capable of mitigating turnovers that surface through the duration of the outsourcing contract?

- What is the process for personnel management?

- What is the process for attrition management?

- What is the chain of command and control?

- How are workers matched to specific projects?

In order to enable companies considering offshore outsourcing, or potential outsourcers, to actually make use of checklists such as the one given above, two essential steps must be taken. First, two separate checklists must be created for the potential outsourcer. One checklist would cover "outsourcee criteria," which must be consulted in selecting a potential outsourcee. The other checklist would cover "partnership criteria," which is a speculation of foreseeable effects of the

outsourcing partnership between the outsourcer and the selected outsourcee. Once the checklists are created, both must be prioritized in order of relative importance to the outsourcer using them. The order of relative importance is highly dependent upon the outsourcer's main outsourcing goal, which is a reflection of what the outsourcer can gain through outsourcing. The outsourcer's main use for outsourcing can be detected by carefully examining the nature of the software development project it is looking to outsource and its in-house capabilities with respect to the project.

B. Types of outsourceable development projects

As briefly mentioned above, software projects can be categorized in two different ways, where one considers a project's business value to the outsourcer while the other considers its technological characteristics [20].

1. Project's business value

a. Critical differentiator: A project that is a critical differentiator is one that sets the outsourcer apart from its competitors. For example, if a company differs from its competitors mainly through the service it offers its customers, a software application that is designed to facilitate communication with the customers would be considered a critical differentiator.

b.   Critical commodity: A project that is a critical commodity is one that is essential to the outsourcer's business, but does not necessarily challenge its competitors. Applications that support aircraft maintenance for an airline company, for example, would be a critical commodity that may be somewhat uniform throughout the airline industry.

c.   Useful commodity: A project that is a useful commodity is one that offers benefits to the outsourcer, but not necessarily as a winning strategy over its competitors.   For instance, maintenance and upgrades for enterprise applications may be valuable to the outsourcer as a steady source of revenue, and would thus be considered a useful commodity.

d.   Useful differentiator: A project that is a useful differentiator is one that sets the outsourcer apart from its competitors, yet does not substantially contribute to its business.   Thus from an efficiency point of view, this category of projects are not necessary.   But they are very common, and often make up parts of routines, that they cannot easily be eliminated.   A leading area of software development that most easily gets trapped in this category is customization, often resulting in costly and not largely rewarding software maintenance.

2.   Project's technological characteristics

The technological characteristics of a software development project can be seen through two distinct degrees of measurement.   They are technological maturity and

technological integration [20].

A project's degree of technological maturity reveals how familiar the outsourcer is with the technical requirements of the project. For instance, if a development uses a novel imaging technology that the outsourcer does not clearly understand, then the project would be considered to have low technological maturity.

The degree of technological integration specifies how closely knit a project is to other applications and processes used by the outsourcer. For example, if an outsourcer's new application must be made compatible to all its other products, the development would be considered to have high technological integration.

Drawing from the two degrees of measurement, a project can be categorized as one of the following:

a. Low technological maturity with high technological integration

b. Low technological maturity with low technological integration

c. High technological maturity with low technological integration

d. High technological maturity with high technological integration

C. *Outsourcer's in-house capabilities*

Once an outsourcer identifies the type of project that it is looking to outsource,

it must carefully assess its in-house capabilities regarding the necessary resources for the project. After all, outsourcing is most often effective when it is used as a strategic tool to supply the outsourcer with complementary resources.

There are two areas of focus involved in the in-house assessment [20]. The first is concerned with whether or not an outsourcer already has an established efficient method of development for applications such as the project at hand. For example, if the outsourcer has built a similar previous software in-house, and has found that it did not have any redundant work or cost, it would consider itself to have established efficiency. The other area focuses on the managerial practices of the outsourcer. Although this area is also concerned with efficiency, it links the virtue to the competency of the managerial team heading the project. If an outsourcer that has established efficiency still has a weak managerial team for the project at hand, it is very unlikely to be able to maintain the efficiency when problems specific to the new project require prudent managerial decisions.

Drawing from the two areas of focus above, an outsourcer's in-house capabilities for a project can be categorized as one of the following:

1. Established efficiency with leading management
2. Established efficiency with lagging management
3. Not established efficiency with lagging management
4. Not established efficiency with leading management

D. Outsourcer's main outsourcing goal

Observing the characteristics of the project to be outsourced and assessing in-house capabilities regarding the necessary resources for the project, an outsourcer can gain insight into what it can gain most through outsourcing. The insight leads the outsourcer to solidify its main goal in outsourcing software development. The nature of the goal can be categorized into the following three levels of services that outsourcers seek through an outsourcing relationship [10]:

1. Operational service: An outsourcer looking for specific skills at a lower cost, often for developing applications with pre-planned technical details, would desire operational services from its outsourcee. The main emphasis of the outsourcing relationship is put on reducing the cost of development [15], and the outsourcee must exhibit delivery competency over all [10].

2. Competitive improvement: If a development project requires a sufficient change in its nature to compete readily in the market, and if the outsourcer is looking to make that possible through outsourcing, it would desire quality improvement from its outsourcee. The main emphasis of the outsourcing relationship is put on achieving competitive advantage [15], and the outsourcee must exhibit transformation competency over all [10].

3. Long-term viability: For projects that are likely to form the core of the business for an outsourcer, an evolving outsourcing relationship that can respond readily to

changes in market trends and customer demands over time is desirable.   The main emphasis of the outsourcing relationship is put on the business compatibility between the outsourcer and the outsourcee, and the outsourcee must thus exhibit relationship competency over all [10].

E.   Outsourcee criteria

Once an outsourcer decides on its main outsourcing goal, it can move on to selecting the outsourcee that is best fit for providing the services it desires.   An outsourcee's competencies can be assessed by examining whether or not it possesses the following 12 capabilities [10]:

1.   Domain expertise: The outsourcee must have adequate technical knowledge that can be applied to the software to be developed.   Needless to say, the details of the knowledge depend on the nature of the project.

2.   Business management: The outsourcee must be able to meet the planned business goals of not only the outsourcer, but also of its own.   Although some outsourcers may be prone to only give value to whether the outsourcee can meet their plans, they cannot be free from getting adversely affected if the outsourcee's business is unsuccessful.

3.   Behavior management: Since outsourcing inevitably involves transfer of

personnel and realignment of hierarchy, the outsourcee must be able to effectively train, manage, and motivate its workers for novel assignments.

4. Sourcing: An outsourcer's needs often vary widely, from lower labor costs to leveraging economies of scale. Since the most effective way to meet them all may not be to have them all be approached from one direction, the outsourcee must have access to a wide network of sources from which they can supplement their development efforts.

5. Technology exploitation: For development projects that have been building upon predecessor applications for a long time, the base technology is often significantly outdated. As outsourcers are wary about the cost and effectiveness of implementing a whole new base, they must carefully evaluate the outsourcee in terms of how it can help them find cost-effective technology.

6. Process re-engineering: It is often the case that software projects acquire changes in goals and standards as their development progresses. The capability of the outsourcee to design and implement changes to its development methodology is essential to achieving the targets set for the outsourced project.

7. Customer development: Since outsourced projects are "contracted out" to the outsourcee, the outsourcee may feel that it needs to only answer to the demands of its outsourcer. But in fact, if the application is to be truly matched to the needs of its users, direct contact between the outsourcee and the customers is vital. The

outsourcee must thus have commendable customer interaction experience and communication skills.

8. Planning and contracting: The outsourcee must hold the capacity to be realistic and logical about planning tasks, which includes both a vision and an associated process. Also, it should have a good grasp of how to solidify its position in the outsourcing relationship through a contract. As mentioned earlier, success of the outsourcee is indispensable to the success of the relationship, and in turn of the outsourcer.

9. Organization design: A creditable outsourcee would most likely have many useful resources, but the resources can only be utilized to their full potentials if they are effectively allocated. Especially since each different stage along the development process requires a different organization of available resources, the outsourcee must be capable of deciding on a prudent allocation of them at each stage.

10. Governance: Outsourcers must evaluate whether their outsourcee has firmly established review committees with specifically defined reporting processes to go with them. Also, if problems in the software application are not addressed early on in the development process, they are bound to escalate; the outsourcee must thus have prepared procedures to follow in dealing with such problems.

11. Program management: Especially for longer-term relationships, the

outsourcee must have the ability to manage the program for its outsourcer, which goes beyond a single outsourced software development project. As multiple tasks may be under way simultaneously, it must effectively prioritize and coordinate the steps that it needs to take. An important aspect of an outsourcee's program management is the blend of its efforts with the outsourcer's endeavors.

12. Leadership: Beyond the governance capability of the outsourcee, strong individual leaders heading the software projects have a significant effect on the outcome of the outsourcing relationship. The outsourcee must thus have leaders that exhibit admirable personal relationships with the leaders of its outsourcer. The importance of the leader to the project team is even further augmented when development projects are approached at the front-end rather than as a full-function business unit.

F. Partnership criteria

In addition to the outsourcee criteria given above, an outsourcer must also consider the effects of forming a relationship with an outsourcee. Even if the outsourcee meets all of the necessary items on the outsourcee criteria, it may not be the ideal partner for the outsourcer in terms of the following [15]:

1. Cost: Forming an outsourcing relationship encompasses costs that outsourcers often either overlook or cannot accurately determine [25]. The costs arise mainly

from four different stages of the relationship, which are a) outsourcee search and contracting, b) transitioning to the outsourcee, c) managing the relationship and the outsourced work, and d) transitioning following the end of the relationship. Although the cost of outsourcing is indeed dependent on the nature of the outsourced software project, a factor of equal or even higher influence is the extent of outsourcing experience on the parts of both the outsourcer and the outsourcee. And even though there may be ways to reduce the costs of preparing for outsourcing, a loosely planned project and contract may cause more ambiguities to deal with later on, adding to the cost of the outsourcing effort as a whole.

2. Software maturity: Whether the software is meant for the public market or for in-house use by the outsourcer, the developed application must meet relevant quality expectations. The distinct levels of quality reachable by a software project are outlined in detail by the Software Engineering Institute (SEI)'s Capability Maturity Model of Software (SW-CMM) [30]. Figure 2 below, taken from SEI's SW-CMM document, shows the five levels of development quality:
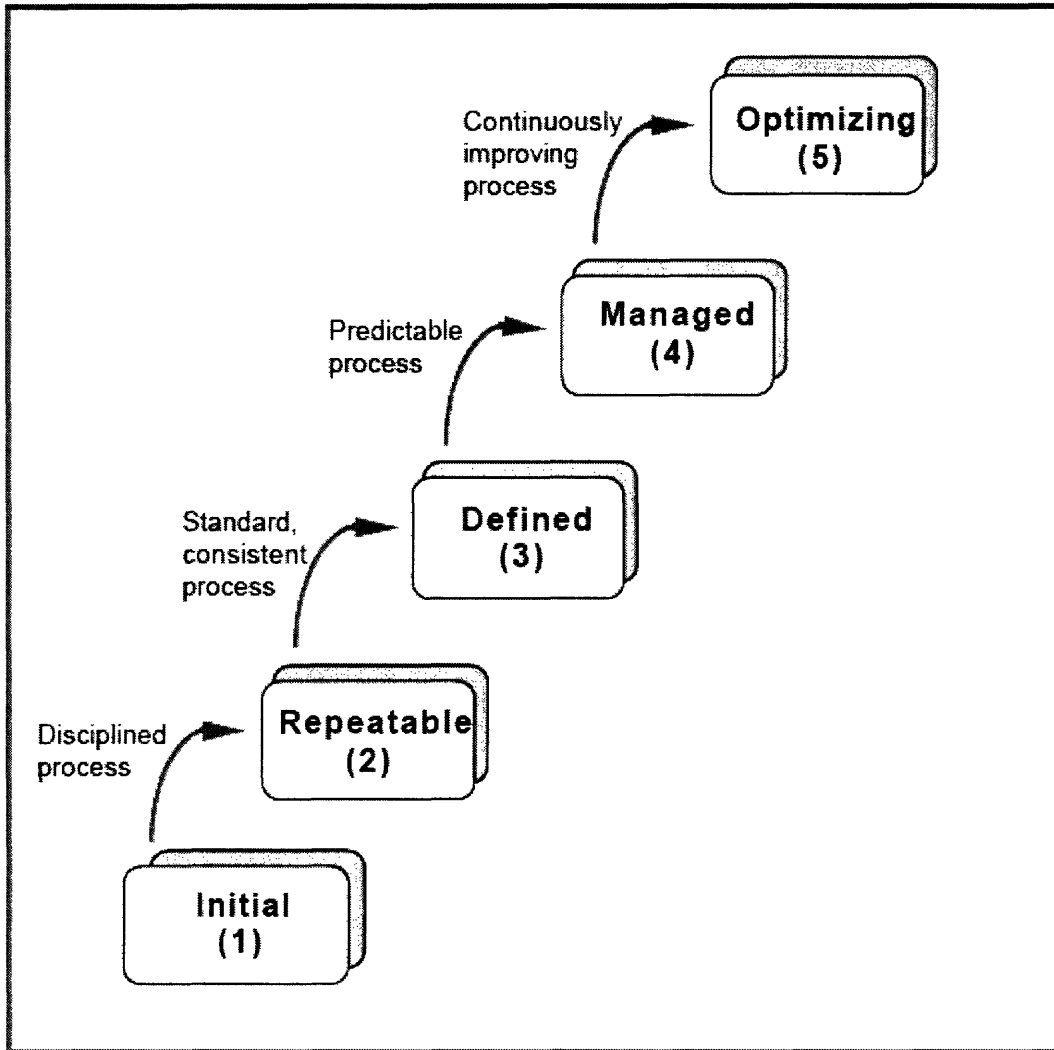
Figure 2: SEI's five levels of software quality assurance maturity

The quality level to be aimed for is highly dependent on the purpose of the software; a critical differentiator software and a useful commodity software, for example, would not require the same rigor of quality check. The outsourcer must have insight into what is the appropriate quality assurance maturity for a given software project, and must ensure that the target level can be achieved through the outsourcing partnership.

3.   Business capability creation: Particularly for longer-term relationships, outsourcers should plan to create differential capabilities in their business when deciding to outsource.   This means that the partnership between the outsourcer and the outsourcee should be focused not merely on becoming an expert in one particular technical aspect of software, but additionally on developing the ability to leverage advanced technologies for a pool of potential future endeavors.   A partnership that creates business capabilities must thus be able to identify the path along which software development technologies will change, and look to long-term business effects of decisions made in the present.

III.   Analytical Methodology

For both the outsourcing and the partnership criteria, it is important to remember that each item among them do not ever exist as entirely separate entities from one another, even across the two sets of criteria.   Successful business capability creation, for instance, is difficult to achieve if the costs of outsourcing are ignored, or if the outsourcee completely fails to offer domain expertise on the immediate project.   But depending on the main goal of outsourcing, determined primarily by the outsourceable project and in-house capabilities as seen above, the criteria items can be effectively prioritized into checklists to provide potential outsourcers with a more specific focus of what they should look for in an outsourcee

and in an outsourcing partnership.

By clarifying the nature of the outsourceable project and the in-house capabilities regarding the project, the outsourcer can ascertain its main goal in outsourcing. The goal then in turn would dictate the patterns of prioritization for the checklist items of the outsourcee criteria and the partnership criteria in making outsourcing decisions. The process of generating such customized weighted checklists is summarized in Figure 3 below:
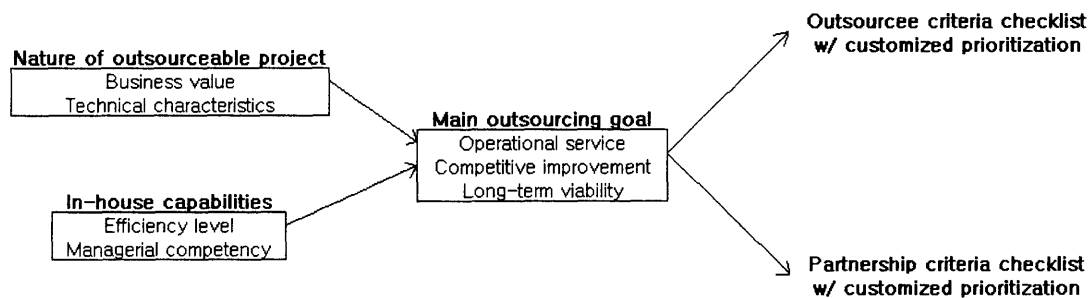
Figure 3: Customized weighted checklist generation

A. *Determining the main outsourcing goal*

As it can be seen from Figure 3 above, the first step in the prioritized checklist generation for the outsourcee and the partnership criteria is to determine the outsourcer's main outsourcing goal. In order to allow a systematic approach to determining this, the outsourcer must carefully assess the positioning of the project and its in-house capabilities on the spectra shown below in Figure 4:

Figure 4:   Spectra for determining the main outsourcing goal

The outsourcer positions cursors on the spectra for its outsourceable project's business value (useful vs. critical and commodity vs. differentiator), project's technological charact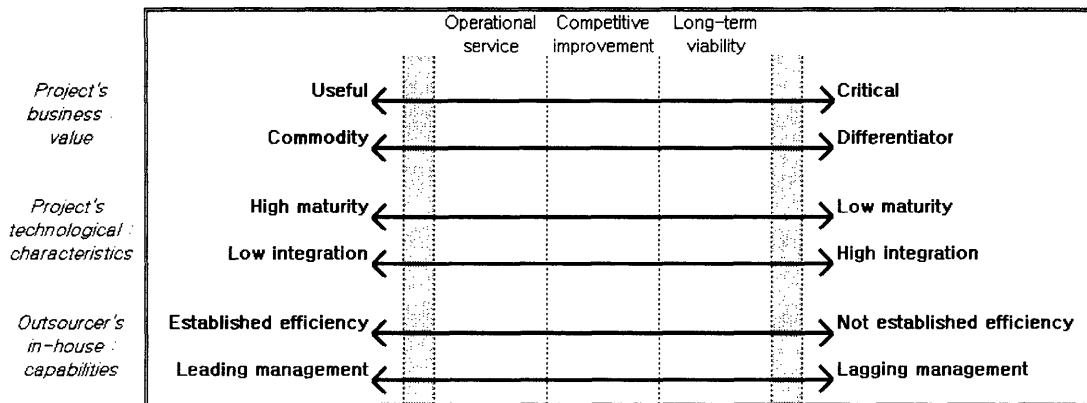eristics (maturity level and integration level), and in-house capabilities relevant to the project (efficiency level and managerial competency).   If most of the cursors line up under one of the three goals of operational service, competitive improvement, or long-term viability, the outsourcer is ought to take that one goal as the main purpose of outsourcing.   If the cursors are drastically split horizontally, and thus end up under multiple goals, or if most cursors get put in the gray-shaded areas on both extremes of the spectra, the outsourcer must first accept that outsourcing may not be a successful strategy for its business.   If it is still determined to explore the option, it should make a careful decision as to which of the project's business value, technological characteristics, and in-house capabilities is hardest to change, and then go along the cursors under that selection.

B. *Prioritizing the checklists*

Once the main outsourcing goal is decided, items included in the outsourcee criteria and the partnership criteria can be prioritized accordingly. As mentioned earlier, it is difficult to draw rigid boundaries between each item, especially since they all are virtues that would add positively to the outsourcing relationship. Yet prioritizing them according to the main goal sought in outsourcing is important for preventing the outsourcers from expending excessive effort on endeavors that do not directly spawn the key focus of the goal.

Table 1 below summarizes the prioritization pattern for the 12 items on the outsourcee criteria checklist [10], provided earlier, where "1" indicates the items of highest priority to the outsourcer for a given main outsourcing goal shown at the top of the table:

Table 1:   Outsourcee criteria prioritization

Main outsourcing goal Outsourcee competency sought Order of priority	Operational service Delivery Outsourcee criteria	Competitive improvement Transformation Outsourcee criteria	Long-term viability Relationship Outsourcee criteria
1	Domain expertise Business management	Technology exploitation Process re-engineering	Planning and contracting Organizational design
2	Behavior management Sourcing Governance	Customer development Behavior management Sourcing	Governance Customer development
3	Program management Leadership	Program management Leadership	Program management Leadership
4	Technology exploitation Process re-engineering Customer development Planning and contracting Organizational design	Planning and contracting Organizational design Governance Domain expertise Business management	Domain expertise Business management Behavior management Sourcing Technology exploitation Process re-engineering

In addition to the outsourcee criteria, the partnership criteria must also be prioritized according to the main outsourcing goal.   All the items in the partnership criteria are indeed essential to any outsourcing relationship, but the desired dynamic and focus of the relationship should differ depending on the outsourcer's main purpose behind outsourcing.   For instance, although reducing cost may be a key factor to any outsourcing endeavor, an outsourcer who plans on a long-term relationship with an outsourcee would not want the outsourcee suffering from a loss of revenue.

Table 2 below summarizes the prioritization pattern for the three items on the

partnership criteria checklist [15].   Note that only one of the items is highlighted for each main outsourcing goal, reflecting the overall equal importance of the other two in each case:

Table 2:   Partnership criteria prioritization

Main outsourcing goal	Operational service	Competitive improvement	Long-term viability
Priority	Partnership criteria	Partnership criteria	Partnership criteria
Primary	Cost	Software maturity	Business capability creation
Secondary	Software maturity Business capability creation	Business capability creation Cost	Cost Software maturity

IV.   Analysis Through Case Studies

A.   Studies related to determining the main outsourcing goal

The spectra for determining the main outsourcing goal of an outsourcer, shown as Figure 4 above, are primarily based on studying cases of firms in a variety of industries that have attempted outsourcing their software development projects. Their successes and shortcomings portray the usefulness of the spectra.

The first case study is of a European ferry company that has software

applications for handling its reservation and check-in [20]. It considers them to be critical differentiators that distinguish it from its competitors. Since the applications come in direct contact with its customers, its competitive strategy is to differentiate through service. Such nature of the applications have convinced the company to rule out outsourcing as a viable strategy for the developing their applications, despite the potential higher salary paid to its in-house employees.

The next case study is considered for insight into the role of the degree of technological integration in setting main outsourcing goals [20]. A U.K. food manufacturer needed software for automating its factory processes, and thus decided to outsource the development to an outsourcee with domain expertise in factory automation software. But as the software was integrated into almost every single business unit of the outsourcer, the outsourcing relationship ended up lasting four years instead of the planned two. Thus in such a case, it is apparent that for higher degrees of integration of a given software project, the outsourcer should look into making long-term viability as its main outsourcing goal. Such goal will then lead the outsourcer to search for an appropriate outsourcee that not only has domain expertise, but also the ability work together to organize and conquer the extensive integration tasks necessary.

B. *Studies related to criteria prioritization*

Additional case studies were considered for designing the patterns of prioritization for checklists of the outsourcee and the partnership criteria. Despite

the strong interrelated nature of the individual items of the criteria, the studies show characteristic outsourcing goals shaping the main focus in forming outsourcing relationships.

CGI Group Inc. is an information technology services firm that serves as an outsourcee for a variety of business process projects in addition to software development [23]. For each of its outsourcers that looks for a clear improvement of competitiveness, it develops an annual technology plan that both itself and its outsourcer can agree upon to allow the selection of the most cost-effective technology investmensts [10]. This in turn adheres to the prioritization of technology exploitation for the goal of competitive improvement.

For companies looking for long-term viability, it should look for an outsourcing partnership that can create business capabilities, despite the potential higher cost. For instance, Wal-Mart decided to experiment with Sun's Java applets on the Internet through outsourcing [15], aggressively taking the lead in the software technology's beta testing. With regards to outsourcing, the ex-CIO of Wal-Mart and ex-CEO of Wal-Mart International, Robert Martin, commented [15], "When I'm presented with a proposal to invest in new technology, I look beyond the financial commitment I'm asked to make today and try to understand what my follow-on commitments will be…. We have to know how we will get from the investment we make in today's generation of technology to the next generation."

V. Limitations and Additional Considerations

The weighted checklists, represented through the unique prioritization orders for each outsourcing goal, provide guidance for firms developing software in the business considerations that come prior to making their offshore outsourcing decisions. Yet, notable limitations to the current checklists must not be overlooked. First, the checklists are strictly limited to the business considerations, while in reality, legal considerations are of equal importance in offshore outsourcing. Also, it is often the case that firms developing software have strategic imperatives that cause them to look into even longer-term outsourcing strategies, where they either conduct a M&A transaction with an offshore outsourcee or perform what is called a Do-It-Yourself ODC (DIYODC) [13]. The current checklists do not extend far enough to provide information for firms that are looking to abide by such strategies.

A. Legal considerations

The major legal considerations are summarized into the following categories, and the goal of a firm looking to outsource offshore should be to become able to have clear answers to the questions associated with each of the categories [6]:

1. Ownership: Who legally owns the technology and intellectual property developed through the outsourced work?

2. Process management: Are specifications for development clearly indicated in the outsourcing contract?

3. Liability: Are there export control or insurance issues, either for the outsourcer or the outsourcee?

4. Infringement indemnity: Can the outsourcer obtain indemnity against the outsourcee's infringement of purchased IP rights?

5. Dispute resolution: How will disputes be resolved, and who will be responsible for the costs of resolution?

6. Enforcement: If there is a breach of contract, what enforcement options exist for the outsourcer?

7. Termination: What are the necessary circumstances for allowing termination of contract?

8. Taxation: How will the necessary federal, regional, and local tax obligations be accounted for?

9. Local counsel: Does the outsourcer have a specialized legal counsel in the offshore region?

B. Longer-term outsourcing strategies

In addition to the legal considerations, the current checklists must be made to handle their items to be prioritized for firms with a strategic imperative to outsource offshore for over a longer period of time. One of the strategies that such firms take on is DIYODC, where the outsourcer builds and establishes its own offshore facility [13]. This requires the outsourcer to pay attention to even more fundamental issues such as electricity, water, and physical security, and is a significant investment that can only be planned for long-term profit. Since this strategy only maintains the "offshore" quality of offshore outsourcing without the "separate entity" idea, the outsourcer is fully responsible for all maintenance even outside of direct development, such as equipment, resources, and training.

Another outsourcing strategy for firms facing such a strategic imperative to outsource is M&A, where the outsourcer purchases an already established offshore entity [13]. Since the investment for M&A, as is with DIYODC, is permanent, the process involved in finding the right company to purchase becomes highly complex. The outsourcer must keep in mind that the outsourcee's risk then directly becomes its own risk, as the two are no longer separate. Although neither DIYODC nor M&A strictly abide by the definition of "outsourcing," as both the outsourcer and the outsourcee are essentially the same company, many of the items on the checklists and in the list of legal considerations must be accounted for when sending work offshore through these longer-term strategies.

VI. Future Work

The first of the next series of steps to follow for further related research is to critically evaluate the current status of the checklists and the additions that must be made to them. Assuming a satisfactory completion of that step, several possibilities for future work arise, adhering to the testing, extension, and automation of the weighted checklists initiated through my work.

A. Inclusion of legal considerations and longer-term outsourcing strategies

As the inclusion of legal considerations and longer-term outsourcing strategies is made to the current checklists, their realistic completeness will allow for field testing of the prioritized checklists by actual firms in the market. There would broadly be two different stages to this process, where the stages will differ primarily by where the subject firms lie in their outsourcing processes. The first stage will look at firms that have made the decision to outsource offshore, tracing back to see whether the issues they considered to be important adhere to the ones indicated by the checklists. The checklists should then be revised for increased accuracy, prior to the second stage, where they will actually be used by firms just entering the stage of making the decision to outsource offshore, with their progressions being tracked for further test data.

B. Extension outside of software development projects

Effective use of the field tested weighted checklists should then be considered for extension into use by firms in making outsourcing decisions for projects other than software development.   There are key steps that must not be overlooked in initiating such extension, one of the most important being the evaluation of the target project in comparison to software.   Rarely is there a product such as software, where the cost of design is remarkably higher than that of production [1], and also that which is advancing technologically at such an extreme pace.   Most other projects will thus have a somewhat less complicated implementation of outsourcer-outsourcee collaboration, and it should also be a major task to consider how to effectively spend the resulting saved resources.

C. Automation of weighted checklist generation

As is the case with any process of strategic determination, automation of the process of generating the corresponding weighted checklists for a firm would appreciably enhance the feasibility of considering the issues involved in offshore outsourcing.   A possible form of automation would be a software application that prompts the user, in this case the outsourcer, to provide information about itself that leads to the proper outsourcing goal, and in turn to the optimal weighted checklists of outsourcing considerations.   For instance, an independent software vendor would enter into the application information about its development project, such as that it is

conceptually novel and is critical to its business, which the application would then use to determine the most fit outsourcing goal. It would correspondingly provide the prioritized checklists of items that must be considered by the vendor before initiating offshore outsourcing, making the generation of customized weighted checklists a user-friendly and time-efficient task overall.

VII. Conclusion

According to Gartner, Inc., a provider of research and analysis on the global IT industry [2], although under 5% of IT jobs in the United States is currently being outsourced offshore, the number is expected to rise to 30% by 2015 [3]. Despite the alarm that such data is sending to the IT workers in the United States, the importance of globalizing the IT software and services industry is fully recognized by the Information Technology Association of America (ITAA) through its Global Outsourcing Principles [4]. One of the 11 principles included explicitly outlines that "localization issues may require offshore approaches [5]."

Software development projects are no exceptions to the increasing trend of offshore outsourcing. Furthermore, they require particular consideration due to their inherent aspects of "design" and dependency on rapid technological advancements. Companies looking to outsource their software development should take care to avoid the potential pitfalls of offshore outsourcing (shown in Figure 1) by

thoroughly assessing their outsourceable projects, in-house capabilities, and in turn their main outsourcing goals. Depending on what outsourcers are aiming to gain most out of outsourcing offshore, they can then evaluate potential outsourcees and partnerships in order of the prioritization patterns recommended here (summarized in Table 1 and Table 2).

As a final note, one must keep in mind that this thesis is a reflection of the nature of software and the global economy as it stands today. As it is currently the mere beginning of the 21st century, my hope is that this work will provide a piece of the ground upon which subsequent offshore software development outsourcing research fit for future advancements can take place.

References

[1]   M. Cusumano.   *The Business of Software.*   pp. 1, 11, 132-134.   Free Press, 2004.

[2]   http://www.gartner.com/5_about/company_information/41a.html   (accessed April 11, 2005).

[3] http://www.informationweek.com/story/showArticle.jhtml?articleID=160400498 (accessed April 11, 2005).

[4]   "Offshore outsourcing."   *Current Issues.*   May 2004. http://www.masoftware.org/public_policy/issue_offshore_outsourcing.asp (accessed April 11, 2005).

[5]   "ITAA Global Sourcing Principles."   Information Technology Association of America, August 6, 2003.

[6]   R. Patel and R. Pais.   "Software Outsourcing Offshore – Business and Legal Issues Checklist."   Fenwick & West LLP, 2004.

[7]   "Applications Outsourcing Services: Overview."   Accenture, 2005. http://www.accenture.com/xd/xd.asp?it=enweb&xd=services\outsourcing\applicatio n\capabilities\application_capabilities.xml (accessed April 11, 2005).

[8]   "Applications Outsourcing Services."   Electronic Data Systems Corporation, 2005. http://www.eds.com/services/appsoutsourcing/ (accessed April 11, 2005).

[9]   R. Dandrea.   "Outsourcing: Guidelines for Success."   ITX Corp., 2004.

[10]   D. Feeny, M. Lacity, and L. Willcocks.   "Taking the Measure of Outsourcing Providers."   *MIT Sloan Management Review*, Spring 2005, pp. 41-48.

[11] "Four Steps to Successful Software Development Outsourcing." QualityLogic Inc., 2003. http://www.qualitylogic.com/newsletter/q1_03/sq_steps.html (accessed April 11, 2005).

[12] "Build-Operate-Transfer for ISVs – The Five Strategies for Offshore Software Development." Lionbridge Technologies, Inc., 2005.

[13] "Five Strategies for Global Sourcing of Application Development – Why Captive ODC Makes Sense for Enterprise IT." Lionbridge Technologies, Inc., 2005.

[14] D. Ganesh. "Planning for Offshore Outsourcing." *Guidelines for IT Management*. The National Computing Centre Limited, 2005.

[15] N. Venkatraman. "Beyond Outsourcing: Managing IT Resources as a Value Center." *Sloan Management Review*, Spring 1997, pp. 51-64.

[16] "Development Outsourcing Risks." *FoxPro Wiki*. http://fox.wikis.com/wc.dll?Wiki~DevelopmentOutsourcingRisks~VFP (accessed April 17, 2005).

[17] S. Sun, T. Lin, and P. Sun. "The Factors Influencing Information Systems Outsourcing Partnership – A Study Integrating Case Study and Survey Research Methods." *Proceedings of the 35th Hawaii International Conference on System Sciences.* IEEE, 2002.

[18] E. Beulen and P. Ribbers. "Managing Complex IT Outsourcing – Partnerships." *Proceedings of the 35th Hawaii International Conference on System Sciences.* IEEE, 2002.

[19] J. Rochester and H. Rochester. "Advantages and Disadvantages of Outsourcing." IEEE, 1995.

[20] M. Lacity, L. Willcocks, and D. Feeny. "The Value of Selective IT Sourcing." *Sloan Management Review*, Spring 1996, pp. 13-25.

[21] A. Hassler and M. Neuman. "Guidelines for Outsourcing Remote Access."

Cause/Effect, Volume 19, Number 4, Winter 1996, pp. 14-21.   Cause, 1996.

[22]   R. Richardson.   "Answers to Outsourcing."   *Purchasing b2b*, Archive Issue, January/February 2005.

[23]   http://www.cgi.com/web/en/overview.htm (accessed May 15, 2005).

[24]   "Software Development Life Cycle."   *StylusInc.*
http://www.stylusinc.com/Common/Concerns/SoftwareDevtPhilosophy.php
(accessed April 17, 2005).

[25]   J. Barthelemy.   "The Hidden Costs of IT Outsourcing."   *MIT Sloan Management Review*, Spring 2001, pp. 60-69.

[26]   A. Tiwana.   "Beyond the Black Box: Knowledge Overlaps in Software Outsourcing."   *IEEE Software*, September/October 2004, pp. 51-58.

[27]   "Evaluating Overseas Software Development Outsourcing."   *Nucleus Research*, Research Note D64.   http://www.nucleusresearch.com/research/d64.pdf
(accessed April 17, 2005).

[28]   W. Meredith.   "Outsourcing comes of age?"   *III-Vs Review – The Advanced Semiconductor Magazine*, Jan/Feb 2003.

[29]   A. DiRomualdo and V. Gurbaxani.   "Strategic Intent for IT Outsourcing."
Sloan Management Review, Summer 1998, pp. 67-80.

[30]   M. Paulk, B. Curtis, M. Chrissis, and C. Weber.   "Capability Maturity Model for Software, Version 1.1."   Technical Report, CMU/SEI, February 1993.
(http://www.sei.cmu.edu/pub/documents/93.reports/pdf/tr24.93.pdf)