

A GUIDE FOR COMPUTER AIDED DESIGN STUDENTS WHO SEEK TO
ESTABLISH A SUCCESSFUL BUSINESS SERVING THOSE
COMPANIES WHO WISH TO OUTSOURCE OR
CONTRACT OUT CAD AND DESIGN WORK

By

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Abstract

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A Comprehensive Literature Review and Guide for Computer Aided Design
Students Who Seek to Setup a Successful Business Serving Those Companies
Who Wish to Outsource or Contract Out CAD and Design Work
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In the global economy, companies need to continuously reduce costs, and develop new products and services to stay competitive. Corporations can reduce costs in many different ways such as improving employee productivity, reducing employee pay, reducing building maintenance, consolidating operations, and outsourcing operations.

Firms outsource to keep the business competitive and reduce costs. Frito Lay is outsourcing computer programming to a Russian firm, Luxoft. The low cost Russian computer programming that Luxoft provides is so popular, the company is growing revenue at 40% a year.

Reducing costs is not the only reason to outsource. A company might not be able to find the talent it needs in house. Many companies have found it easier

and more cost effective to outsource the development of the company's website, rather than hire a full time web designer.

Several of Wisconsin's Technical colleges offer two-year computer aided design (CAD) degrees. Graduates of the CAD programs typically operate computer aided design software at manufacturing, design, and architectural firms. A designer's work is computer intensive and much of the workday is spent alone at a computer station. Given the nature of the work, companies may find it convenient to outsource CAD and design work rather than hire staff.

The purpose of this study was to research and review the literature on outsourcing and contracting to provide a guide for CAD students who seek to set up a successful business serving those companies who wish to outsource CAD and design work.

The study was conducted through a comprehensive review and critical analysis of research and literature focused upon the research questions of the study.

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CHAPTER ONE

Introduction

In the global economy, companies need to continuously reduce costs and develop new products and services to stay competitive. Corporations can reduce costs in many different ways such as improving employee productivity, reducing employee pay, reducing building maintenance, consolidating operations, and outsourcing operations.

Car company Chrysler makes only 30 percent of the parts which go into an automobile themselves, a figure that Chrysler executives hope to drive lower still. “Chrysler is evolving into a company that coordinates and supervises the work of others” (Bookman, 1996, p. 2).

The shoemaker Nike does not make a single pair of sneakers.

Last year, it sold more than \$3.5 billion worth of shoes. Yet Nike does not own a single shoe factory; all of its sneakers are made by independent contractors in overseas factories. Nike is essentially a glorified marketing agency; its greatest assets are not factories, but athletes such as Michael Jordan and Michael Johnson. They create the image that enables Nike to sell sneakers for \$120 retail (Bookman, 1996, p. 1).

Companies not only outsource manufacturing, but also many different products and services. Frito Lay is outsourcing computer programming to a Russian firm, Luxoft. The low cost Russian computer programming that Luxoft provides is so popular, the company is growing revenue at 40% a year (Essick, 2002). The city of Indianapolis outsourced garbage collection and the city’s

solid-waste budget shrank from \$43.9 million to \$26.8 million; at the same time, complaints fell 30% (Pascal, 1996).

Lack of employees skilled in the area of need is another reason companies outsource. A company might not be able to find the talent it needs in-house. Many companies have found it easier and more cost effective to outsource the development of their website, rather than hire a full time web designer.

The popular Compaq Ipaq pocketpc was designed and is built by Korea's Samsung Corporation. Your new Gateway notebook computer is really the same as your friend's Dell, which is the same as your other friend's Samsung. All three computers are the same internally. Samsung simply puts a different brand name on the computer's exterior (Wildstrom, 2002).

New communication technologies and the Internet have allowed people all over the world to stay connected anywhere at anytime. Broadband allows the transmission of large files over great distances in minutes. According to Bookman(1996), programmers in India can work for a company in Atlanta:

The key to the arrangement is the Internet. Raw data for the project is transmitted to programmers in India via the Net; when they're done, they use the Internet to transmit the finished work back to Southern Co...In essence, those programmers telecommute from India to Atlanta. They do not have to immigrate to the United States to compete against American workers; immigration reform would be useless in halting such arrangements (p. 1).

Outsourcing has played a major role in the way corporations operate and has allowed companies to drastically reduce costs and increase profits. According to Towers Perrin, a management consulting firm:

Fortune 500 companies slashed the number of people on their payrolls by more than 18 percent from 1983 to 1993, a process that is continuing.

Some of those employees were replaced directly by computers and robots; others were replaced with contract workers, outsourcing and temporary employees...And over that same period, as payrolls were slashed and job security diminished, corporate profits increased more than 57 percent after inflation (cited in Bookman, 1996, p. 2).

Designers get involved in a variety of work. Western Wisconsin Technical College summarizes the mechanical design profession as follows.

Mechanical designers are challenged to create more reliable, sophisticated and complex products than ever before and in less time. Products must meet specifications and satisfy design requirements at a level that exceeds customer expectations. Mechanical design technicians use science, mathematics and engineering to solve technical problems in product design, manufacture, inspection, sales and maintenance. This requires creativity, communication skills, and the ability to work with others.

Technicians use 3D computer aided design (CAD) software as a primary tool. Graduates of the Mechanical Design Technician Program will be able to: Create CAD models that meet design requirements; Produce working drawings (dimensions, details, and bill of materials); Evaluate

manufacturing materials and processes; Produce engineering documentation; Use CAD models for strength & motion analysis, machining, and rapid prototyping; Use scientific problem solving techniques; Use other computer tools; Develop organizational skills required to meet deadlines (Western Wisconsin Technical College, 2002, n.p.).

Several of Wisconsin's Technical colleges offer a two year Computer Aided Design Associate Degree. Graduates of the program typically operate computer aided design software at manufacturing, design, or architectural firms. A designer's work is computer intensive and much of the workday is spend alone at a computer station. Given the nature of the work, companies may find it convenient to outsource CAD and design work rather than hire staff.

Statement of the Problem

Firms employ computer aided design graduates in a variety of industries. The designers perform various tasks on the job including CAD. If a designer wanted to establish himself as an independent contractor to perform these tasks, what things would he need to do in order to launch a successful business?

Purpose of the Study

The purpose of this study was to provide a guide for Computer Aided Design students who seek to set up a successful business serving those companies who wish to outsource CAD and design work. The researcher wrote the guide by means of a comprehensive review and critical analysis of literature.

Research Questions

The research questions answered in this study were:

1. What equipment investment is necessary to set up an office to do design and drafting work?
2. What are some techniques to market yourself and get clients?
3. What types of CAD and design jobs can be easily outsourced?
4. For what reasons does a company outsource?
5. What experiences have companies had with outsourcing?
6. What experiences can a successful contractor share with those who seek to enter the world of independent contracting?
7. What institutions offer CAD degrees in the state of Wisconsin?

Definition of Terms

For clarity and understanding, the following terms need to be defined.

Assembly Drawing - A drawing that can be created to represent a major subdivision of the product, or the complete product.

Assembly Model – A computer model composed of multiple part models

Bills of Material (BOM) - A list of all the subassemblies, parts, materials, and quantities required to manufacture one assembled product or part, or build a plant. A BOM can be generated automatically on some CAD/CAM systems.

Computer Aided Design (CAD) -A process that uses a computer system to assist in the creation, modification, storage, and display of a design.

Client - The party for which the independent contractor renders services.

Consultant - One who gives professional advice or services.

Designer - Somebody who makes and executes designs

Drafting - Drawing plans and sketches (as of machinery or structures).

Drafters create the necessary production documentation of a product, while the engineer typically designs it.

Independent contractor - A company or individual with a formal contract to do a specific job, supplying labor and materials and providing and overseeing staff if needed, working independently.

Internet – The collection of networks and gateways that use the TCP/IP protocol suite and function as a single, cooperative, virtual network.

In-house - Conducted within, coming from, or being within an organization or group: an in-house computer system; in-house counsel; an in-house newsletter.

IT – (Information Technology) is a term that encompasses all forms of technology used to create, store, exchange, and use information in its various forms (business data, voice conversations, still images, motion pictures, multimedia presentations, and other forms, including those not yet conceived). It's a convenient term for including both telephony and computer technology in the same word. It is the technology that is driving what has often been called "the information revolution."

Mechanical Designer - Somebody who makes and executes designs of a mechanical nature.

Outsourcing - The practice of subcontracting manufacturing work to outside and especially foreign or nonunion companies.

Solid Modeling - A type of 3-D modeling in which the solid characteristics of an object under design are built into the database, so that complex internal structures and shapes can be realistically represented.

Telecommuting - To work at home by the use of an electronic linkup with a central office.

Workstation - The work area and equipment used for CAD/CAM operations. It is where the designer interacts or communicates with the computer.

WTCS- Wisconsin Technical College System

Assumptions

The research was focused on establishing the designer as an independent contractor who works at home with no employees. The terms outsourcing, independent contractor, contract engineering, designer, and consultant all have the same meaning for the purpose of this study. Individuals have a varying degree of experience and skills. The study was written for individuals with various skill and education levels who have similar professions as designers.

Limitations of the study

The following are considered to be limitations of the study.

1. Technology and software are advancing at a rapid rate. It is possible this study may not provide the latest information from the best sources. This study should only be used as a guide or starting point for developing more knowledge of the subject.

2. No empirical research was done and the study is limited to a literature review.

CHAPTER TWO

Review of Literature

Introduction

Establishing one as an independent contractor of CAD and design services for companies requires more than just CAD skills. It requires investment in CAD software, home office equipment, marketing your services, reviewing literature on the employer's perspective, reviewing the literature on the independent contractor's perspective, and evaluating education opportunities.

Technical college education

While it is possible for the independent contractor to learn CAD and design processes on his own, attending a technical college is seen as an important step for career advancement in this field. The Wisconsin Technical College System has 16 technical colleges, with 46 campuses and numerous outreach centers. The colleges offer over 300 career education programs in business and marketing, health, trades and industry, agriculture and agribusiness, service occupations, technical fields and wage-earning home economics. The following Wisconsin Map shows the technical colleges districts and locations.



Source: Wisconsin Technical College System

Wisconsin technical colleges offer one and two year degrees. There are over 300 programs, but only seven programs have their roots in drafting in design. Of these seven programs, there are four areas of focus. The prospective student needs to choose a design and CAD area to specialize in. The areas are Architectural Programs, Civil Engineering Program, Mechanical Design Programs, and the Applied Engineering Technology Program. The offering locations and description of the programs are as follows.

Architectural Programs – Architectural programs are offered at five different colleges around the state. There are four different program names. The most common name is Architectural Technology. WTCS describes this program: “The architectural area is broad and challenging. It is the purpose of the architect and/or consulting engineer to supply owners with a set of plans and specifications of the structure desired. Students learn how to assist architects or engineers in the development of plans and specifications, and checks on building erections and alterations” (WTCS, 2002, n.p.) See Table 1.

Table 1. Architectural Programs offered by Wisconsin Technical Colleges
Data from WTCS

Program Name	College	Job titles	Program Length	Salary after 6 months
Drafting – Architectural	1. Madison Area	Drafter CAD Manager CAD Technician Production Draftsperson Kitchen and Bath Designer	1 year	\$28,078
Architectural Commercial Design	1. Indianhead	AutoCAD Technician CAD Drafter CAD Technician Designer Draftsman	2 years	\$25,335
Architectural Residential Design	1. Northcentral	Design Engineer Layout Technician Truss Engineer Structural Engineer Carpenter/Draftsman	2 years	\$26,973
Architectural Technology	1. Madison Area 2. Milwaukee Area 3. Northeast	CAD System Operator Drafter Designer Architectural Technician Estimator	2 years	\$25,992

Civil engineering Technology Program – The civil engineering technology program is offered at four different colleges around the state. WTCS Description: “This program trains technicians to assist civil engineers in planning, scheduling, designing, estimating, surveying and inspecting the construction of highways, bridges, buildings and other structures. Specific courses provide students with the option for careers in land surveying.”(WTCS, 2002, n.p.) See Table 2.

**Table 2. Civil Engineering Program offered by Wisconsin Technical Colleges
Data from WTCS**

Program Name	College	Job titles	Program Length	Salary after 6 months
Civil Engineering technology	1. Gateway 2. Madison Area 3. Milwaukee Area 4. Northeast	CAD System Operator Engineering Specialist Civil Engineering Technician Engineer CAD Tech Estimator/Project Manager	2 years	\$31,199

Mechanical Design Programs – There are two different program names

‘Mechanical Design Technician’ and ‘Mechanical and Computer Drafting’.

WTCS defines the Mechanical Design program as follow: “The mechanical design curriculum is based on manufacturing and design of mechanical products or the machines, tools and equipment used in their fabrication or assembly.

Students acquire extensive skills using computers as a design tool. The increased use of automation in all industries has triggered a rising demand for trained people in this field.” (WTCS, 2002, n.p.) See Table 3.

Table 3. Mechanical Design Programs offered by Wisconsin Technical Colleges - Data from WTCS

Program Name	College	Job titles	Program Length	Salary after 6 months
Mechanical Design Technician	1.Blackhawk 2.Chippewa Valley 3. Fox Valley 4. Gateway 5. Lakeshore 6. Madison Area 7. Milwaukee Area 8. Moraine Park 9. Mid-State 10.Northcentral 11.Northeast 12.Southwest 13.Waukesha 14.Indianhead 15.Western	Mechanical Designer Drafter Designer Drafting Technician Product Designer	2 years	\$30,000
Mechanical and Computer Drafting	1. Gateway 2. Milwaukee Area 3. Indianhead	Architectural Drafter Draftsman Industrial Engineer Assistant Mechanical Designer Quality Manager/Drafter	1 years	\$32,000

Applied Engineering Technology Program

Four Wisconsin technical colleges offer the applied engineering technology program. WTCS summarizes the applied engineering program: “There are several Applied Engineering Technology paths from which to choose. Industrial Engineering Technicians strive to improve the productivity of an industrial firm. Manufacturing Engineering Technicians help direct and coordinate manufacturing processes in industrial plants. Materials Planning & Control Technicians are responsible for the planning and control of the parts and products in manufacturing. Quality Assurance Technician plan and coordinate programs designed to ensure continuous production consistent with established standards for an effective and profitable manufacturing operation.” (WTCS, 2002, n.p.) See Table 4.

Table 4. Applied Engineering Technology offered by Wisconsin Technical Colleges - Data from WTCS

Program Name	College	Job titles	Program Length	Salary after 6 months
Applied Engineering technology	1. Gateway 2. Northcentral 3. Northeast 4. Waukesha County 5. Indianhead	Not Available	2 years	Not Available

CAD software

A designer’s main tool is the CAD software. There are a plethora of CAD packages on the market today. Solid modeling, because of its 3D visualization advantages is replacing 2D CAD, as the tool of choice for designers. The CAD software the researcher taught to Mechanical design students at Western

Wisconsin Technical College (WWTC) includes: Inventor, SolidWorks, Mechanical Desktop and AutoCAD. Given that WWTC trains students on these packages, the researcher believes these software packages to have the most market share in the U.S. Each of these CAD packages costs several thousand dollars to purchase. It is important that the independent contractor's customers are able to read the files the contractor has created, therefore software compatibility is an issue. CAD software typically can't read files created by different CAD software.

Getting one program to work with another is one of the biggest problems companies have with computer software. When it comes to word processing, that's not such a big deal. But with computer-aided design (CAD) programs it can be a major pain in the corporate neck...The lack of compatibility of CAD software costs manufactures in the automotive industry \$1 billion a year, according to a 1999 study by the National Institute of Standards and Technology (Stevens, 2001, p.1).

CAD software is a high cost investment the independent contractor needs to carefully select. The best scenario is for the independent contractor is to use the same software and revision as the client, which will eliminate translation issues.

The designer may have to become proficient at many software packages in order to serve different clients. Given the high cost of software, the designer should start by purchasing the CAD program his clients use and he is proficient at using, and then add other software as needed.

Home Office

According to Kiplinger Magazine a good home office can be setup for under \$5000. Lankford of Kiplinger details the cost to setup a home office as follows: Computer workstation, \$2000; CAD software, \$100-\$4000; computer desk, \$200; Fax Machine, \$100; Printer, \$50-\$2000; separate phone line, \$20 per month; and a cellular phone, \$35 per month (Lankford, 2000, n.p.).

Collaboration Technology

There are a variety of technologies, which allow the Mechanical Designer to communicate with the client more effectively. The Designer may want to consider complementing the common business communication tools (phone, fax, voicemail, cell phone, internet, email) with the newer technologies such as Microsoft's net meeting. "Net meeting is a teleconferencing program developed by Microsoft. It lets you chat, use voice and video transactions, and share applications over the Internet" (TechTv, 1999, n.p.).

Major software companies AutoDesk and SolidWorks have net meeting built right into their CAD software. AutoDesk summarizes the Meet Now function of its software as follows.

With Meet Now you can collaborate in real time on the Web with clients and use the extended design team. Or you can use it to train staff online. Using Microsoft Net meeting technology, Meet Now moves your design communications to the Internet, Autodesk's own ILS server, or company intranet, which you can access from within AutoCAD. The automatic

application-sharing feature means that, once connected, everyone's PC displays the same information (Autodesk, 2002, n.p.).

SolidWorks offers an add-on called 3D TeamWorks. SolidWorks summarizes it as follows.

Unlike common methods of communication like telephone, fax, and email, 3D TeamWorks enables real-time communication among team members and provides anytime anywhere interaction with design data. 3D TeamWorks is a Web-based service that provides an online environment with a centralized locations, where product design teams can share information, conduct real time design reviews, troubleshoot problems, and coordinate team activities (SolidWorks, 2002).

"CAD companies are promoting their CAD software's ability to integrate with the Internet to enable a more productive design environment... the internet can help companies outsource more" says Bill Gacogne, SDRC's senior vice president for worldwide operations (cited in Baxter, 1999, p. 3).

"...Internally the internet is seen as a powerful tool for spreading design and data throughout an organization, and extending its usefulness."(Baxter, 1999, p. 3)

With the Internet enhancing communication throughout the organization, it bodes well for the independent contractor who is working off-site.

Reasons to Outsource

Why would a company want to outsource? The independent contractor must put himself into the shoes of his potential clients in order to understand them

and sell to them. Samuel (2001) says there are many reasons a firm may decide to outsource.

- to reduce and control operating costs
- to improve company focus
- to improve quality
- to access capabilities not otherwise available
- to free internal resources for other purposes
- to reduce cycle time
- to make capital funds available
- to obtain cash infusion
- to reduce risk
- to gain flexibility
- to turn fixed costs into variable ones
- to stabilize an unstable situation
- to engage an outside agent of change

The most frequent reason for outsourcing is to reduce operating costs. In my involvement with hundreds of outsourcing transactions, I can count on one hand the times when cost was not important in the decision to outsource (pp. 35-36).

Dick LeFebre, director of information technology for Simpson industries says, "If there is somebody out there who can do it better, faster, and cheaper than you, then you don't want to do the work in house. If it doesn't make sense, you outsource it" (cited in Samuel, 2001, p. 27).

If the number one reason firms outsource is cost savings, then the mechanical design contractor will need to sell his services at competitive rates and highlight the potential savings to the client.

Marketing

How will a designer get customers? By Selling! In recent years companies have turned into marketing organizations. “Many companies no longer build products first and then decide how to sell it. A marketing-oriented company first asks about customer needs and attempts to satisfy those needs at a profit.” (Weiglin, 2002, p. 1) When selling his services, the designer must consider what is called the marketing mix or the four Ps. The right marketing mix will lead to sales and income for the designer. The four Ps are as follows:

1. Product

Product is the need satisfying offering of a firm. In the case of contract design and CAD work, the product is a service. The independent contractor must decide the type of service to offer.

2. Price

What is charged for something is the price. The designer must set an hourly rate to charge for his service. Instead of charging an hourly rate, the contractor may want to bid the job. By bidding a job, the client will know how much the project will cost before work begins.

3. Place

Place is making goods and services available in the right quantities and locations - when customers want them. The designer will need to determine if it is better to work on-site or offsite. The designer will also need to determine which companies to market to

4. Promotion

Promotion is communicating information between seller and potential buyer or others in the channel to influence attitudes and behavior. The designer will need to promote his services through advertising or other means to acquire customers.

Cold calling and promotion can lead to many dead end leads. According to Misner (2002, p.1) word of mouth marketing is “The World's Best-Known Marketing Secret: Everyone knows about it, but hardly anyone does it well.”

Misner offers three tips to help market your business via word of mouth.

- 1. Diversify your networks.** If you want to build your business through word-of-mouth, you have to be visible and active in the community by participating in various networking groups and/or professional associations.
- 2. Develop your contact spheres.** Contact Spheres are businesses that are symbiotic and noncompetitive to you. For example: a lawyer, an accountant, a financial planner and a banker. All of them have clients with overlapping similar needs. They can all work with and refer each other easily.
- 3. Word-of-mouth is more about farming than it is about hunting.** Word-of-mouth is more about farming than it is about hunting.

Building your business through word-of-mouth is about cultivating relationships with people who get to know you and trust you. People do business with people they have confidence in. One of the most important things I've learned in the past two decades is this: It's not what you know, or who you know, it's how well you know them that counts. (Misner, 2002, p.1)

Word of mouth advertising and networking can be a great tool in getting new customers referrals. When interviewed about his companies outsourcing strategy, the IT manager of Noodles Restaurant, Brian Yahn used networking techniques to find someone to provide the services he wanted. Says Yahn:

We had somebody we were working with, and she needed to take on some other responsibilities, so I went to a couple of our current vendors to ask if they had anybody they knew of...They turned me onto a gentleman who's doing a fabulous job now. It's a networking strategy...Most of our outsourcing right now is with people we have relationships with...If we need to go outside that realm, we will take advice from a company that we already have relationships with and that may know somebody. It's kind of word-of-mouth reference from providers that we are currently using (cited in Nations Restaurant News, p. 14).

Designers have gone to work at many firms around the state. Appendix A lists some of the firms that have hired technical college graduates. The contractor may want to market to these firms because they have shown a need for designers though their hiring of designers in the past.

Outsourcing: a Client's Perspective

Employers outsource when it makes sense and not all work is well suited for outsourcing. In this section the researcher will evaluate literature about employers who have outsourced work. By examining the literature on those companies who have outsourced, the mechanical designer can gain insight into how to successfully serve his customers.

When interviewed, the managers who outsourced made comments which about the different aspects of outsourcing.

Knowledge of the client's business

Jobs which require a lot of knowledge of the business, are typically not the jobs to outsource unless the independent contractor has the skills and is knowledgeable of your business. If a job requires constant communication with the client, it is typically more cost effective to keep it in house. Rick Smith, the chief information officer for the Cheesecake Factory Restaurant makes the following comments about outsourcing some of his company's IT functions.

The downside of someone not intricately familiar with a company's operations is that you must have someone there spoon-feeding them all the time... If you want a total solution or a solution that's crafted around your real business requirements, it's tough to see someone doing that. For example, labor-scheduling systems are different from one restaurant company to another - how you do it, how you apply it. If someone said they were going to build one, the first thing you ask them is, how much of

the business do you really know (cited in Nation's Restaurant News, 2001, p.15)?

The more the designer knows about the clients business, the better. A company does not want to waste their time telling the contractor how to do a job. Brian Yahn, made these statements about his companies outsourcing.

Outsourcing, as far as cost goes, is usually a great idea...It's much more cost effective, but you lose that personal aspect. You're subject to someone else's timeline. If it's in house, you dictate the timeline... There are both positive and negative aspects to it. It's where your priorities lie. If the priority is getting it done in an extremely thorough, timely fashion, excluding cost, it's much more effective to do it in-house. If you are primarily cost-driven, outsourcing is much more of an advantage (cited Nation's Restaurant News, 2001, p. 15).

Independent contractor has skills company doesn't have in house

An independent contractor may have skills, which no one at the client's company may have. In this case the independent contractor adds a dimension to the design project which is not achievable in house. For example, a client may not have the resources to invest in software. An independent contractor can fully utilize his CAD software and amortize the cost among to his clients.

Tanya Taank, director of IT at Boston's Gourmet Pizza in Vancouver, British Columbia, outsources when skills are limited in-house or the time is very tight. "The main reason we outsourced was the skill level required in developing

the Web site," Taank says. "We did not at that time, or now, have the skill needed to program an extranet" (cited in Nation's Restaurant News, 2001, p.16).

Companies outsource non strategic items

Companies usually choose to outsource non-strategic items to reduce cost and focus on what it does best. "Operational excellence is not achievable at all levels of the organization. Yet in this time of ever increasing competition, low cost operational and operational excellence in all facets of the company are essential now more than ever" (Samual, 2001, p.20).

Brian Smith outsources non-strategic items at Taco Bell. "At Taco Bell we did a significant amount of outsourcing," says Smith, "The way we used to think about it is that you would outsource those things that are non-strategic. But anything that is strategic or a competitive advantage, you keep internal" (cited in Nation's Restaurant News, 2001, p. 16).

Outsourcing: an Independent Contractor's Perspective

To be successful at contracting out your services, one might want to examine a successful contractor in the field. Bob Kennett is a successful contractor. The New Hampshire business review interviewed Mr. Kennett on his contracting experiences.

Mr. Kennett made the following comments about the recent slowdown in the economy.

Independent contractors tend to be the canaries in the coal mine. When business goes south, we're the first to get hit, and when business starts

to come back, then we start to get hired back. And when business is good we're 100 percent employed (cited in Madden, 2002, p. 33).

Mr. Kennett works with placement agencies that help him get contracting work.

They know if they send me into an interview that I'll get the contract. Contractors have to focus on the businesses that they know are going to make them money and so do the placement agencies (cited in Madden, 2002, p. 33).

According to Kennett, it is very difficult to grow your contracting business beyond that of a one-man operation. "It's tough to grow when you're a contractor," said Kennett. "You end up being trapped by a lot of things. You end up working all the time for really good money, and to really put the time into sales you have to change the way you work" (cited in Madden, 2002, p. 33).

Kennett says his role as a contractor is very different than regular full time employees at a firm. Kennet says:

I try to focus on that the company has brought me in for a particular job, and I have an obligation to treat myself as a contractor and not as an employee. I think employees have a long-term commitment relationship with a company, and they tend to spend more time building relationships. Long and leisurely lunches discussing the Super Bowl help to build morale. But as a contractor, I'm going to be out in six months, so I spend less time team building and more time working (cited in Madden, 2002, p. 34).

CHAPTER THREE

Summary, Conclusions, and Recommendations

Summary

In Chapter two, the research questions were addressed and the different areas of CAD and drafting were examined. In this section the researcher will formulate conclusions from the research and provide recommendations to the designer who seeks to set up his business.

Conclusions

The majority of literature reflects the increasing popularity of large corporations outsourcing to foreign countries to save money. Computer programming and manufacturing are popular items to outsource because the task can easily be defined and intimate knowledge of the customer's business is not necessary. Business processes like human resources, information technology and payroll are also easily outsourced and classified as non-core at most companies.

There was limited literature on design outsourcing. The most likely reason is that most companies have determined design as core and should keep it in house for control and company security. Firms may not wish to outsource design for fear of giving away design information to a competitor.

Design and engineering may be considered core, but there will always be a need to develop prints and assist with drafting so an engineer may focus on designing products. Drafting may be viewed as non-core, making it good for outsourcing. A contracted designer may simply receive solid models or hand sketches and turn those items into CAD data and documentation.

In conclusion, one of the biggest obstacles for the mechanical design contractor to overcome is that core company processes are not outsourced. Unfortunately, design and engineering is core at most companies. Therefore, the designer may find it difficult to persuade companies to outsource. To be a successful contractor, a designer must network and look for niche areas where he can provide good service at a reasonable price to his clients.

Recommendations

From the comprehensive review of literature and research on the topic, the following recommendations are provided.

If a designer is to be successful, he must network. The researcher has not advertised or promoted his services, but has landed two jobs simply through networking.

Former employers are a good source of work. You may have left the company on good terms and there will be a void because chances are the company will not have found a replacement to do your work. This work needs to be done and it may be an opportunity for you to work for your former employer doing contract or consulting work.

When selling your services, the contractor should strive for outsourcing agreements and not contracting agreements. Samuals defines contracting as money for a defined work. When a company outsources, the contractor owns the process (Samuals, 2001). Contracting agreements can be shopped around to the lowest price while outsourcing contracts can't.

In a contracting situation, most companies believe they can use their position as a consumer and switch suppliers fairly quickly and easily. But to go into outsourcing with that assumption is a big mistake! Because suppliers own the outsourced process and buyers face substantial switching costs, suppliers often enjoy greater market power than they would as contractors (Samuels, 2001, p. 30).

For example, the mechanical designer should strive for an outsourcing agreement such as “providing all of a firm’s drafting and design services”, rather than for a contract agreement such as “solid modeling 50 parts.”

Narrow your focus and identify what you are good at. What areas are skills needed? What will companies buy? An independent contractor can’t be all things to all people, but can serve some customers very well.

Design is most likely core in most circumstances. For this reason, a designer may find it difficult to persuade companies to outsource their design and engineering. Drafting on the other hand, is using someone else’s design to create engineering documentation. A designer may be able to find work in the drafting areas, because drafting is most likely non-core. A designer may want to focus on areas that lend themselves well to being outsourced. Some areas in which a designer might be able to provide lower cost solutions to companies are:

1. *File translation* – Companies spend millions of dollars each year manipulating CAD data from a different CAD system to work with their system. A mechanical designer may be able to become proficient at this service.

- 2.** *2d to 3d services* - Many companies have only recently switched to 3d and most of their legacy data is 2d. It may be more cost effective to outsource the work so higher paid engineers don't have to do it. Or, the company may not have the manpower complete the transfer in a timely manner.
- 3.** *Jig and fixture design or other specialized niche specialty* – By becoming an expert in a certain area of design that is in demand, a contractor may find firms willing to pay a premium for his expertise.

BIBLIOGRAPHY

- Autodesk. (2002, July 15). Meet anywhere with meet now. Retrieved July 15, 2002, from: <http://pointa.autodesk.com/local/enu/portal/Articles/article.jsp?articleId=1493>
- Baxter, A. (1999, October 20). The tail is now wagging the dog. *London Financial Times*, 3. Retrieved June 29, 2002, from ProQuest database.
- Bookman, J. (1996, July 28). Understanding the future building lifeboats for the new economy, caught in a tidal wave of change spurred by technology and global competition, corporations have downsized and outsourced their way out of the center of our social and business lives. *The Atlanta Journal the Atlanta Constitution*, n.p. Retrieved June 29, 2002, from ProQuest database.
- Essick, K. (2002, June 18). WSJE CEO Summit (A Special Report) --- Russia's outsourcing market heats up --- More U.S. and European companies turn to nation's lower-cost software programmers. *Wall Street Journal*, A7. Retrieved June 29, 2002, from ProQuest database.
- Heywood, J. (2001). Outsourcing dilemma: the search for competitiveness. Prentice Hall PTR.

- Lankford, K. (2000, February). Bringing home the business. *Kiplinger's Personal Finance Magazine*, 54,(2), 122-128. Retrieved June 29, 2002, from ProQuest database.
- Madden, L. (2002, February 22). Independent contractors are like the canary in the coal mine. *New Hampshire Business Review*, 24, 33. Retrieved June 29, 2002, from ProQuest database.
- Misner, I. (2002, July 1). Word-of-mouth: the world's best-known marketing secret everyone knows about it, but hardly anyone does it well. It's time to change your approach to word-of-mouth marketing. *Entrepreneur magazine*. Retrieved July 2, 2002 from:
<http://www.Entrepreneur.com/article/0,4621,301179,00.html>
- Nation's Restaurant News, N.A. (2001, October 22). Outsourcing: Yes. No. Maybe. *Nation's Restaurant News*, 35, 43, 14-15. Retrieved June 29, 2002, from ProQuest database.
- Northeast Wisconsin Technical College. (N.D.). 2001 Graduate follow up report. Retrieved 7/25/02 from:
<http://www.nwtc.edu/Admissions/gradfollowup.htm>
- Pascal, Z. (1996, Aug 6). Two-edged sword: More public workers lose well-paying jobs as outsourcing grows --- taxpayers reap big savings, at cost of job security and benefits for temps --- high wages for specialists. *Wall Street Journal*, A1. Retrieved June 29, 2002, from ProQuest database.

SolidWorks. (2002, July 25). 3D TeamWorks. Retrieved July 25, 2002, from:

<http://www.3dteamworks.com/index-new.cfm>

Samuel, P. (2001). Turning lead into gold: the demystification of outsourcing.

Executive Excellence Publishing.

Stevens, T. (2001, June 11). The costs of CAD incompatibility. *Industry Week*,

n.p. Retrieved July 15, 2002, from: <http://www.industryweek.com/>

[CurrentArticles/asp/articles.asp?ArticleID=1067](http://www.industryweek.com/CurrentArticles/asp/articles.asp?ArticleID=1067)

TechTV, (1999, March 15). Are there other servers to use with NetMeeting?

Retrieved July 25, 2002, from:

<http://techtv.com/screensavers/print/0,23102,2223031,00.html>

Western Wisconsin Technical College. (2002). Mechanical Design Technician.

Retrieved June 25, 2002, from:

<http://www.wwtc.edu/wwtcstudents/addetail.asp?varProgID=106061>

Wildstrom, S. (2002, June 7). Don't be fooled by the name on the box

Today, even the design of brand-name gear is farmed out. Often, though, that's not bad news. *Business Week*, 3787, 18. Retrieved June 29, 2002, from ProQuest database.

Weiglin, P. (N.D.). Essentials of marketing. Retrieved July 25, 2002, from:

http://learn.berkeley.edu/classrooms/bs/x460.1d/11d/html/body_11t5p1.htm

Wisconsin Technical College System (2002). Retrieved July 25, from:

<http://www.witechcolleges.com/wwtc.htm>

APPENDIX A

Employers of Program Graduates

Northeast Wisconsin Data from:

2001 Northeast Wisconsin Graduate follow up report.

Madison Area Technical College Data from:

2001 Madison Area Technical College Graduate follow up report.

Western Wisconsin Technical College Data from:

2000 Western Wisconsin Technical College Graduate follow up report.

2001 Northeast Wisconsin Technical Architectural Technology Program

Architectural Drafter: Wick Homes, Mazomanie

Architectural Drafter: Millennium Architects, Green Bay

Architectural Drafter: Richard Schroeder, Oshkosh

Architectural Drafter: Hall Development & Const, De Pere

Architect: Seymour Lumber Of Wisconsin, Inc., Seymour

Engineering Technician: Rice Engineering, Luxemburg

Detailer: Viking Steel, Inc., Oshkosh

Sales Representative: Wicks Lumber, Greenville

CAD System Operator: (2) Berners-Schober Associates, Inc., Green Bay

CAD System Operator: Krueger International, Green Bay

CAD System Operator: Mead & Hunt, Inc., Madison

CAD System Operator: PTD Inc., Fond Du Lac

Supervisor: Hoffers, Inc., Green Bay

1991 Northeast Wisconsin Technical Architectural Technology Program

Project Designer: Schuh Construction, Seymour

Designer: McMahon Associates, Neenah

Owner/Operator: Anderson Building & Remodeling, New Franken

2001 Northeast Wisconsin Civil Engineering Technology

Survey Technician: (2) Robert E. Lee & Associates, Inc., Green Bay

Survey Technician: R W Nordin & Associates Inc, Shawano

Survey Crew Chief: Hinze & Associates, Sheboygan

Engineering Technician: Wisconsin Dept Of Transportation, Green Bay

Engineering Technician: Manitowoc Public Utilities, Manitowoc

Engineering Technician: City Of Menasha, Menasha

Engineering Technician: Department Of Transportation, Madison

Engineering Technician: Waupaca County Highway Department,

Laboratory Technician: Northeast Asphalt, Inc, Greenville

CAD System Operator: Robert E. Lee & Associates, Inc., Green Bay

CAD System Operator: McMahon Associates, Neenah

2001 Northeast Wisconsin Civil Engineering Technology

Survey Technician: Ruckert & Mielke Inc, Waukesha
 Survey Technician: SMI, Manitowoc
 Engineering Technician: Foth & Van Dyke, Green Bay
 Engineering Technician: River Valley Testing Corp., Appleton
 Engineering Technician: STS Consultants Limited, Green Bay
 Engineering Technician: Mead & Hunt Inc, Green Bay
 Engineering Technician: City Of Sheboygan, Sheboygan
 Engineering Technician: McMahon Associates, Neenah

2001 Northeast Wisconsin Mechanical Design Program

Engineering Technician: Paper Converting Machine Company, Green Bay
 Engineering Technician: Wisconsin Electric, Milwaukee
 Mechanical Designer: Specialty Components, Inc., Green Bay
 Mechanical Designer: EMT International, Green Bay
 Mechanical Designer: Jacobs Engineering, De Pere
 Drafter: Paper Converting Packaging Machinery Div, Green Bay
 CAD System Operator: HJ Martin, Green Bay

2001 Northeast Wisconsin Mechanical Design Program

Technical Writer: (2) Paper Converting Machine Company, Green Bay
 Mechanical Designer: Paper Converting Machine Company, Green Bay
 Mechanical Designer: Kimberly Clark Corporation, Neenah
 Mechanical Designer: Fosber America, Inc, Green Bay
 Lead Designer: Jacobs Engineering, De Pere
 Senior Designer: Leach Company, Oshkosh

2001 Madison Area Technical Mechanical Design Program

Aztalan Engineering Inc. Lake Mills Laborer
 Big Sky Engineering Inc. Middleton Project / Design Engineer
 Contour Design & Engineering Designer
 Durrant Group Mechanical Technician
 Fleetguard / Nelson Stoughton Drafter / Designer
 Lifeline USA Design Engineer
 Madison Gas & Electric CAD Operator

2001 Madison Area Technical Architectural Technology Program

Affiliated Engineers Inc. CADD Technician (3)
 Affiliated Engineers Inc. Entry Level Designer
 Affiliated Engineers Inc. PC Support Specialist
 Ahern Fire Protection Designer (2)
 Amwood Custom Homes Janesville Architectural Technician
 Cleary Building Corp Verona AutoCad Operator
 Flad & Associates Architectural Technician

Graef, Anhalt, Schloemer & Associates Engineering Technician
Isthmus Architecture Drafter
Jaeckle Wholesale Sales Representative /Customer Service
Jorgensen Technologies Inc. CAD Supervisor
Planning Associates Inc. CAD Drafter
University of Wisconsin-Madison Administrative Program Specialist
Wick Homes Mazomanie Production Drafter
Windsor Homes Inc. Architectural Technician
Woodland Consultants, Inc. CAD Technician

2000 Western Wisconsin Technical Mechanical Design Program

Design Drafter Alkar Lodi WI
Design Engineer Brunner Mfg Mauston WI
Drafter Chart Industries La Crosse WI
Illustrator MultiTech Publications West Fargo ND
Drafting Technician The Trane Company La Crosse WI