

# **ACS Custom Creation's New Business and Assembly Operations**

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## Executive Summary

ACS Custom Creations had assembly and business operations that wasted time and wasted money. The objective of the project is to improve and implement ACS Custom Creations business and manufacturing operations. The proposed assembly process involves the rearranging of the bottlenecked steps to eliminate constraints. The assembly workstations were also redesigned to reduce cycle time. With the improvement of the new assembly and business operations, ACS is poised to grow into a bigger company.

Financial Statements were created to improve visibility of the company's historical data. These financial statements include an income statement, balance sheet, and a cash flow statement. These statements can also be used to support analysis for future investments. An access database needs to be created to store all of this financial information and inventory. The database will also be used to create and manage orders.

During an assembly build, the employees spend 40 minutes and 20 seconds per build performing the current process costing the company \$21 per computer. Using the same data from the current process, the new process and workstations cause the employees to spend 28 minutes and 43 seconds per computer, costing the company \$14.92 per computer. This amounts to a 28.9% time and money saved for ACS Custom Creations.

Further recommendations are to continue improvements on the assembly process. With continuous improvements, ACS can continue to grow into a more successful company. ACS is currently in the process of developing an e-commerce website that will take all the information from their database and make it available to the customers. When developed, another recommendation is that the employees update prices of their components once a month. This will allow for ACS to stay profitable and competitive.

## Introduction

The objective of this project is to improve the assembly and business operations for Adaptive Computer System (ACS) Custom Creations. These improved business operations will include a database, better relations with new clients and suppliers, and workstations with improved ergonomics.

These improvements should eliminate some of the problems that have occurred. The major problem is that ACS lacks a functional database. Currently, ACS keeps track of its suppliers and clients in Microsoft Excel. This is not a bad method but there have been complaints that receiving certain information takes too long. By using Microsoft Access Database, a database will be created that will be user friendly and should decrease the time it takes to gather information. Another problem is that ACS currently only goes through one supplier. Although this supplier is close to their headquarters, the supplier does not always have certain components needed or offer the cheapest price. Using supply chain management and industrial costs and controls, a new business process will be mapped out which will enable ACS to find new suppliers ultimately leading to reducing the cost of components. ACS is also currently looking to increase sales and expand outside of the Bay Area. By using engineering economics, the value of taking on different investment opportunities will be looked at. The final problem that will be addressed is the workstations that are used for the assembly of the computers. Some times when ACS gets big orders, a bottleneck occurs during the final stages of assembly. By using human factors and work design and measurement, a more efficiently designed workstation will be created in order to minimize or eliminate the bottleneck.

By using the above industrial engineering techniques, ACS Custom Creations' business operations will be improved and enable them to grow into a more profitable company. The remainder of this report will include a company overview, industrial engineering theories, the actual execution of the theories, analysis of solutions, and final recommendations.



## Background

ACS Customer Creations is a customizable computer company. It was founded in the summer of 2008 by Kent Christensen and Daniel Martinez. ACS is located in San Jose, Ca and currently does business within the Bay Area. The company currently only has one location with a total of two employees. ACS specializes in the assembly of high performance computers offering high end components at a reduced price.

Since the company's creation, a few problems have occurred. Throughout this report, these problems will be analyzed and solutions will be provided that will allow ACS to grow into a more profitable company. The ability to manufacture large quantities of computers using a large array of parts, with high quality, has made them a small yet successful company.

## Literature Review

The objective of this project was to create improved business and assembly operations for ACS Custom Creations, applying the following Industrial Engineering topics: creation and usage of a database in Microsoft Access, human factors, engineering economics, work design and measurement, supply chain management, and industrial cost and controls.

### Microsoft Access Database

A Microsoft Access Database is essentially an infinite storage warehouse of data. The objective of creating a database is to electronically store data about the process for future analysis of historical records.

Microsoft Office Access 2007 is a powerful relational database application that includes hundreds of tools that allow you to quickly start tracking, sharing, and reporting information, even if you are new to database development (Lambert 2007). Access Database has many unique features that make it easy for the user to manage the database. Access uses a function called a switchboard, which can be used to navigate through the different steps of the database. Forms can be made within the database to increase user functionality. These forms are user friendly and usually consist of menu options, combo boxes, and control buttons. Learning how to create forms and use these features can help the user perform the process the most efficient way possible.

Microsoft Access's bread and butter are its very effective queries. According to the Microsoft Access tutorial, there are two types of query: Select and Action. A "select" query gathers, collates and presents information in usable forms. An "action" query makes changes in specified records of an existing table, or creates a new table (Hui 1996). Sometimes, information is scattered in many tables. For example, customers' information is stored in Customers table while their ordering information is stored in Orders table. In order to retrieve information from more than one table, queries are used. Moreover, queries are capable of performing the functions of filters, namely adding selection criteria and sorting instructions. In addition, queries allow calculations of new fields (Hui 1996).

If a user wants to pull information or data from the database, then queries are created to organize the data in the desired format by the user. These queries can be linked to buttons and forms to allow a more efficient way to pull data or information from the database.

Microsoft Access Database's purpose is to create an efficient way of electronically storing data that can be used later on as the basis of reports or future analysis. If properly created, a database can be used to increase performance and efficiency within a company as well as provide security for valuable information. If used correctly, Microsoft Access Database is a powerful tool that can lead to a more efficient business process. A more efficient business process was created by developing a database for ACS. The use of forms and buttons were used to make the database user friendly.

## Engineering Economics with Industrial Cost and Control

Engineering economics involves the systematic evaluation of the economic merits or proposed solutions to engineering problems. To be economically acceptable, solutions to engineering problems must demonstrate a positive balance of long-term benefits over costs, and they must also promote the well being and survival of an organization, embody creative and innovative technology and ideas, permit identification and scrutiny of their estimated outcomes, and translate profitability to the bottom line through a valid and acceptable measure of merit. Engineering economy is the dollars-and-cents side of the decisions that engineers make or recommend as they work to position a firm to be profitable in a highly competitive marketplace (Sullivan 2006). Engineering economics does not deal solely with the monetary costs of decision making but also accounts for the value of resources such as labor, time and the opportunity cost of choosing one alternative over the others (Steiner 1988). One of the most common equations in any business is that “Time = Money.” This equation comes from the basic concept known as the time value of money. In order to determine the value of money, one can use the minimum attractive rate of return (MARR). According to Sullivan, MARR is usually a policy issue resolved by the top management of an organization in view of the numerous considerations. Among these considerations are the following:

- The amount of money available for investment, and the source and cost off these funds
- The number of good projects available for investment and their purpose (i.e., whether they sustain present operations and are essential or whether they expand on present operations and are elective)
- The amount of perceived risk associated with investment opportunities available to the firm and the estimated cost of administering projects over short planning horizons.
- The type of organization involved (i.e., government, public utility, or private industry)

In order for a project option to be chosen it must have a rate of return greater than the MARR or interest, which would be the expected return on investment of other projects that the money could have went to. Once the MARR is established there are three primary values analysts look at to determine which project is financially a better project: Present Worth (PW), Future Worth (FW), and Annual Worth (AW). ACS will concentrate mostly on Present Worth, the value of the project in present dollars.

Another economical analysis tool is the internal rate of return (IRR). According to Sullivan, The IRR is the most widely used rate of return method for performing engineering economic analyses. This method solves for the interest rate that equates the equivalent worth of an alternative’s cash inflows (receipts or savings) to the equivalent worth of cash outflows. In order for a project to be considered a good investment its IRR must be greater than the set MARR.

All methods presented thus far reflect the profitability of a proposed alternative for a study period. The payback method, which is often called the simple payout method, mainly indicates a project's liquidity rather than its profitability. The payback method calculates the number of years required for cash inflows to equal cash outflows. For instance, if station monitors costs a total of \$1,000 and the purchases are expected to save \$500 a year because of faster throughput, then its payback period would be 2 years.

## Industrial Cost and Control

Estimation of manufacturing costs for production planning, cost analysis, and cost control can be very effective for any company. Certain techniques can assist in the analysis of variances for management control, inventory evaluation and decision making. These techniques are forecasting, pricing, cost estimating and cost reduction. Within these techniques, are tools that can be very useful to a company. These tools include the use of an income statement and a balance sheet. An income statement, also called a profit and loss statement (P&L), is a company's financial statement that indicates how the revenue is transformed into net income. The purpose of the income statement is to show managers and investors whether the company made or lost money during a period of time (Wolk, Dodd, and Tearney 2004). Below is an example of an income statement ([www.financialstatementschool.com](http://www.financialstatementschool.com)):

- INCOME STATEMENT BOND LLC -			
For the year ended DECEMBER 31 2007			
		\$	\$
Revenues			
GROSS PROFIT (including rental income)		496,397	
	-----		
Expenses:			
ADVERTISING		6,300	
BANK & CREDIT CARD FEES		144	
BOOKKEEPING		3,350	
EMPLOYEES		88,000	
ENTERTAINMENT		5,550	
INSURANCE		750	
LEGAL & PROFESSIONAL SERVICES		1,575	
LICENSES		632	
PRINTING, POSTAGE & STATIONERY		320	
RENT		13,000	
RENTAL MORTGAGES AND FEES		74,400	
UTILITIES		491	
	-----		
TOTAL EXPENSES		(194,512)	
	-----		
NET INCOME		301,885	
	=====		

Another useful tool is the balance sheet. A balance sheet is a summary of a person's or organization's balances. Assets, liabilities, and ownership equity are listed for a specific date. A balance sheet is often described as a snapshot of a company's financial condition (Williams 2008).

A company balance sheet has three parts: assets, liabilities and ownership equity. Assets include: cash, inventories, accounts receivable, and prepaid expenses. Liabilities include: accounts receivable, warranties, taxes, interest in equities, and unearned revenue. Ownership equity includes: money from stocks, and treasury shares. Below is an example of a small business balance sheet (Haka 2008):

Assets		Liabilities and Owners' Equity	
Cash	\$6,600	Liabilities	
Accounts Receivable	\$6,200	Notes Payable	\$30,000
		Accounts Payable	
		<i>Total liabilities</i>	\$30,000
Tools and equipment	\$25,000	Owners' equity	
		Capital Stock	\$7,000
		Retained Earnings	\$800
		<i>Total owners' equity</i>	\$7,800
<i>Total</i>	\$37,800	<i>Total</i>	\$37,800

The final tool that will be used is a cash flow statement. A cash flow statement is a financial statement that shows how changes in balance sheets and income accounts affect cash and breaks the analysis down to operating, investing, and financing activities. As an analytical tool, the statement of cash flows is useful in determining the short-term viability of a company, particularly its ability to pay bills (Bodie & Kane & Marcus 2004). Below is an example of a cash flow statement.

Statement of Cash Flow for the period 01/01/2006 to 12/31/2006	
Cash flow from operations	\$4,000
Cash flow from investing	\$(1,000)
Cash flow from financing	\$(2,000)
Net increase (decrease) in cash	\$1,000

By using the above tools, ACS would have an easier time doing an inventory evaluation or making decisions that could further improve their investment opportunities. If a balance sheet and income statement are done monthly, ACS could make proper decisions about the growth of their company.

## Work Design and Measurement with Human Factors

Work study succeeds because it is systematic both in the investigation of the problem being considered and in the development of its solution. Work study is one of the

most penetrating tools of investigation available to management. This makes it an excellent weapon for starting an attack on inefficiency in any organization since, in investigating one set of problems, the weaknesses of all the other functions affecting them will gradually be laid bare (Kanawaty 1992). There are eight steps in performing a complete work study. They are:

1. Select the job or process to be studied
2. Record or collect all relevant data about the job or process using the most suitable data collection techniques, so that the data will be in the most convenient form to be analyzed.
3. Examine the recorded facts critically and challenge everything that is done considering: the purpose of the activity; the place where it is performed; the sequence in which it is done; the person who is doing it; the means in which it is done.
4. Develop the most economical method, taking into account all the circumstances and drawing as appropriate on various production management techniques.
5. Evaluate the results attained by the improved method compared with the quantity of work involved and calculate a standard time for it.
6. Define the new method and related time and present it to all those concerned
7. Install the new method, training those involved
8. Maintain the new standard practice by monitoring the results and comparing them with the original targets.

Work study has several different techniques. One of these techniques is work measurement. Work measurement is the application of techniques designed to establish the time for a qualified worker to carry out a task at a defined rate of working. Time studies are a very essential tool of work measurement. Time studies are the process of calculating a standard amount of time it takes to perform a process. Calculating standard hours helps companies keep track of their worker's performance and their production schedules.

Before the time studies can be started, the process of the system should be studied. The system needs to be defined as a complex arrangement of physical elements characterized by measurable parameters (Irani Z, 1999). Once this has been completed, the person performing the time study should track the times of each operation for the system over a given time. Once the times have been collected, they can be fully analyzed to find the standard times for each individual operation. If the standard time appears to be longer than expected, a change in the system might be necessary to improve the process.

Several time studies were completed on the assembly of a computer at ACS. Bottlenecks were found and a gap analysis was performed to correct them. By using work design and measurement, the lead times should be reduced and productivity increased.

## **Human Factors**

All solutions chosen for this project will require human factors consideration. Human factors involve the study of the factors and development of tools that facilitate the achievement of the following goals: (Wickens, Becker, Lee, & Liu 2004)

- Enhances performance
- Increases safety
- Increases User Satisfaction

Human Factors is a discipline characterized as a blend of engineering, psychology, anatomy, physiology, and organizational studies (Woodson & Tillman 1987).

The implications of human factors for any manufacturing plant are enormous. Federal regulating agency OSHA (Occupational Safety and Health Administration) requires companies to abide to their standards that aim to prevent work related injuries ([www.OSHA.gov](http://www.OSHA.gov)). Additionally standards organizations such as ISO (International Standards Organization) encourage safety through ergonomics by offering specialized certifications for companies with proven ergonomic standards ([www.ISO.org](http://www.ISO.org)). Since ACS is not a publically traded company, it does not need to abide by the standards and regulations set by ISO and OSHA. However, it is a great idea to aim for these standards because ACS plans to grow their business to become a bigger company. Also these standards can have a great deal of impact on a company's profit. A company can be held financially responsible for work related injuries which can result in a reduction of the company's profit. Injuries can also lead to a decrease in production and efficiency.

Computer building stations could have many dangers to an employee's health. Heavy chassis, sharp yet fragile parts, and loose wires can lead to broken parts or even injury. ACS needs a more efficient workstation for the assembly of their computers. An eight step process was created for improving the ergonomics of the set up and assembly of a computer ([www.buildyourown.org](http://www.buildyourown.org) 2009):

- Find a large (at least 3ft by 3ft) , clean, well-lit work surface
- Use a workstation that has two or more power outlets nearby (Residual Current Device protected, if possible.)
- Use a big enough work station that will have enough space for your monitor, keyboard and mouse and to lay your case on its side
- Collect together the necessary tools nearby, such that they are close to hand.
- Set up anti-static precautions.
- Make a collection of all your new components (still in their packaging) and place them nearby, ready for use.
- Unwrap and carefully place your monitor (on its stand) on the work surface, such that you can clearly view the screen. Be careful when lifting monitors as they can be extremely heavy.
- Retrieve the power and signal cables from the packaging and fit them to the monitor as instructed by its manual. Do the same with the keyboard, mouse and speakers such that they are ready to be used later on.

When these steps are put in place, there is less of a chance of damaging the components and costing the company money down the road. Also, the better set up a workstation is, the higher the throughput. One of the goals of this project is to improve throughput. If we can increase throughput by reducing the frequency of movements, the

outcome will result in less required labor and hence an improvement in the production process.

## Supply Chain Management

Supply Chain Management is the management of a network of interconnected businesses involved in the provision of product and services required by end customers (Harlend 1999). Supply Chain Management spans all movement and storage of raw materials, work-in-process inventory, and finished goods from point-of-origin to point-of-consumption.

Supply Chain business process integration involves collaborative work between buyers and suppliers, joint product development, common systems and shared information. Operating an integrated supply chain requires continuous information flow (Lambert and Cooper 2000). However, in many companies, management has reached the conclusion that optimizing the product flows cannot be accomplished without implementing a process approach to the business. The key supply chain processes are:

- Customer relationship management
- Customer service management
- Demand management
- Order fulfillment
- Manufacturing flow management
- Supplier relationship management
- Product development and commercialization
- Returns management

A.T. Kearney Consultants (1985) noted that firms engaging in comprehensive performance measurement realized improvements in overall productivity. However, the global measures of Profit, Return on Investment, and Cash Flow do not work for making decisions. The current dominant paradigm of using cost allocations does not work and neither does the use of efficiency type measurements for all resources so let's use a more focused approach for measurements that aid decision making (Hutchin 1997).

The three key measurements are throughput, investment, and operating expense. Throughput is defined as the rate at which the system generates cash through sales revenue minus the cost of raw materials. Investment is as the cash tied up in the business. Operating Expenses is defined as the money that goes out in terms of labor, rent, lighting, and many other expenses that are used within the system. These three measurements are put into three equations as follows:

Profit = Throughput – Operating Expenses

Productivity =  $\frac{\text{Throughput}}{\text{Operating Expenses}}$



$$\text{Return On Investment} = \frac{\text{Throughput} - \text{Operating Expenses}}{\text{Investment}}$$

The above three equations are measurements of finances, but what about the other perspectives? Within a manufacturing environment, the following measurements should be used:

- Due Date Performance (DDP) or more usually written as delivering the product or service on time
- Lead Time Reduction – is it going down? What about with an increase in volume through the facility
- Material Released on Time (MROT) – Was the material released as promised?

The measurements listed thus far have been based on a number of assumptions:

- The organization is seen as a series of dependent links in a chain (Supply Chain)
- Within any one chain, there will be a weakest link- the constraint
- The capacity of the chain will always be less than the other resources in the chain
- Improving a non-constraint does nothing for the overall system

Once your assumptions have been set and your measurements have been put into place, there is a 5 step process that should decrease constraints and therefore increases productivity and profit. The 5 step method is as follows:

1. Identify the Constraint using time studies
2. Exploit the constraint
3. Subordinate all other activities to the performance of the constraint
4. Once control has been achieved, elevate the constraint
5. Go back to step one and prevent inertia

All the above measurements will be used to fully map out ACS's supply chain. I will hopefully create an efficient process so that it reduces cost while potentially limiting constraints.

The design of the new process was started by the research in supply chain management. From there the movement and storage of raw materials was designed. Then a manufacturing process was designed followed by the supplier and customer relations. Once the new process had been put into place, the use of industrial costs and controls was used to look at the profitability of current investments. If a new investment opportunity arises, engineering economics can be used to do a cost analysis and make decisions to further benefit the company. After this foundational process was designed, the rest of the overall system process was created in Microsoft Access Database. Training, supervising and time studies were performed to help the workers learn the new process and a report was given to show management the difference between the two processes. These are the six Industrial Engineering concentrations that contributed to the design of the new operation plan of ACS Custom Creations.

## Design

Discussed in this chapter is the overview of the design process that leads to the improvements in the ACS Custom Creations manufacturing and business process. There are three designs: creation of a database, creation of Financial Statements, and creation of a supplier management process. This chapter will mention the entire thought process and all design steps that occurred during the creation of each process.

### Microsoft Access Database

#### Tables

There are 3 main tables in the database, and they are used for three different reasons: inputting data, storage of that data, and manipulating data using forms and queries. Then there are a total of sixteen data tables that are used to keep track of all the products that the company offers.

#### Client Table

The “Client” table is the first table to create for the purpose of storing all the clients’ information. The table consists of eight columns titled as such:

- ClientID
- First Name
- Last Name
- Phone
- Email
- Street
- City
- State
- Zip Code

The “ClientID” is an auto number provided by Access, which generates a new number for each client. The data type for this column is called “AutoNumber”. “AutoNumber” is a function within Access that automatically generated a number for data entry. The rest of the columns are data that helps us locate our customers. This includes a shipping address as well as contact information.

#### Transaction Table

The “Transaction” table is the next table to be created. The purpose of this table is for the user to store all of our current orders. The table consists of twenty-five columns titled as such:

Client Information	Inventory Information	Financial Information and Services
ClientID	Build	Warranty
TransactionID	Case	Cost
First Name	CPU	Multiplier
Last Name	CPU Cooler	Price
Date	Graphics	Tax
	Hard Drive	Profit
	Memory	
	Monitor	
	Motherboard	
	Mouse and Keyboard	
	Operating System	
	Optical Drive	
	Power Supply	
	Sound Card	

The “TransactionID” is an auto number provided by Access, which generates a new number for each transaction. The data type for this column is called “AutoNumber”. The rest of the columns are text fields that helps us keep track of all the parts our clients have recently ordered inside of their new computer. This table only keeps track of current orders within the company. The next table is what allows us to keep track of all previously completed orders.

## History Table

The “History” table is the final table of the data storage tables to be created. The History table will be built similar to the Transaction table with the exception of its purpose. The History table will be used keep track of all customers’ previously built computers. Once a computer gets built and is delivered to the customer, all of the data will be moved

from the transaction table to the history table. As stated early, it too will contain twenty-five columns titled as such:

Client Information	Inventory Information	Financial Information and Services
ClientID	Build	Warranty
TransactionID	Case	Cost
First Name	CPU	Multiplier
Last Name	CPU Cooler	Price
Date	Graphics	Tax
	Hard Drive	Profit
	Memory	
	Monitor	
	Motherboard	
	Mouse and Keyboard	
	Operating System	
	Optical Drive	
	Power Supply	
	Sound Card	

The “TransactionID” in the History table will keep the same value that the transaction had in the Transaction table. The rest of the columns are text fields that helps ACS keep track of all the parts their clients ordered inside their computer. This table will only keep track of previous orders that have already been built and shipped within the company.

## Data Tables

The next set of tables is used to contain data to pull from for each transaction. Sixteen tables contain a list of part numbers for each type of component or service that could be used to build a computer system. The sixteen types of components or services are:

- Build
- Case
- CPU
- CPU Cooler
- Graphics
- Hard Drive
- Memory
- Monitor
- Motherboard
- Mouse and Keyboard
- Operating System
- Optical Drive
- Power Supply
- Sound Card
- Warranty

Therefore a table will be created for each component or service. All of these tables consist of only two columns. One called name with a data type called “text”. The second column called price with a data type called “Currency”. These tables are created because the database needs to know what kind of kind of components or services are being used to build the computers.

## Queries

Queries are created to perform functions or answer questions that could be useful for the user. The queries created for this database are used to generate quotes, create reports to view the data, tell the user what components or service the customer wants, and stores that data in the transaction and history tables.

## Generating Quotes and Computer Purchases

Within the database, there are sixteen queries that assist in the generating of the quotes and final computer purchases. Each query corresponds to one of the data tables discussed earlier in the chapter. The queries include

- “Buildqry”
- “Caseqry”
- “CPUqry”
- “CPUCoolerqry”
- “Graphicsqry”
- “HardDriveqry”
- “Memoryqry”
- “Monitorqry”
- “Motherboardqry”
- “MouseandKeyboardqry”
- “OperatingSystemqry”
- “OpticalDriveqry”
- “PowerSupplyqry”
- “SoundCardqry”

- “Warrantyqry”
- “Serviceqry”

Each of these queries serves the same function. Their purpose is to retrieve the cost of the service or part that is chosen by the customer. Each of the above queries is linked to a combo box which is a drop down list that allows the user to select the part or service chosen by the customer. The query then goes into the corresponding data table and extracts the correct price of the part or service.

## Reports

There are three possible reports to create, and queries are needed to grab information from the “Clients”, “History”, and “Transaction” tables. The three queries are: “Viewclientinfo”, “Viewclienthistory”, and “viewclienttransaction”. The “Viewclientinfo” query performs the function of bringing up all the customer data for the user based on a combo box that lists all the current customers within the database. The “Viewclienthistory” query performs the function of bringing all the customers order history from the history table. This will list all the details of the order such as the components, service performed, cost, and date it was purchased. The “viewclienttransaction” query performs the exact same way as the “Viewclienthistory” query except it shows the data fields from the transaction table instead of the history table. Like the “Viewclienthistory” query, this query will list all the details of the order such as the components, service performed, cost, and date it was purchased.

## Update/Add Buttons

The last three remaining queries that have not been discussed yet are “Update Clients”, “Purchase Computer”, and the “Assembly Complete” query. The “Update Clients” query is an Append Query that appends all the clients’ information into the “Client” table. The “Purchase Computer” query completes the generated quote into a purchase. It takes all of the computers components, service required, price, and profit from the quote and adds the assembly to the “transaction” table. When an assembly is put into the transaction table, it is a queue to the user that the computer is to be built. The final query is the “Assembly Complete” query. This query is powered by a button that when pushed and the proper transaction ID is inputted, it moves the assembly from the “Transaction” table to the “History” table signifying the assembly is complete. Like the previous query, it transfers all the computers components, service required, price, and profit into the table.

## Forms

There will be three different forms used within the database. The first form will be called “Client Info” and will be used to primarily handle all customer data. The second form will be called “Quote and Purchase” and will be used to create quotes and handle all product creation. The third form is the “Switchboard”. The “Switchboard” is the main menu which allows the user to navigate to the two other forms.

## Switchboard

This is the main menu for the users. There will be three buttons that will be used to navigate to the other two forms. The first one is for the user to input client data and is called "Client Info". This button takes the user to the "Client Info" form, where they can add the client data to the database. The second button is titled "Quote and Purchase". This takes the user to the "Quote and Purchase" form. From here, the user can generate quotes and give the green light for the assembly of the computer based on customer's approval of the quote. The last button exits the database and closes Microsoft Access.

## Database Process

The database process involves the steps taken by the user to effectively run the database. The process should be made as simple as possible so that the user can easily follow it. The process steps are as follows:

Step 1: Open up the Client Info

Step 2: Type in all customer data such as First Name, Last Name, Phone, Email, Street, City, State, and Zip Code in the respective text boxes. Click on the "Add Client to DB" button.

Step 3: Open up the "Quote and Purchase" Form.

Step 4: Select all the parts the customer requires for their assembly from each of the drop down boxes. The quote price will be generated

Step 5: If the price and computer is agreed upon, click the "Purchase Computer" button.

Step 6: Once the assembly is complete, select the correct TransactionID from the drop down box and click on the Assembly built button.

These are the steps which the user takes to perform the process. Now what will be discussed are the steps taken by the database when those buttons are being clicked. When the "Add Client to DB" button is clicked, the database opens the "Update Clients" query that adds the clients information to the Client database. The "Update Clients" query is an append query that allows the user to add information to the database. When the "Purchase Computer" button is clicked, the database opens the "Purchase Computer" query. This query is an append query that adds all the order details to the transaction table. When the "Assembly Built" button is clicked, the database opens the "Assembly Built" and the "Delete Transaction" queries. The "assembly built" query adds the completed transaction to the "History" table and the "Delete Transaction" query deletes the transaction from the "transaction" table.

## Financial Statements

The three financial statements that will be designed in this section will be an Income Statement, Balance Sheet, and a Statement of Cash Flow.

## Income Statement

The purpose of the income statement is to show managers and investors whether the company made or lost money during a period of time. This section will discuss the design of the Income Statement for ACS. The Income Statement will be made for 1 year (12 Months) with each time period being one month.

The first part of an income statement is the revenue from sales or services. Since ACS has six different standard configurations of computers it sells, the revenue section will have six rows as well as two additional rows for custom and services. That gives us a total of eight rows in the revenue sections so that ACS can monitor each one of its products or services. The eight rows will be titled as follows:

- "Enterprise Class"
- "Office Class"
- "HDX01"
- "JTLS 8900"
- "iCE 3000"
- "AC01"
- "Custom"
- "Services"

The next part of the Income Statement will be the cost of parts needed to make each of the above configurations. That section will only have seven rows with the same names as before. The services column will not have a cost of parts and therefore will not be included in the in this sections of the statement.

Directly under the cost for the parts, a gross profit sections will be needed for each month. You can obtain the profit of any given month by adding up total sales and subtracting the cost of parts from it. This will give you the profit the company has made during the time period.

After the gross profit section has been established, the next step is to determine expenses of the company. This section will include the following fields:

- "Salary Expenses"
- "Outside Services"
- "Supplies (office and operating)"
- "Repairs and maintenance"
- "Advertising"
- "Car, delivery and travel"
- "Accounting and legal"
- "Rent"

Since ACS is still a small company, it has no salary expenses, outside services, and rent. However, ACS is looking to further grow so they will be left in the income statement. A total expenses row will be created to sum up all of the above mentioned expenses.



The final step for the Income Statement is a Net Profit row. To get Net profit, subtract Total Expenses from the Gross Profit row. This gives you a value for what your company has made during the given time period.

## Balance Sheet

A balance sheet is a summary of an organization's assets, liabilities, and ownership equity for a specific date. A company balance sheet has three parts: assets, liabilities and ownership equity.

The first part of the Balance Sheet is the Assets section. In this section there are current assets and fixed assets. A total Assets row will be used to sum the current and fixed assets. In the current assets there will be five rows and a sixth row will be added for a total current assets. The six rows will be titled as follows:

- "Cash in bank"
- "Accounts Receivable"
- "Inventory"
- "Prepaid Expenses"
- "Other current assets"
- "Total Current Assets"

Note: The total current assets row will be used to sum up all current assets.

The fixed assets will have a total of seven rows titled as follows:

- "Machinery & equipment"
- "Furniture & fixtures"
- "Leasehold improvements"
- "Land & buildings"
- "Other fixed assets"
- "LESS accumulated depreciation on all fixed assets"
- "Total Fixed Assets"

Note: The "Total Fixed Assets" will be used to sum up all fixed assets.

The next step in designing a balance sheet is the liabilities sections. The liabilities section will have two subheadings in Current Liabilities and Long Term Debt. In the current liabilities section, there will be seven rows with the seventh row being a total current liabilities row. The rows will be titled as follows:

- "Accounts payable"
- "Interest payable"
- "Taxes payable"
- "Short-term (due within 12 months)"
- "Current part, long-term debt"
- "Other current liabilities"

- “Total Current Liabilities”

The Long Term Debt will have a total of five rows titled as follows:

- “Bank loans payable”
- “Notes payable to stockholders”
- “LESS: Short-term portion”
- “Other long term debt”
- “Total Long-term Debt”

The total long term debt row will sum all of the long term debt. At the end of the liabilities sections there will be a row titled “Total Liabilities” that will sum up “Total Current Liabilities” and “Total Long Term Debt”.

The final section to create is the Owners Equity section. There will be four rows in this section. The four rows will be titled as follows:

- “Invested capital”
- “Retained earnings - beginning”
- “Retained earnings - current”
- “Total Owners' Equity”

Note: The “Total Owners' Equity” field will sum up all Owners Equity. A “Total Liabilities & Equity” field will be added to sum up Total Liabilities and Equity.

## Cash Flow Statement

A cash flow statement is a financial statement that shows how changes in balance sheets and income accounts affect cash and breaks the analysis down to operating, investing, and financing activities. The cash flow statement will have two sections, “Cash Receipts” and “Cash Paid Out”.

The “Cash Receipts” sections will consist of five rows titled as follows:

- “Cash Sales”
- “Loans”
- “Total Cash Receipts”
- “Total Cash Available (before cash out)”

The “Total Cash Receipts” will be the sum of all the cash receipts while the “Total Cash Available (before cash out)” will be the sum of “Total Cash Receipts” and the cash from previous month.

The “Cash Paid Out” section will consist of seventeen rows. They will be titled as follows:

- “Purchases (merchandise)”
- “Salary Expenses”
- “Outside Services”
- “Supplies (office and operating)”

- “Repairs and maintenance”
- “Advertising”
- “Car, delivery and travel”
- “Accounting and legal”
- “Rent”
- “Subtotal”
- “Loan principal payment”
- “Capital purchase”
- “Other startup costs”
- “Reserve and/or Escrow”
- “Owners' Withdrawal”
- “Total cash paid out”
- “Cash Position (end of month)”

Note: The “Total cash paid out” field will total the cash paid out and the “Cash Position (end of month)” field will subtract the “Total cash paid out” field from the “Total Cash Receipts” field.

## **Work Design and Measurement with Human Factors**

By using work study and human factors, a redesign of the existing workstation used by ACS will be completed in order to complete operations in a timelier manner.

### **Workstations**

As stated earlier in the Literature Review, an eight step process was created for improving the ergonomics of the set up and assembly of a computer. Refer to page 7 for the 8 step process.

In order to accomplish all of the above, the workstation “as is” will be studied. Time studies and process improvement will be discussed later in the chapter.

During the study, some key observations were made:

- Tools seem to get lost easily on workstation
- It takes too much time to move the computer parts around on table to work
- Inadequate lighting
- A lot of time is spent screwing in screws for each part

The above weaknesses need to be addressed. In order to address all of them, a new workstation will be designed. Currently all that is being used is a table in the garage with a set of screwdrivers. Each individual weakness will be looked at to improve efficiency.

Tools seem to get lost easily on workstation:

Since there is several waste from the boxes of the parts, a trash bin should be stored nearby. Currently there is not trash bin, but a small one on top of the desk would be a great addition to the new workstation. The next thing to do is to make sure that when a tool gets done being used, it is stored in a specific location. A taped off corner of the desk would allow a neat and efficient way of keeping track of tools being used while building a new computer.

It takes to much time to move the computer parts around on table to work

A device can be made so that the parts for the computer can be moved around easier. A potential solution is to buy or build a little cart that swivels and has wheels on it. This would allow the builder to not have to get up and move or pick the part to work on it. They can simply just rotate the cart using wheels.

Inadequate lighting

This problem could be fixed by getting a new light bulb. However, maybe we can look into having a light built on to the desk that has a movable pole that would allow it move up, down or even sideways.

A lot of time is spent screwing in screws for each part

It takes to long to screw the screws in by hand. It might be useful to buy a electric screwdriver as it would speed up the process and be less of a strain on the employees hands and wrists.

We will now work on addressing these weaknesses in the creation section when we create the new workstation.

## Supply Chain Management

Supply Chain Management spans all movement and storage of raw materials, work-in-process inventory, and finished goods from point-of-origin to point-of-consumption. ACS's supply chain was as follows:



New logistics will be defined to insure that ACS increases its performance within the overall supply chain. These new logistics include the way customers place orders, and how they receive them. This will be altered with a new website designed by Hathaway Tech. The website will track all orders and allows customers to pay online using credit cards. For this a merchant account was created with Chase. Once a customer places an order, the website determines the weight of the computer and sends a notice to UPS. UPS then comes and picks up the computer and delivers to the customer. In order to do this a business account was created at UPS.

ACS's current supply chain will be evaluated and a new supply chain will be proposed. The three key measurements are throughput, investment, and operating expense. These three measurements are put into three equations as follows:

Profit = Throughput – Operating Expenses

Productivity =  $\frac{\text{Throughput}}{\text{Operating Expenses}}$

Return On Investment =  $\frac{\text{Throughput} - \text{Operating Expenses}}{\text{Investment}}$

On any given assembly, using the above equation, the productivity of ACS is at least a ratio of 1.9%. Also, ACS has very little to none investment. The only investment they currently do is the cost of their new website. If we can assume the website and search engine advertising would net as an extra 24 computers a year (2 a month), then the ROI would come to a ratio of 6%. This number can be derived by taking throughput of the extra computers minus the operating expenses. Then that number is divided by the cost of the website.. The ROI can increase as ACS provides more services to Hathaway Tech because the cost of the investment would decrease.

The above three equations are measurements of finances, but what about the other perspectives? Within a manufacturing environment, the following measurements should be used:

- Due Date Performance (DDP) or more usually written as delivering the product or service on time
- Lead Time Reduction – is it going down? What about with an increase in volume through the facility
- Material Released on Time (MROT) – Was the material released as promised?

Since its establishment, ACS has only had one late delivery of their product. A computer was late by one day due to the fact that our supplier's computer system went down. Even though ACS has a great DDP, it can always be better. The Lead Time Reduction measurement will be addressed in the work design and measurement portion of the report. Also since ACS only picks up the materials needed as they are ordered, its MROT is perfect.

Once the measurements have been put into place, there is a 5 step process that should decrease constraints and therefore increases productivity and profit. The 5 step method is as follows:

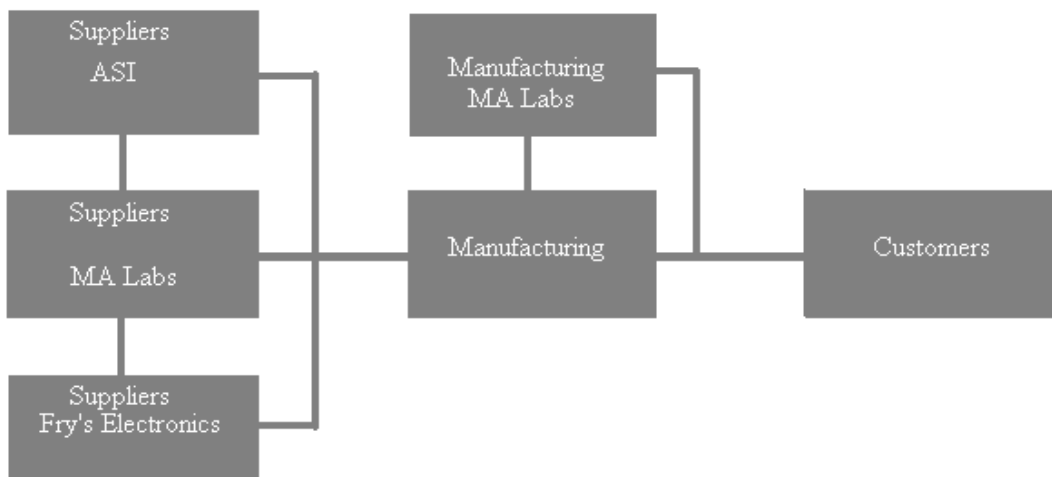
1. Identify the Constraint using time studies
2. Exploit the constraint
3. Subordinate all other activities to the performance of the constraint
4. Once control has been achieved, elevate the constraint
5. Go back to step one and prevent inertia

The only measurement that ACS could improve is the Due Date Performance. By looking at the system, it is evident that suppliers play a crucial role in the measurement. This means that in order to eliminate this constraint, new suppliers must be found to prevent further decrease of the DDP.

After a lot of research, an additional supplier was found called MA Labs. Their prices are competitive and their location is a lot closer, which would cut down the cost of transportation. Upon a tour of their facilities, their information seems to be very good. Also during contract negotiation a 3% cash reduction was agreed upon. This allows ACS to increase profits or drop prices to stay competitive. One final benefit of switching to MA Labs is that they will also build computers for a small price if ACS gets to big of an order.

Another supplier that can be used if ACS is in a crunch is Fry's Electronics. Their pricing on some items is just as good as the suppliers and they always seem to have stock of the components that are needed.

Then new and improved supply chain is as follows:



## Creation

This chapter discusses the steps to take in order to design this database. It will show the reader step by step on how to create it with figure illustrations and appendices to help.

## Tables

### Master Data

The first table to create is the “Clients” table. First click on “Tables” under the objects window and then double click on “Create table in Design view”. Next the design view of the table will appear. The “Field Name” contains the titles of the columns in the table. Type in the following titles from top to bottom:

- “ClientID”
- “Phone”
- “City”
- “First Name”
- “Email”
- “State”
- “Last Name”
- “Street”
- “Zip code”

After each title has been typed in, there will be a default setting for the “Data Type” for each column as “Text”. Now the data type needs to be changed for the ClientID column. Change the “ClientID” data type to “AutoNumber”. Then click on the “ClientID” slot and turn it into the “primary key” for the table by clicking on the yellow key. Close the design view window and save the table as “Clients”. This table will be the main place used to store all Client Information. The Clients Table in design view can be seen in Appendix A.

The second table to create is the “Transactions” table. First click on “Tables” under the objects window and then double click on “Create table in Design view” Next the design view of the table will appear. The “Field Name” contains the titles of the columns in the table. Type in the following titles from top to bottom:

Client Information	Inventory Information	Financial Information and Services
ClientID	Build	Warranty
TransactionID	Case	Cost
First Name	CPU	Multiplier
Last Name	CPU Cooler	Price
Date	Graphics	Tax
	Hard Drive	Profit
	Memory	
	Monitor	

	Motherboard	
	Mouse and Keyboard	
	Operating System	
	Optical Drive	
	Power Supply	
	Sound Card	

After each title has been typed in, there will be a default setting for the “Data Type” for each column as “Text”. Now the data type needs to be changed for the ClientID column. Change the “TransactionID” data type to “AutoNumber”. Then click on the “TransactionID” slot and turn it into the “primary key” for the table by clicking on the yellow key. Change the “Cost”, “Price”, “Tax”, and “Profit” columns to the “currency” data type. Then change the “multiplier” data type to “number”. Close the design view window and save the table as “Transactions”. This table will be the main place used to store all “Transaction” Information. The Transaction Table in design view can be seen in Appendix B.

The third table to create is the “History” table.” This table will be created using the exact same data names and requirements as the “Transaction” table. Close the design view window and save the table as “History”. This table will be the main place used to store all order “History” Information.

## Product and Service Data Tables

The next set of tables will consist of the product data for the database to use. They will all be created the same but just be called different names. First click on “Tables” under the objects window and then double click on “Create table in Design view” Next the design view of the table will appear. The “Field Name” contains the titles of the columns in the table. Type in the following titles: “Name” and “Price”. After each title has been typed in, there will be a default setting for the “Data Type” for each column as “Text”. Now the data type needs to be changed for the “Price” column. Change the “Price” data type to “Currency”. This will be the same format for all tables created. Create a table for each of the following titles:

- “Build”
- “Case”
- “CPU”
- “CPU Cooler”
- “Graphics”
- “Hard Drive”



- “Memory”
- “Monitor”
- “Motherboard”
- “Mouse and Keyboard”
- “Operating System”
- “Optical Drive”
- “Power Supply”
- “Sound Card”
- “Warranty”
- “Service”

Close the design view window and save all the tables. These tables will be where the database will get its entire product information. The Production Information tables in design view can be seen in Appendix C.

## Queries

### Update/Add Buttons

The first three queries that need to be created are the “Update Clients” query, “Purchase Computer” query, and the “Assembly Complete” query. The “Update Clients” query is an Append Query that appends all the clients’ information into the “Client” table. To create this query, select Query Design under the Create toolbar. Under the Design toolbar, click on the Append Query icon. Bring in the Clients table and drag every field into the query design. The query will append to the same table. However, the data that will be appended will be typed in by the user using text boxes from the Client Form. This will be discussed later on in the chapter. The field name for each off the columns should read: Expr1: [Forms].[Client].[Text11]. This points the query to the correct form and text box to retrieve the information. The “Purchase Computer” query completes the generated quote into a purchase. It takes all of the computers components, service required, price, and profit from the quote and adds the assembly to the “transaction” table. This query is created the exact same way as the previous Query except instead of bringing in the “Client” table, bring in the “Transaction” table. Likewise the query will append to the “Transaction” table. The field name for each off the columns should read: Expr1: [Forms].[Quote and Purchase].[Combo11]. When the “purchase computer” button is pressed, and all the information is chosen from the combo boxes, the data will be appended to the “Transaction” table. The final query is the “Assembly Complete” query. This query is powered by a button then when pushed and the proper transaction ID is input, it moves the assembly from the “Transaction” table to the “History” table signifying the assembly is complete. It is built the same was as the previous two queries; however, the “History” table is used. The Purchase Computer query in design view can be seen in Appendix D.

### Generating Quotes and Computer Purchases

Within the database, there are sixteen queries that assist in the generating of the quotes and final computer purchases. Each query corresponds to one of the data tables discussed earlier in the chapter. The queries include:

- “Buildqry”
- “Caseqry”
- “CPUqry”
- “CPUCoolerqry”
- “Graphicsqry”
- “HardDriveqry”
- “Memoryqry”
- “Monitorqry”
- “Motherboardqry”
- “MouseandKeyboardqry”
- “OperatingSystemqry”
- “OpticalDriveqry”
- “PowerSupplyqry”
- “SoundCardqry”
- “Warrantyqry”
- “Serviceqry”

Each of these queries serves the same function. Their purpose is to retrieve the cost of the service or part that is chosen by the customer.

The first step to creating each query is to first add the desired table in the query design view. The above queries have two columns: “Name” and “Price”. Therefore the “Name” and “Price” should be dragged from the table to the query field. The queries are now complete and ready to be used in the forms.

## Forms

There are three forms to create: “Client”, “Quote and Purchase”, and a “Switchboard”

### Client Form 1

Create a form in design view and select the text box button on the tool box. Drag the cursor to create a text box. Repeat this process seven times to create a total of eight text boxes. The text boxes should be titled:

- “First Name”
- “Last Name”
- “Phone”
- “Email”
- “Street”
- “City”
- “State”
- “Zip code”

Then a combo box must be created. We want this combo box to be linked to the “ClientID” column in the “Client” Table. The next step is to add command buttons. The first button will be called “Add Client to DB”. This button will be linked to the “Update Clients” query that was already discussed. The next three buttons will all be created the same. They will all be linked to the combo box that was created earlier in the form. The three buttons will

be called: "View Client Info", "View Client History", and "View Current Transaction". Each of the buttons must be linked to the three queries that were discussed earlier in the design section. Two sub forms were created to allow the user to easily view the customer contact information. The code can be seen in Appendix E. The Client Form can be viewed in Appendix F.

## Quote and Purchase Form 2

The next form to be created will be the Quote and Purchase Form. Create a form in design view and select the Combo box button under design toolbar. A wizard will pop up guiding you through the Combo box creation process. Select "I want the combo box to look up the values in a table or query". Select the Client table and select the "ClientID", "First Name", and "Last Name" fields. Use the "ClientID" field as the unique identifier. When the combo box has been created, two text boxes need to be created. The text boxes will show the first name and last name of the client selected. The code can be viewed in Appendix 3A.

The next step is to insert a calendar that allows the user to input the date into the databases. To insert the calendar, select the insert ActiveX Control button. Select the Calendar Control 12.0. In order to properly add the value into the database, a text box must be linked to the calendar. So the next step would be to create the text box and link it to the calendar. The code can be viewed in Appendix 3B.

Next a combo box must be created for each of the computer components and service offered. There are a total of sixteen combo boxes that need to be made. Each combo box must be linked to one of the following queries:

- "Buildqry"
- "Caseqry"
- "CPUqry"
- "CPUCoolerqry"
- "Graphicsqry"
- "HardDriveqry"
- "Memoryqry"
- "Monitorqry"
- "Motherboardqry"
- "MouseandKeyboardqry"
- "OperatingSystemqry"
- "OpticalDriveqry"
- "PowerSupplyqry"
- "SoundCardqry"
- "Warrantyqry"
- "Serviceqry"

Create each combo box showing all data from each of their respective queries. After each of these combo boxes have been created, right click each box and select properties. In the column widths field, type in "1";0". Then a text box must be created for each of the combo boxes. This will make it easier to have the quote generated for the user. The text box is where the price for each component or service will be generated. The code can be seen in Appendix G. The Quote and Purchase Form can be viewed in Appendix H.

## **Switchboard**

Once all of the forms have been created, the switchboard is the last thing needed to be created. The switchboard also needs to be the first thing that the user sees, go into “Database Tools” and select “Switchboard Manager”, and select the edit button. Add two new forms to the switchboard called “Clients” and “Quote and Purchase”. Select the “Access Options” under the “file” drop down. Select the current database tab and change the “Display Form” to “Switchboard”. This will have the “Switchboard” form pop-up when the database is opened. The code can be seen in Appendix I. The Switchboard Form can be viewed in Appendix J.

## **Financial Statements**

The three financial statements that will be created in this section will be an Income Statement, Balance Sheet, and a Statement of Cash Flow. All templates were created in excel so that totals will be automatically summed when data is inputted. The data will be gathered from ACS’s historic sale records.

### **Income Statement**

A template of the income statement has been provided to describe the creation of the statement.

**Income Statement**

ACS Custom Creations

Fiscal Year Begins

Jan-09

	Jan-09	Feb-09	Mar-09	Apr-09	May-09	Jun-09	Jul-09	Aug-09	Sep-09	Oct-09	Nov-09	Dec-09	YEARLY
<b>Revenue (Sales)</b>													
Enterprise Class													
Office Class													
HDX01													
JTLS 8900													
ICE 3000													
AC01													
Custom													
Services													
<b>Total Revenue (Sales)</b>													
<b>Cost of Sales</b>													
Enterprise Class													
Office Class													
HDX01													
JTLS 8900													
ICE 3000													
AC01													
Custom													
<b>Total Cost of Sales</b>													
<b>Gross Profit</b>													
<b>Expenses</b>													
Salary expenses													
Payroll expenses													
Outside services													
Supplies													
Repairs and maintenance													
Advertising													
Car, delivery and travel													
Accounting and legal													
Rent													
<b>Total Expenses</b>													
<b>Net Profit</b>													

**Balance Sheet**

The creation of the Balance Sheet will be very similar to the creation of the Income Statement. A template of the balance sheet has been provided to describe the creation of the template.

**Balance Sheet**  
ACS Custom Creations

	Beginning as of 01/01/2010
<b>Assets</b>	
<u><b>Current Assets</b></u>	
Cash in bank	
Accounts receivable	
Inventory	-
Prepaid expenses	-
Other current assets	-
<b>Total Current Assets</b>	<u>\$ -</u>
<u><b>Fixed Assets</b></u>	
Machinery & equipment	
Furniture & fixtures	-
Leasehold improvements	-
Land & buildings	-
Other fixed assets	
(LESS accumulated depreciation on all fixed assets)	-
<b>Total Fixed Assets (net of depreciation)</b>	<u>-</u>
<b>TOTAL Assets</b>	<u>\$ -</u>
<b>Liabilities</b>	
<u><b>Current Liabilities</b></u>	
Accounts payable	\$ -
Interest payable	-
Taxes payable	
Short-term (due within 12 months)	-
Current part, long-term debt	
Other current liabilities	-
<b>Total Current Liabilities</b>	<u>-</u>
<u><b>Long-term Debt</b></u>	
Bank loans payable	\$ -
Notes payable to stockholders	-
LESS: Short-term portion	-
Other long-term debt	-
<b>Total Long-term Debt</b>	<u>\$ -</u>
<b>Total Liabilities</b>	<u>\$ -</u>
<u><b>Owners' Equity</b></u>	
Invested capital	
Retained earnings - beginning	-
Retained earnings - current	-
<b>Total Owners' Equity</b>	<u>-</u>
<b>Total Liabilities &amp; Equity</b>	<u>\$ -</u>

## Cash Flow

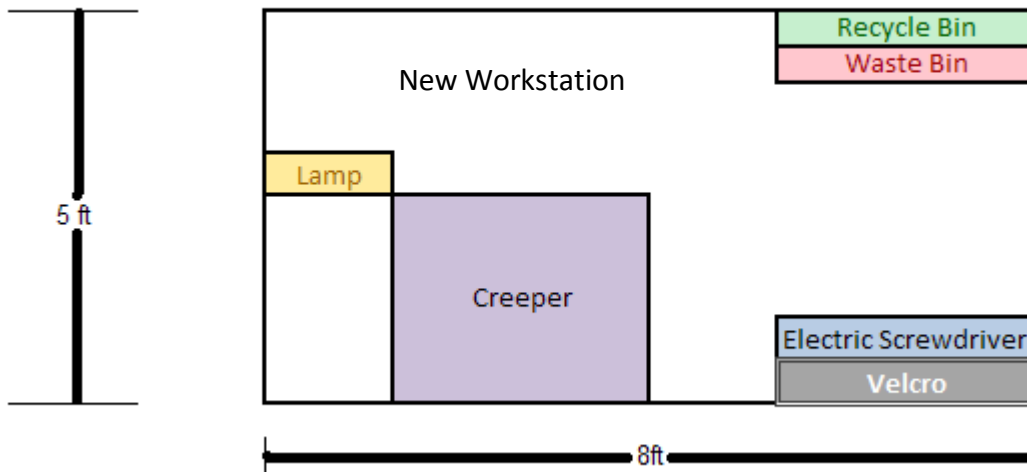
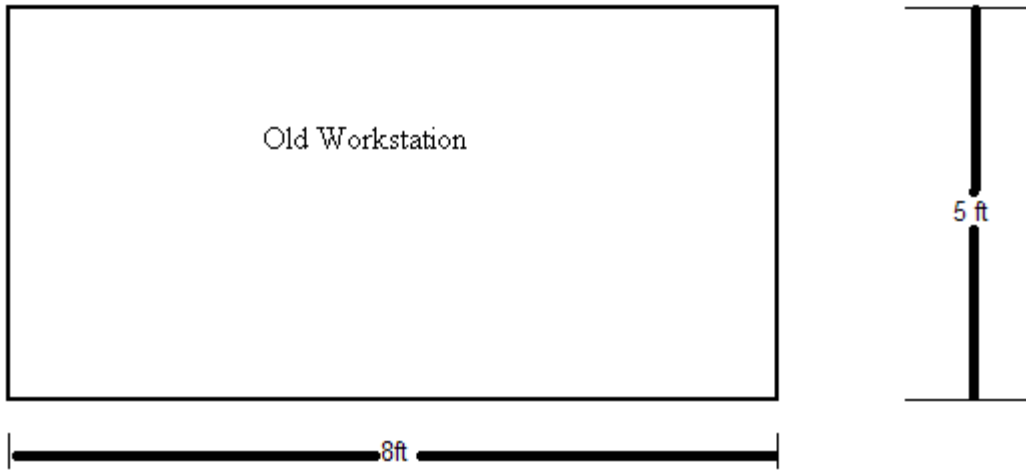
The final statement to be created is the Cash Flow Statement. It as well will be set up like the first two statements. A template of the cash flow statement has been inputted to describe the creation of the statement.

Cash Flow		ACS Custom Creations												Fiscal Year Begins:	Jan-08
	Pre-Startup EST	Jan-08	Feb-08	Mar-08	Apr-08	May-08	Jun-08	Jul-08	Aug-08	Sep-08	Oct-08	Nov-08	Dec-08	Total Item EST	
Cash on Hand (beginning of month)	\$ -														
<b>CASH RECEIPTS</b>															
Cash Sales															
Loans															
<b>TOTAL CASH RECEIPTS</b>															
Total Cash Available (before cash out)															
<b>CASH PAID OUT</b>															
Purchases (merchandise)															
Salary expenses (taxes, etc.)															
Outside services															
Supplies (office & repairs & maintenance)															
Advertising															
Car. delivery & travel															
Accounting & legal															
Rent															
<b>SUBTOTAL</b>															
Loan principal payment															
Capital purchase															
Other startup costs															
Reserve and/or Escrow															
Owners' Withdrawal															
<b>TOTAL CASH PAID OUT</b>															
Cash Position -end of month															

## Work Design, and Measurement with Human Factors

### Workstations

In order to create a new workstation to address the weaknesses of the previous one, some supplies were bought. To fix the lighting issue, a Alvin ML255-D White Magnifier Task Lamp was purchased from EBAY for \$35.00. To speed up the screwing time, a Milwaukee 65456-6 2.4V Two Speed Screwdriver is used. The electric screwdriver is placed in its case, which is Velcro taped to the right hand corner of the workstation to prevent it from being misplaced. To address the problem of heavy lifting and the mobility of the parts, a car creeper is used with locking wheels. A waste and recycle bin are placed in the upper right hand corner of the workstation to reduce clutter. The comparison of the new workstation can be viewed below.





## Methodology

The method used to measure the current and proposed states of the process is time studies. Five studies were done on the old process before the new process was implemented.

## Work Design & Measurement with Human Factors

### Current and new process

Step Detail	Step #	Step #
	Old Process	New Process
Remove packaging from all components		1
Lay out Components in proper assembly order		2
Open side panel of case	1	3
Install standoffs to match motherboard screw layout	2	4
Install the CPU on the motherboard	4	5
Install the CPU fan on the CPU	5	6
Install the RAM into the open memory slots	6	7
Remove the back panel plate for the motherboard attachments	7	8
Install the back panel plate that came with the motherboard	8	9
Screw the motherboard into the case	3	10
Install the optical drive into the case	9	11
Install the hard drive into the case	10	12
Install the graphics card and any other peripherals onto the motherboard	11	13
Plug in all power connectors from the power supply onto the motherboard	12	14
Plug in power connectors from the power supply to the OD, HD, and graphics card	13	15

Connect SATA cables from the hard drive and the OD onto the motherboard	14	16
Use zip ties to neatly tie back and hold together all system cabling	15	17

### Work Study

In order to record an accurate amount of data, the study needs to be done for the building of several computers. However, orders come spaced out and there was not enough computers being built. Therefore, the current process was studied for only five computers. The new process was built in place for the next five computers. After those computers were built, the new workstation was created and studies will be done for those next. The third set of time studies will be on the new workstations as well as the new assembly process. In order to eliminate employees working at different speeds, the same employee built all computers.

## Results

### Time Study

The results from the time studies taken are as follows:

Process	Computer	Build Type	Time (Min:Sec)
Original	Computer 1	Basic	40:25
	Computer 2	Basic	39:34
	Computer 3	Gaming	44:33
	Computer 4	Basic	38:21
	Computer 5	Basic	38:08
	<b>Average</b>		<b>40:20</b>
New Process	Computer 6	Basic	35:38
	Computer 7	Basic	34:37
	Computer 8	Upgrade	21:21
	Computer 9	Basic	33:51
	Computer 10	Basic	32:32
	<b>Average - Outlier</b>		<b>32:55</b>
New WS	Computer 11	Basic	29:30
	Computer 12	Basic	29:31
	Computer 13	Basic	28:01
	Computer 14	Basic	28:09
	Computer 15	Basic	28:24
	<b>Average</b>		<b>28:43</b>

From the above table, the average time it took using the original process was 40 minutes and 20 seconds to build a computer. The average time it took using the new process was 32 minutes and 55 seconds. Note that an upgrade was studied for computer 8 and was not inserted into the average. Using the following equation:  $(\text{Total Current} - \text{Total Proposed}) / \text{Total Current} = 22.5\%$  of time saved per computer, if using the new process instead of the old process. Using the same equation, one would get 15% of time saved per computer from implementing the new workstation compared to just the new process. However, using that same equation, one would get **28.9%** of time saved per computer from implementing the new workstation and the new process from the original design.

Appendix O shows the time studies done for the different states.

These results are very much expected because the new process uses similar steps to the old process. The time spent arranging components in order seems to have really paid off. Also the implementation of the new workstation and tools has seemed to have cut down on a lot of wasted time.

## Financial Statements

After the financial statements were made, it is time for the company to input their data into them. This data gives ACS a better report of its company's financial well being. The data however, in this section was masked so that personal information is not disclosed to general public.

### Income Statement

The first statement that was created was the income statement. The income statement has three major areas listed as follows: Revenues, Cost of Sales, and Expenses.

The revenues section is the total sale price minus taxes that each computer has sold for. As you can see, this section is broken down into each month and then each different computer build or service. The statement should look as follows thus far:

	Jan-09	Feb-09	Mar-09	Apr-09	May-09	Jun-09	Jul-09	Aug-09	Sep-09	Oct-09	Nov-09	Dec-09	YEARLY
<b>Revenue (Sales)</b>													
Enterprise Class	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	60,000
Office Class	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	120,000
HDX01	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	48,000
JTLS 8900	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	48,000
iCE 3000	4,400	4,400	4,400	4,400	4,400	4,400	4,400	4,400	4,400	4,400	4,400	4,400	52,800
AC01	2,700	2,700	2,700	2,700	2,700	2,700	2,700	2,700	2,700	2,700	2,700	2,700	32,400
Custom	1,200	1,200	1,200	1,200	1,200	1,200	1,200	1,200	1,200	1,200	1,200	1,200	14,400
Services	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	12,000
<b>Total Revenue (Sales)</b>	<b>32,300</b>	<b>32,300</b>	<b>32,300</b>	<b>32,300</b>	<b>32,300</b>	<b>32,300</b>	<b>32,300</b>	<b>32,300</b>	<b>32,300</b>	<b>32,300</b>	<b>32,300</b>	<b>32,300</b>	<b>387,600</b>

The next section in the income statement is the cost of sales. This section is broken up by months and by different computer builds as well. The cost of sales is the cost of the equipment used to build the computer. This is usually called cost of goods sold. Note that there is no cost for services because there is no cost of goods sold for a service. After the data was input, this section in the statement looked as follows:

Cost of Sales													
Enterprise Class	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	48,000
Office Class	8,000	8,000	8,000	8,000	8,000	8,000	8,000	8,000	8,000	8,000	8,000	8,000	96,000
HDX01	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	36,000
JTLS 8900	2,800	2,800	2,800	2,800	2,800	2,800	2,800	2,800	2,800	2,800	2,800	2,800	31,200
ICE 3000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	36,000
AC01	1,800	1,800	1,800	1,800	1,800	1,800	1,800	1,800	1,800	1,800	1,800	1,800	21,600
Custom	675	675	675	675	675	675	675	675	675	675	675	675	8,100
Total Cost of Sales	23,075	23,075	23,075	23,075	23,075	23,075	23,075	23,075	23,075	23,075	23,075	22,400	268,800
<b>Gross Profit</b>	<b>9,225</b>	<b>9,225</b>	<b>9,225</b>	<b>9,225</b>	<b>9,225</b>	<b>9,225</b>	<b>9,225</b>	<b>9,225</b>	<b>9,225</b>	<b>9,225</b>	<b>9,225</b>	<b>9,900</b>	<b>118,800</b>

The gross profit per month was calculated by taking the total revenue per month and subtracting it by the total cost of sales per month.

The next and final section of data that was input is the expenses of ACS. These expenses are overhead costs to the company that have nothing to do with the actual amount of computers made. The salary and payroll expenses were input by finding out the amount of money spend on employee salaries each month. The outside services amount was input because when ACS has a big order in which it can not meet the demand of its customers, MA Labs will perform the operations of a computer for a negotiated price of \$35. The supplies amount was derived by the cost of office supplies used by ACS. This includes printers, paper, pens, pencils, and other various supplies used. The repair and maintenance amount is determined by the amount of money it cost to repair the utilities used by ACS. The advertising amount is derived from the amount of money ACS spends on advertising a month. This includes search engine advertising, newspaper advertising and pay per click advertising. The car, delivery, and travel is the cost of all travel including gas for the ACS employees as they pick up components from their supplier. The final two fields that were input were: accounting and legal, and rent. The accounting and legal field includes the cost of all contracts including the yearly cost of a business license. The rent field is left empty because all of ACS's operations are done inside the owners homes. With all of this data entered, the final section of the report should look as follows:

Expenses													
Salary expenses	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	60,000
Payroll expenses	0	0	0	0	0	0	0	0	0	0	0	0	0
Outside services	35	35	35	35	35	35	35	35	35	35	35	35	420
Supplies	100	100	100	100	100	100	100	100	100	100	100	100	1,200
Repairs and maintenance	0	0	0	0	0	0	0	0	0	0	0	0	0
Advertising	200	200	200	200	200	200	200	200	200	200	200	200	2,400
Car, delivery and travel	180	180	180	180	180	180	180	180	180	180	180	180	1,920
Accounting and legal	20	20	20	20	20	20	20	20	20	20	20	20	240
Rent	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Total Expenses</b>	<b>5,515</b>	<b>5,515</b>	<b>5,515</b>	<b>5,515</b>	<b>5,515</b>	<b>5,515</b>	<b>5,515</b>	<b>5,515</b>	<b>5,515</b>	<b>5,515</b>	<b>5,515</b>	<b>5,515</b>	<b>66,180</b>
<b>Net Profit</b>	<b>3,710</b>	<b>3,710</b>	<b>3,710</b>	<b>3,710</b>	<b>3,710</b>	<b>3,710</b>	<b>3,710</b>	<b>3,710</b>	<b>3,710</b>	<b>3,710</b>	<b>3,710</b>	<b>4,385</b>	<b>52,620</b>

The net profit per month is calculated by taking the sum of the revenue per month and subtracting the cost of sales per month and the expenses per month from it. This gives ACS an amount of net profit per month. This will be the leading decider if the company has been successful for the year. The Income Statement with masked company data can be seen in Appendix K.

# Balance Sheet

The second statement that was created was the balance sheet. The balance sheet consists of three areas titled as follows: Assets, Liabilities, and Equity. The assets section has two sub divisions titled current assets and fixed assets. The cash in bank field from the current assets portion is the amount of money ACS has in the bank from the previous year of operations. Note that this is the same amount as shown in the net profit of the income statement. In the fixed assets portion, the two fields that are populated are the machinery and equipment, and other fixed assets. The machinery and equipment field is populated with the book value amount of machinery such as computers or monitors. The total assets field is a sum of both the current and fixed assets and gives management at ACS the present worth of their company. The asset portion of the balance sheet looks as follows:

**Balance Sheet**  
ACS Custom Creations

	Beginning as of 01/01/2010	
<b>Assets</b>		
<u><b>Current Assets</b></u>		
Cash in bank	\$	52,620
Accounts receivable		-
Inventory		-
Prepaid expenses		-
Other current assets		-
<b>Total Current Assets</b>	<u>\$</u>	<u>52,620</u>
<u><b>Fixed Assets</b></u>		
Machinery & equipment	\$	3,000
Furniture & fixtures		-
Leasehold improvements		-
Land & buildings		-
Other fixed assets		150
(LEBB accumulated depreciation on all fixed assets)		-
<b>Total Fixed Assets (net of depreciation)</b>	<u>\$</u>	<u>3,150</u>
<b>TOTAL Assets</b>	<u>\$</u>	<u>55,770</u>

The next section of the statement is the liabilities and owners equity section. Within the current liability portion, the only fields that are populated are the taxes payable and the current past long term debt. The taxes payable field is derived by the amount of taxes ACS needs to pay. This money is kept by ACS until taxes are owed to the government. The current past, long term debt simply shows the portion of long-term debt that the company must pay in the next 12 months. Within the owners equity portion, the only field that is populated with a dollarized amount is the invested capital field. Invested capital represents the total cash investment that share holders and debt holders have made in the company. However, the only shareholders in the company are the owners due to the fact that ACS is not a publically traded company. The total liabilities and equity was then summed up to show the amount that the company is in debt. The other fields in this section do not currently apply to ACS. The second portion of the balance sheet looks as follows:

<b>Liabilities</b>	
<u>Current Liabilities</u>	
Accounts payable	\$ -
Interest payable	-
Taxes payable	4,000
Short-term (due within 12 months)	-
Current part, long-term debt	1,000
Other current liabilities	-
<b>Total Current Liabilities</b>	<u>\$ 5,000</u>
<u>Long-term Debt</u>	
Bank loans payable	\$ -
Notes payable to stockholders	-
LESS: Short-term portion	(1,000)
Other long-term debt	-
<b>Total Long-term Debt</b>	<u>\$ (1,000)</u>
<b>Total Liabilities</b>	<u>\$ 4,000</u>
<u>Owners' Equity</u>	
Invested capital	\$ 2,000
Retained earnings - beginning	-
Retained earnings - current	-
<b>Total Owners' Equity</b>	<u>\$ 2,000</u>
<b>Total Liabilities &amp; Equity</b>	<u>\$ 6,000</u>

Note that assets are equal to the liability plus owners equity. The Balance Sheet with masked company data can be seen in Appendix L.

## Cash Flow Statement

The final statement that was created was the Cash Flow Statement. The cash flow statement shows the company how much cash is coming in or going out during any given month. It also shows the company how much cash that is available to be used to invest in other opportunities such as advertising or purchase of machinery. The first portion of the cash flow statement is the cash receipts section. The first field is the cash on hand. Since ACS requires no investment or overhead, ACS had no start up cash. The rest of the cash accumulated throughout the year comes from the sales of computers and sales. The cash from sales comes from the net profit field from the income statement. The loan field is null because ACS did not take out a business loan. The total cash receipts field then equals the cash from sales. The cash receipts portion looks as follows:

Cash Flow	ACS Custom Creations													Total Item EST
	Pre-Startup EST	Jan-08	Feb-08	Mar-08	Apr-08	May-08	Jun-08	Jul-08	Aug-08	Sep-08	Oct-08	Nov-08	Dec-08	
Cash on Hand (beginning of month)	\$ -	3,710	7,420	11,130	14,840	18,550	22,260	25,970	29,680	33,390	37,100	40,810	44,520	44,520
<b>CASH RECEIPTS</b>														
Cash Sales	9,225	9,225	9,225	9,225	9,225	9,225	9,225	9,225	9,225	9,225	9,225	9,225	9,225	
Loans	0													
<b>TOTAL CASH RECEIPTS</b>	<b>9,225</b>	<b>9,225</b>	<b>9,225</b>	<b>9,225</b>	<b>9,225</b>	<b>9,225</b>	<b>9,225</b>	<b>9,225</b>	<b>9,225</b>	<b>9,225</b>	<b>9,225</b>	<b>9,225</b>	<b>9,225</b>	<b>0</b>
<b>Total Cash Available (before cash out)</b>	<b>9,225</b>	<b>12,935</b>	<b>16,645</b>	<b>20,355</b>	<b>24,065</b>	<b>27,775</b>	<b>31,485</b>	<b>35,195</b>	<b>38,905</b>	<b>42,615</b>	<b>46,325</b>	<b>50,035</b>	<b>53,745</b>	<b>44,520</b>

The second portion of cash flow statement is the cash paid out section. There are no purchases of merchandise by ACS so that field is equal to zero. The rest of the cash paid out is taken from the income statement and balance sheet. The final part of the cash flow statement looks as follows:

CASH PAID OUT														
Purchases (merchandise)														
Salary expenses (taxes, etc.)	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	
Outside services	35	35	35	35	35	35	35	35	35	35	35	35	35	35
Supplies (office & repairs & maintenance)	100	100	100	100	100	100	100	100	100	100	100	100	100	100
Advertising	200	200	200	200	200	200	200	200	200	200	200	200	200	200
Car. delivery & travel	160	160	160	160	160	160	160	160	160	160	160	160	160	160
Accounting & legal	20	20	20	20	20	20	20	20	20	20	20	20	20	20
Rent														
<b>SUBTOTAL</b>	<b>5,515</b>	<b>5,515</b>	<b>5,515</b>	<b>5,515</b>	<b>5,515</b>	<b>5,515</b>	<b>5,515</b>	<b>5,515</b>	<b>5,515</b>	<b>5,515</b>	<b>5,515</b>	<b>5,515</b>	<b>5,515</b>	<b>0</b>
Loan principal payment														
Capital purchase														
Other startup costs														
Reserve and/or Escrow														
Owners' Withdrawal														
<b>TOTAL CASH PAID OUT</b>	<b>5,515</b>	<b>5,515</b>	<b>5,515</b>	<b>5,515</b>	<b>5,515</b>	<b>5,515</b>	<b>5,515</b>	<b>5,515</b>	<b>5,515</b>	<b>5,515</b>	<b>5,515</b>	<b>5,515</b>	<b>5,515</b>	<b>0</b>
<b>Cash Position -end of month</b>	<b>3,710</b>	<b>7,420</b>	<b>11,130</b>	<b>14,840</b>	<b>18,550</b>	<b>22,260</b>	<b>25,970</b>	<b>29,680</b>	<b>33,390</b>	<b>37,100</b>	<b>40,810</b>	<b>44,520</b>	<b>48,230</b>	<b>44,520</b>

The Cash Flow Statement with masked company data can be seen in Appendix M.

With the creation and implementation of the above financial statements, ACS can now determine past performance of the company, manage future performance, and assess the capability of generating future cash flows. These financial statements are a far better method of keeping records of all financial data than what ACS currently had in place.

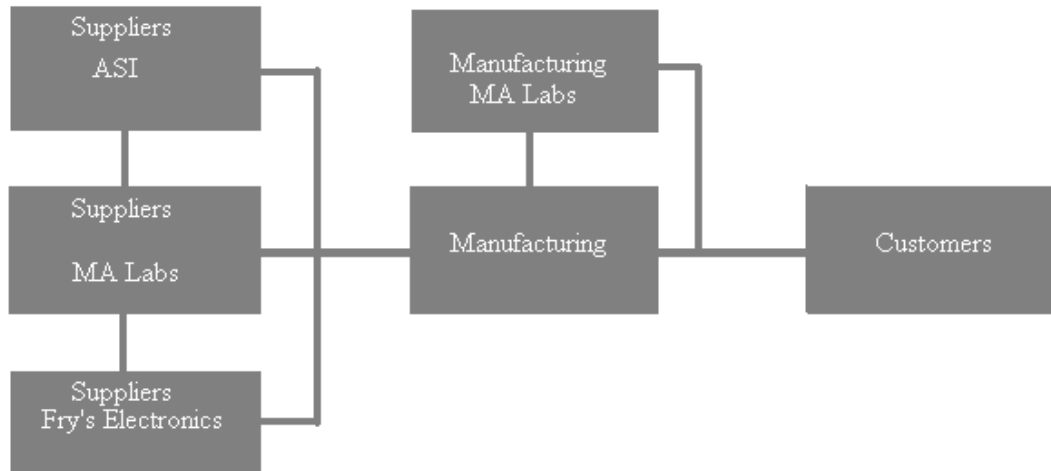
### Supply Chain Management

As mentioned in the above report, ACS's supply chain has been evaluated and redesigned. The addition of new suppliers and manufacturers should increase not only profitability but also an increase in flexibility. The previous supply chain looked as follows:



The new supply chain that was designed is as follows:





With the increase in additional suppliers, ACS can save close to 4% on components due to competitive prices provided by MA Labs and Fry's Electronics. With this money saved in component prices in addition to the 3% cash savings provided by MA Labs, ACS can save a total of 7% per computer built. According to last years statistics 38 computers were sold at an average price \$1,200 per computer. The 7% savings would come to a total savings of \$3,192 if last years number repeat. This extra money allows ACS to increase its profit margin on each computer just by increasing the number of suppliers they use.

Also stated earlier, new logistics were defined to insure that ACS increases its performance within the overall supply chain. These new logistics include the placement of orders, build of orders, payment, and the delivery of the final product.

All of these new logistics is encompassed by the investment of ACSs new website. The cost of this website was \$2,000 and will now be compared to the usage of the Access database. The Access database is already created, so the cost would be zero. However, the Access database doesn't contain the improved logistics that the website brings to ACS. So the decision was made to determine if the price of the website was worth it.

Stated in the design section of the report, If we can assume the website and search engine advertising would net ACS an extra 24 computers a year (2 a month), then the ROI would come to a ratio of 6%. This number can be derived by taking the throughput of the extra computers minus the operating expenses. If ACS makes an average of \$500 per computer, this comes to an amount of \$12,000. This is then divided by the cost of the website (\$2,000). The ROI can increase as ACS provides more services to Hathaway Tech because the cost of the investment would decrease. It has been said by Daniel Martinez, an former employee of Intel, that a ROI of 5%-8% in the computer assembly industry is justified for an investment. ACS has agreed that a 6% ROI for the first year of the website is acceptable. Each year that ACS uses the website, the ROI will continue to rise; making the investment a great idea for management.

## Conclusion

The objective of this project is to improve and implement ACS Custom Creations assembly and business operations. The new process cuts down the time the employees spend assembling computers. The new process is implemented to reduce cycle time. The proposed process adds 2 simple steps that do not take long to implement.

During an assembly build, the employees spend 40 minutes and 20 seconds per build performing the current process costing the company \$21 per computer. Using the same data from the current process, the new process and workstations cause the employees to spend 28 minutes and 43 seconds per computer, costing the company \$14.92 per computer. This amounts to a 28.9% time and money saved for ACS Custom Creations.

Other further recommendations are to continue improvements on the assembly process. With these continuous improvements, ACS can continue to grow into a more successful company. ACS is currently in the process of developing an e-commerce website that will take all the information from their database and make it available to the customers. When developed, another recommendation is that the employees update prices of their components once a month. This will allow for ACS to stay profitable and competitive.

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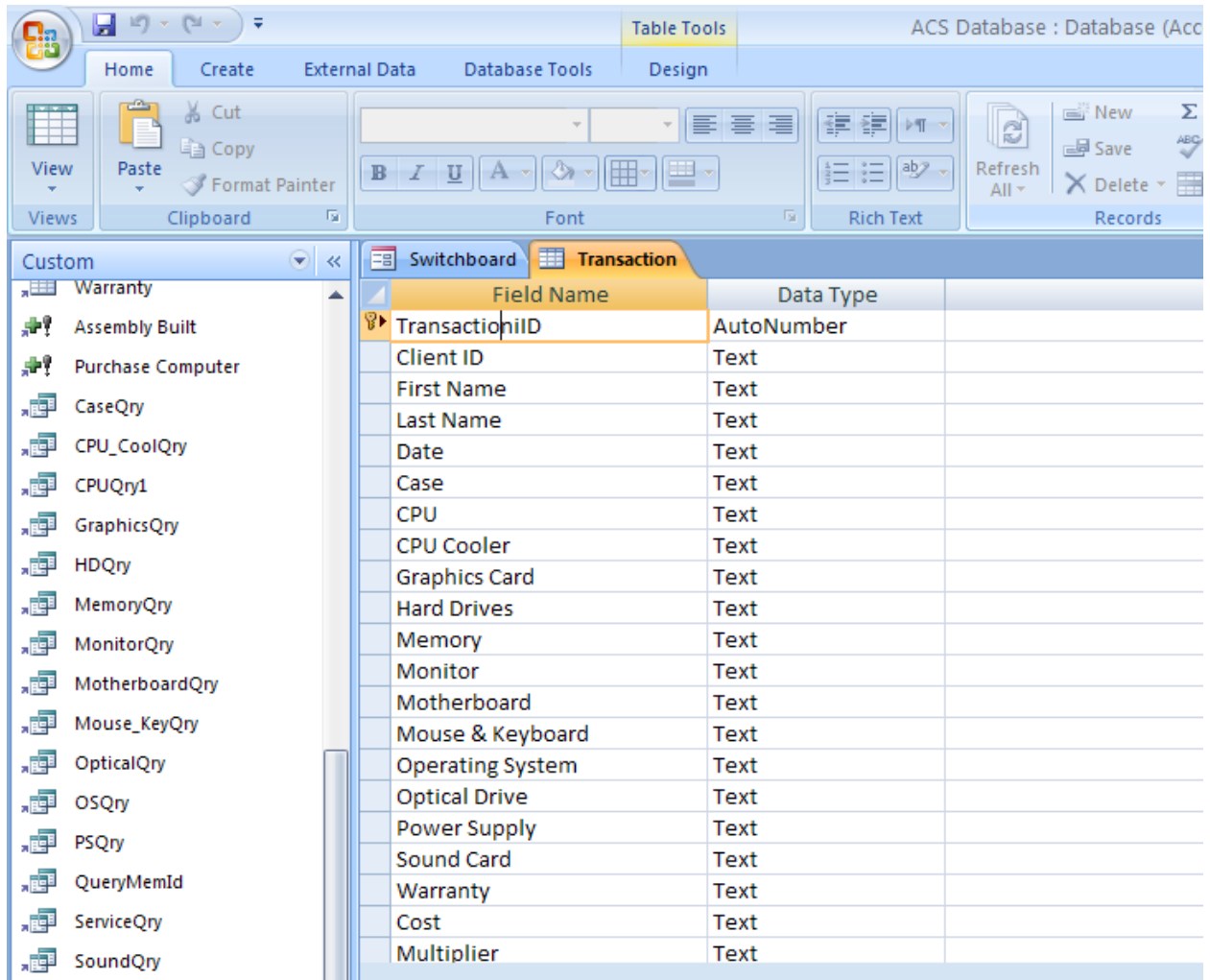
# Appendices

## Appendix A-Clients Table

The screenshot displays the Microsoft Access interface for the 'Clients' table in design view. The ribbon at the top includes 'Table Tools' and 'Design'. The 'Design' ribbon contains sections for 'Views', 'Tools', and 'Property Indexes Sheet'. The 'Tools' section includes 'Primary Key', 'Builder Test Validation Rules', and 'Lookup Column'. The 'Property Indexes Sheet' section includes 'Show/Hide'. The 'Clients' table is selected, and its design is shown in a grid with columns for 'Field Name' and 'Data Type'. The fields are: Client ID (AutoNumber), First Name (Text), Last Name (Text), Phone (Text), Email (Text), Street Number (Text), City (Text), State (Text), and Zip Code (Text). The 'Client ID' field is highlighted with a yellow background.

Field Name	Data Type
Client ID	AutoNumber
First Name	Text
Last Name	Text
Phone	Text
Email	Text
Street Number	Text
City	Text
State	Text
Zip Code	Text

## Appendix B-Transaction Table



The screenshot displays the Microsoft Access interface for a database named "ACS Database : Database (Acc)". The "Table Tools" ribbon is active, showing the "Design" tab. The "Transaction" table is selected, and its design view is shown. The table has the following fields and data types:

Field Name	Data Type
TransactionID	AutoNumber
Client ID	Text
First Name	Text
Last Name	Text
Date	Text
Case	Text
CPU	Text
CPU Cooler	Text
Graphics Card	Text
Hard Drives	Text
Memory	Text
Monitor	Text
Motherboard	Text
Mouse & Keyboard	Text
Operating System	Text
Optical Drive	Text
Power Supply	Text
Sound Card	Text
Warranty	Text
Cost	Text
Multiplier	Text



## Appendix D-Purchase Computer Query

Field:	Expr1: [Forms].[QU	Expr2: [Forms].[Quote	Expr3: [Forms].[Quote	Expr4: [Forms].[Quote	Expr5: [Forms].[Quote	Expr6: [Forms].[Quote	Expr7:
Table:	Expression	Expression	Expression	Expression	Expression	Expression	Exprre:
Total:							
Sort:							
Append To:	Client ID	First Name	Last Name	Date	Case	CPU	CPU C
Criteria:							
or:							



## Appendix E-Client Form Code

Option Compare Database

Private Sub Clients\_Subform\_Enter()

Me.Form.Refresh

End Sub

' Command29\_Click

Private Sub Command29\_Click()

On Error GoTo Command29\_Click\_Err

DoCmd.OpenQuery "Update Clients", acViewNormal, acEdit

Command29\_Click\_Exit:

Exit Sub

Command29\_Click\_Err:

MsgBox Error\$

Resume Command29\_Click\_Exit

End Sub

' Command32\_Click

Private Sub Command32\_Click()

On Error GoTo Command32\_Click\_Err

DoCmd.OpenQuery "ViewCustomerinfo", acViewNormal, acEdit

Command32\_Click\_Exit:

Exit Sub

Command32\_Click\_Err:

MsgBox Error\$

Resume Command32\_Click\_Exit

End Sub

' Command33\_Click

```
Private Sub Command33_Click()
```

```
On Error GoTo Command33_Click_Err
```

```
DoCmd.OpenQuery "View Client History", acViewNormal, acEdit
```

```
Command33_Click_Exit:
```

```
Exit Sub
```

```
Command33_Click_Err:
```

```
MsgBox Error$
```

```
Resume Command33_Click_Exit
```

```
End Sub
```

```
' Command34_Click
```

```
Private Sub Command34_Click()
```

```
On Error GoTo Command34_Click_Err
```

```
DoCmd.OpenQuery "View Client Current Transaction", acViewNormal, acEdit
```

```
fCommand34_Click_Exit:
```

```
Exit Sub
```

```
Command34_Click_Err:
```

```
MsgBox Error$
```

```
Resume Command34_Click_Exit
```

```
End Sub
```

```
Private Sub View_Client_Info_Enter()
```

```
Me.Form.Refresh
```

```
End Sub
```

## Appendix F-Client Form Code

**Clients**

First Name:  View Client Contact Info

Last Name:

Phone Number:

Email:

Street Number:

City:

State:

Zip Code:

Clients Subform

Client	First Name	Last Name	Phone	Email	Street Number	City
* (New)						

Record: 1 of 1 No Filter Search

Client	First Name	Last Name	Phone	Email	Street Number	City

## Appendix G-Quote and Purchase Form Code

Option Compare Database

```
Private Sub Text38_BeforeUpdate(Cancel As Integer)
```

```
Me.Form.Refresh
```

```
End Sub
```

```
Private Sub Calendar0_Click()
```

```
Me.Text41.Value = Me.Calendar0.Value
```

```
Me.Form.Refresh
```

```
End Sub
```

```
Private Sub Calendar0_Updated(Code As Integer)
```

```
End Sub
```

```
Private Sub Combo43_AfterUpdate()
```

```
Me.Text45 = Me.Combo43.Column(2)
```

```
Me.Text47 = Me.Combo43.Column(3)
```

```
End Sub
```

```
Private Sub Combo43_BeforeUpdate(Cancel As Integer)
```

```
End Sub
```

```
Private Sub Combo101_AfterUpdate()
```

```
Me.Text71 = Me.Combo101.Column(1)
```

```
Me.Form.Refresh
```

```
End Sub
```

```
Private Sub Combo101_BeforeUpdate(Cancel As Integer)
```

```
End Sub
```

```
Private Sub Combo103_AfterUpdate()
```

```
Me.Text69 = Me.Combo103.Column(1)
```

```
Me.Form.Refresh
```

```
End Sub
Private Sub Combo103_BeforeUpdate(Cancel As Integer)
End Sub
Private Sub Combo115_AfterUpdate()
Me.Text107 = Me.Combo115.Column(1)
Me.Form.Refresh
End Sub
Private Sub Combo115_BeforeUpdate(Cancel As Integer)
End Sub
Private Sub Combo117_AfterUpdate()
Me.Text109 = Me.Combo117.Column(1)
Me.Form.Refresh
End Sub
Private Sub Combo117_BeforeUpdate(Cancel As Integer)
End Sub
Private Sub Combo119_AfterUpdate()
Me.Text77 = Me.Combo119.Column(1)
Me.Form.Refresh
End Sub
Private Sub Combo119_BeforeUpdate(Cancel As Integer)
End Sub
Private Sub Combo49_AfterUpdate()
Me.Text45 = Me.Combo49.Column(1)
Me.Text47 = Me.Combo49.Column(2)
Me.Form.Refresh
End Sub
```

```
Private Sub Combo51_AfterUpdate()  
Me.Text53 = Me.Combo51.Column(1)  
Me.Form.Refresh  
End Sub  
  
Private Sub Combo79_AfterUpdate()  
Me.Text55 = Me.Combo79.Column(1)  
Me.Form.Refresh  
End Sub  
  
Private Sub Combo81_AfterUpdate()  
Me.Text57 = Me.Combo81.Column(1)  
Me.Form.Refresh  
End Sub  
  
Private Sub Combo83_AfterUpdate()  
Me.Text67 = Me.Combo83.Column(1)  
Me.Form.Refresh  
End Sub  
  
Private Sub Combo85_AfterUpdate()  
Me.Text65 = Me.Combo85.Column(1)  
Me.Form.Refresh  
End Sub  
  
Private Sub Combo87_AfterUpdate()  
Me.Text63 = Me.Combo87.Column(1)  
Me.Form.Refresh  
End Sub  
  
Private Sub Combo89_AfterUpdate()  
Me.Text61 = Me.Combo89.Column(1)  
Me.Form.Refresh
```

```
End Sub
Private Sub Combo93_AfterUpdate()
Me.Text59 = Me.Combo93.Column(1)
Me.Form.Refresh
End Sub
Private Sub Combo93_BeforeUpdate(Cancel As Integer)
End Sub
Private Sub Combo95_AfterUpdate()
End Sub
Private Sub Combo95_BeforeUpdate(Cancel As Integer)
End Sub
Private Sub Combo97_AfterUpdate()
Me.Text75 = Me.Combo97.Column(1)
Me.Form.Refresh
End Sub
Private Sub Combo97_BeforeUpdate(Cancel As Integer)
End Sub
Private Sub Combo99_AfterUpdate()
Me.Text73 = Me.Combo99.Column(1)
Me.Form.Refresh
End Sub
Private Sub Combo99_BeforeUpdate(Cancel As Integer)
End Sub
Private Sub Text113_AfterUpdate()
Me.Combo51.Column (1) + Me.Combo79.Column(1) = Me.Text113
Me.Form.Refresh
End Sub
```

```

Private Sub Text113_BeforeUpdate(Cancel As Integer)
End Sub

Private Sub Text53_AfterUpdate()
End Sub

Private Sub Text53_BeforeUpdate(Cancel As Integer)
End Sub

' Command129_Click
Private Sub Command129_Click()
On Error GoTo Command129_Click_Err
DoCmd.OpenQuery "Purchase Computer", acViewNormal, acEdit
Command129_Click_Exit:
    Exit Sub
Command129_Click_Err:
    MsgBox Error$
    Resume Command129_Click_Exit
End Sub

' Command132_Click
Private Sub Command132_Click()
On Error GoTo Command132_Click_Err
DoCmd.OpenQuery "Assembly Built", acViewNormal, acEdit
    DoCmd.OpenQuery "Delete Query", acViewNormal, acEdit
Command132_Click_Exit:
    Exit Sub
Command132_Click_Err:
    MsgBox Error$
    Resume Command132_Click_Exit
End Sub

```



# Appendix H-Quote and Purchase Form

Switchboard Quote and Purchase

Client ID:

First Name:  Last Name:

**Aug 2009**    Aug    2009

Sun	Mon	Tue	Wed	Thu	Fri	Sat
26	27	28	29	30	31	1
2	3	4	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22
23	24	25	26	27	28	29
30	31	1	2	3	4	5

Date:

Case	iMicro Aluminum Full To	Cost:	<input type="text" value="66"/>		
CPU	Intel Core i7-975 Extrem	Cost:	<input type="text" value="995"/>		
CPU Fan	Zalman CNPS9500A	Cost:	<input type="text" value="49"/>		
Graphics Card	FX nVidia 9400GT 1GB	Cost:	<input type="text" value="53"/>	Service	Moderate Gaming I
Hard Drive	Western Digital 1TB SAT.	Cost:	<input type="text" value="84"/>	Service Factor:	<input type="text" value="1.5"/>
Memory	Kingston HyperX DDR2 I	Cost:	<input type="text" value="58"/>	Cost:	<input type="text" value="\$2,164.50"/>
Monitor	Samsung 18.5" Widescr	Cost:	<input type="text" value="141"/>	Price:	<input type="text" value="\$3,246.75"/>
Motherboard	Gigabyte X58 Chips	Cost:	<input type="text" value="278"/>	Tax:	<input type="text" value="\$300.32"/>

## Quote and Purchase Form Continued...

Motherboard	Gigabyte X58 Chips	Cost:	<input type="text" value="278"/>		Tax:	<input type="text" value="\$300.32"/>
Mouse and Keyboard	Microsoft Wireless	Cost:	<input type="text" value="48.5"/>	Quantity:	<input type="text" value="1"/>	
Optical Drive	LG 6X BluRay 3X HDI	Cost:	<input type="text" value="158"/>		Total:	<input type="text" value="\$3,547.07"/>
OS	Windows Vista Hon	Cost:	<input type="text" value="87"/>			
PS	Thermaltake 700W I	Cost:	<input type="text" value="101"/>		Profit:	<input type="text" value="\$1,082.25"/>
Sound Card	Creative Sound Bl	Cost:	<input type="text" value="46"/>			
Warranty	Gaming 1 YR	Cost:	<input type="text" value="0"/>			

Purchase Computer

TransactionID

Assembly Built

## Appendix I-Switchboard Form Code

```
Private Sub Form_Current()
```

```
On Error GoTo Form_Current_Err
```

```
TempVars.Add "CurrentItemNumber", "[ItemNumber]"
```

```
Form_Current_Exit:
```

```
Exit Sub
```

```
Form_Current_Err:
```

```
MsgBox Error$
```

```
Resume Form_Current_Exit
```

```
End Sub
```

```
' Form_Open
```

```
Private Sub Form_Open(Cancel As Integer)
```

```
On Error GoTo Form_Open_Err
```

```
TempVars.Add "SwitchboardID", "DLookup("""SwitchboardID""", ""Switchboard  
Items""", "[ItemNumber] = 0 AND [Argument] = 'Default'")"
```

```
DoCmd.SetProperty "Label1", acPropertyCaption, DLookup("ItemText", "Switchboard  
Items", "[SwitchboardID] = " & TempVars("SwitchboardID"))
```

```
DoCmd.SetProperty "Label2", acPropertyCaption, DLookup("ItemText", "Switchboard  
Items", "[SwitchboardID] = " & TempVars("SwitchboardID"))
```

```
DoCmd.Requery ""
```

```
Form_Open_Exit:
```

```
Exit Sub
```

Form\_Open\_Err:

MsgBox Error\$

Resume Form\_Open\_Exit

End Sub

' Option1\_Click

Private Sub Option1\_Click()

On Error GoTo Option1\_Click\_Err

On Error GoTo 0

If (Command = 1) Then

TempVars.Add "SwitchboardID", "[Argument]"

DoCmd.SetProperty "Label1", acPropertyCaption, DLookup("ItemText", "Switchboard Items", "[SwitchboardID] = " & TempVars("SwitchboardID"))

DoCmd.SetProperty "Label2", acPropertyCaption, DLookup("ItemText", "Switchboard Items", "[SwitchboardID] = " & TempVars("SwitchboardID"))

DoCmd.Requery ""

Exit Sub

End If

If (Command = 2) Then

DoCmd.OpenForm Argument, acNormal, "", "", acAdd, acNormal

Exit Sub

End If

If (Command = 3) Then

DoCmd.OpenForm Argument, acNormal, "", "", , acNormal

Exit Sub

End If

```

If (Command = 4) Then
    DoCmd.OpenReport Argument, acViewReport, "", "", acNormal
    Exit Sub
End If

If (Command = 5) Then
    DoCmd.RunCommand acCmdSwitchboardManager

    TempVars.Add "SwitchboardID", "DLookup("""SwitchboardID""","Switchboard
Items""", "[ItemNumber] = 0 AND [Argument] = 'Default'")"

    DoCmd.SetProperty "Label1", acPropertyCaption, DLookup("ItemText", "Switchboard
Items", "[SwitchboardID] = " & TempVars("SwitchboardID"))

    DoCmd.SetProperty "Label2", acPropertyCaption, DLookup("ItemText", "Switchboard
Items", "[SwitchboardID] = " & TempVars("SwitchboardID"))

    DoCmd.Requery ""
    Exit Sub
End If

If (Command = 6) Then
    DoCmd.CloseDatabase
    Exit Sub
End If

If (Command = 7) Then
    DoCmd.RunMacro Argument, , ""
    Exit Sub
End If

If (Command = 8) Then
    Call Argument & "()"
    Exit Sub
End If

Beep

```

```

    MsgBox "Unknown option.", vbOKOnly, ""
Option1_Click_Exit:
    Exit Sub
Option1_Click_Err:
    MsgBox Error$
    Resume Option1_Click_Exit

End Sub

' OptionLabel1_Click
Private Sub OptionLabel1_Click()
On Error GoTo OptionLabel1_Click_Err

    On Error GoTo 0
    If (Command = 1) Then
        TempVars.Add "SwitchboardID", "[Argument]"
        DoCmd.SetProperty "Label1", acPropertyCaption, DLookup("ItemText", "Switchboard
Items", "[SwitchboardID] = " & TempVars("SwitchboardID"))
        DoCmd.SetProperty "Label2", acPropertyCaption, DLookup("ItemText", "Switchboard
Items", "[SwitchboardID] = " & TempVars("SwitchboardID"))
        DoCmd.Requery ""
        Exit Sub
    End If
    If (Command = 2) Then
        DoCmd.OpenForm Argument, acNormal, "", "", acAdd, acNormal
        Exit Sub
    End If
    If (Command = 3) Then
        DoCmd.OpenForm Argument, acNormal, "", "", , acNormal

```

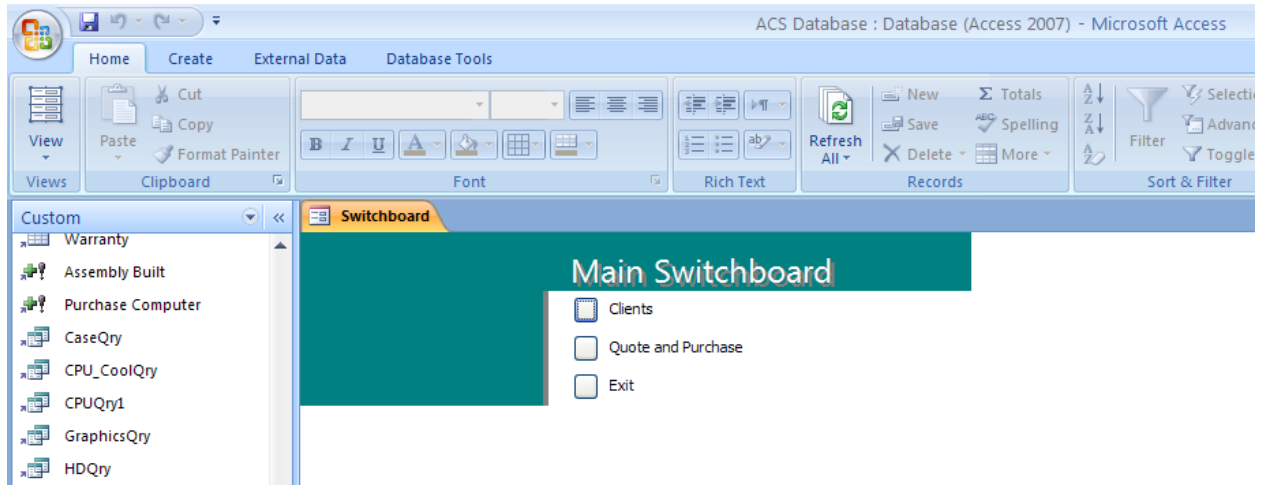
```

Exit Sub
End If
If (Command = 4) Then
    DoCmd.OpenReport Argument, acViewReport, "", "", acNormal
    Exit Sub
End If
If (Command = 5) Then
    DoCmd.RunCommand acCmdSwitchboardManager
    TempVars.Add "SwitchboardID", "DLookup("""SwitchboardID""", ""Switchboard
Items""", ""[ItemNumber] = 0 AND [Argument] = 'Default'""")"
    DoCmd.SetProperty "Label1", acPropertyCaption, DLookup("ItemText", "Switchboard
Items", "[SwitchboardID] = " & TempVars("SwitchboardID"))
    DoCmd.SetProperty "Label2", acPropertyCaption, DLookup("ItemText", "Switchboard
Items", "[SwitchboardID] = " & TempVars("SwitchboardID"))
    DoCmd.Requery ""
    Exit Sub
End If
If (Command = 6) Then
    DoCmd.CloseDatabase
    Exit Sub
End If
If (Command = 7) Then
    DoCmd.RunMacro Argument, , ""
    Exit Sub
End If
If (Command = 8) Then
    Call Argument & "()"
    Exit Sub

```

```
End If
Beep
MsgBox "Unknown option.", vbOKOnly, ""
OptionLabel1_Click_Exit:
Exit Sub
OptionLabel1_Click_Err:
MsgBox Error$
Resume OptionLabel1_Click_Exit
End Sub
```

## Appendix J-Switchboard Form





## Appendix K-Income Statement

### Income Statement

ACS Custom Creations

Fiscal Year Begins

Jan-09

	Jan-09	Feb-09	Mar-09	Apr-09	May-09	Jun-09	Jul-09	Aug-09	Sep-09	Oct-09	Nov-09	Dec-09	YEARLY
<b>Revenue (Sales)</b>													
Enterprise Class	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	60,000
Office Class	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	120,000
HDX01	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	48,000
JTLS 8900	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	48,000
ICE 3000	4,400	4,400	4,400	4,400	4,400	4,400	4,400	4,400	4,400	4,400	4,400	4,400	52,800
AC01	2,700	2,700	2,700	2,700	2,700	2,700	2,700	2,700	2,700	2,700	2,700	2,700	32,400
Custom	1,200	1,200	1,200	1,200	1,200	1,200	1,200	1,200	1,200	1,200	1,200	1,200	14,400
Services	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	12,000
<b>Total Revenue (Sales)</b>	<b>32,300</b>	<b>32,300</b>	<b>32,300</b>	<b>32,300</b>	<b>32,300</b>	<b>32,300</b>	<b>32,300</b>	<b>32,300</b>	<b>32,300</b>	<b>32,300</b>	<b>32,300</b>	<b>32,300</b>	<b>387,600</b>
<b>Cost of Sales</b>													
Enterprise Class	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	48,000
Office Class	8,000	8,000	8,000	8,000	8,000	8,000	8,000	8,000	8,000	8,000	8,000	8,000	96,000
HDX01	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	36,000
JTLS 8900	2,600	2,600	2,600	2,600	2,600	2,600	2,600	2,600	2,600	2,600	2,600	2,600	31,200
ICE 3000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	36,000
AC01	1,800	1,800	1,800	1,800	1,800	1,800	1,800	1,800	1,800	1,800	1,800	1,800	21,600
Custom	675	675	675	675	675	675	675	675	675	675	675	675	8,100
<b>Total Cost of Sales</b>	<b>23,075</b>	<b>23,075</b>	<b>23,075</b>	<b>23,075</b>	<b>23,075</b>	<b>23,075</b>	<b>23,075</b>	<b>23,075</b>	<b>23,075</b>	<b>23,075</b>	<b>23,075</b>	<b>22,400</b>	<b>268,800</b>
<b>Gross Profit</b>	<b>9,225</b>	<b>9,225</b>	<b>9,225</b>	<b>9,225</b>	<b>9,225</b>	<b>9,225</b>	<b>9,225</b>	<b>9,225</b>	<b>9,225</b>	<b>9,225</b>	<b>9,225</b>	<b>9,900</b>	<b>118,800</b>
<b>Expenses</b>													
Salary expenses	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	60,000
Payroll expenses	0	0	0	0	0	0	0	0	0	0	0	0	0
Outside services	35	35	35	35	35	35	35	35	35	35	35	35	420
Supplies	100	100	100	100	100	100	100	100	100	100	100	100	1,200
Repairs and maintenance	0	0	0	0	0	0	0	0	0	0	0	0	0
Advertising	200	200	200	200	200	200	200	200	200	200	200	200	2,400
Car, delivery and travel	180	180	180	180	180	180	180	180	180	180	180	180	1,920
Accounting and legal	20	20	20	20	20	20	20	20	20	20	20	20	240
Rent	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Total Expenses</b>	<b>5,515</b>	<b>5,515</b>	<b>5,515</b>	<b>5,515</b>	<b>5,515</b>	<b>5,515</b>	<b>5,515</b>	<b>5,515</b>	<b>5,515</b>	<b>5,515</b>	<b>5,515</b>	<b>5,515</b>	<b>66,180</b>
<b>Net Profit</b>	<b>3,710</b>	<b>3,710</b>	<b>3,710</b>	<b>3,710</b>	<b>3,710</b>	<b>3,710</b>	<b>3,710</b>	<b>3,710</b>	<b>3,710</b>	<b>3,710</b>	<b>3,710</b>	<b>4,385</b>	<b>52,620</b>

## Appendix L-Balance Sheet

### Balance Sheet

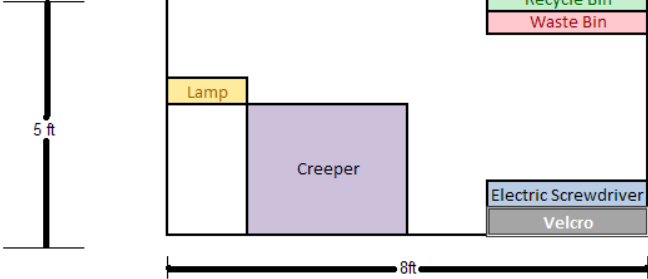
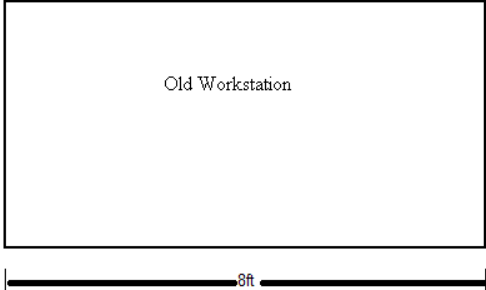
ACS Custom Creations

	Beginning as of 01/01/2010
<b>Assets</b>	
<b><u>Current Assets</u></b>	
Cash in bank	\$ 52,620
Accounts receivable	-
Inventory	-
Prepaid expenses	-
Other current assets	-
<b>Total Current Assets</b>	<b>\$ 52,620</b>
<b><u>Fixed Assets</u></b>	
Machinery & equipment	\$ 3,000
Furniture & fixtures	-
Leasehold improvements	-
Land & buildings	-
Other fixed assets	150
(LESS accumulated depreciation on all fixed assets)	-
<b>Total Fixed Assets (net of depreciation)</b>	<b>\$ 3,150</b>
<b>TOTAL Assets</b>	<b>\$ 55,770</b>
<b>Liabilities</b>	
<b><u>Current Liabilities</u></b>	
Accounts payable	\$ -
Interest payable	-
Taxes payable	4,000
Short-term (due within 12 months)	-
Current part, long-term debt	1,000
Other current liabilities	-
<b>Total Current Liabilities</b>	<b>\$ 5,000</b>
<b><u>Long-term Debt</u></b>	
Bank loans payable	\$ -
Notes payable to stockholders	-
LEBB: Short-term portion	(1,000)
Other long-term debt	-
<b>Total Long-term Debt</b>	<b>\$ (1,000)</b>
<b>Total Liabilities</b>	<b>\$ 4,000</b>
<b><u>Owners' Equity</u></b>	
Invested capital	\$ 2,000
Retained earnings - beginning	-
Retained earnings - current	-
<b>Total Owners' Equity</b>	<b>\$ 2,000</b>
<b>Total Liabilities &amp; Equity</b>	<b>\$ 6,000</b>

## Appendix M-Cash Flow Statement

Cash Flow	ACS Custom Creations													Total Item EST
	Pre-Startup EST	Jan-08	Feb-08	Mar-08	Apr-08	May-08	Jun-08	Jul-08	Aug-08	Sep-08	Oct-08	Nov-08	Dec-08	
Cash on Hand (beginning of month)	\$ -	3,710	7,420	11,130	14,840	18,550	22,260	25,970	29,680	33,390	37,100	40,810	44,520	44,520
<b>CASH RECEIPTS</b>														
Cash Sales	9,225	9,225	9,225	9,225	9,225	9,225	9,225	9,225	9,225	9,225	9,225	9,225	9,225	
Loans	0													
<b>TOTAL CASH RECEIPTS</b>	9,225	9,225	9,225	9,225	9,225	9,225	9,225	9,225	9,225	9,225	9,225	9,225	9,225	0
Total Cash Available (before cash out)	9,225	12,935	16,645	20,355	24,065	27,775	31,485	35,195	38,905	42,615	46,325	50,035	53,745	44,520
<b>CASH PAID OUT</b>														
Purchases (merchandise)														
Salary expenses (taxes, etc.)	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	
Outside services	35	35	35	35	35	35	35	35	35	35	35	35	35	
Supplies/office &	100	100	100	100	100	100	100	100	100	100	100	100	100	
Repairs & maintenance														
Advertising	200	200	200	200	200	200	200	200	200	200	200	200	200	
Car. delivery & travel	160	160	160	160	160	160	160	160	160	160	160	160	160	
Accounting & legal	20	20	20	20	20	20	20	20	20	20	20	20	20	
Rent														
<b>SUBTOTAL</b>	5,515	5,515	5,515	5,515	5,515	5,515	5,515	5,515	5,515	5,515	5,515	5,515	5,515	0
Loan principal payment														
Capital purchase														
Other startup costs														
Reserve and/or Escrow														
Owners' Withdrawal														
<b>TOTAL CASH PAID OUT</b>	5,515	5,515	5,515	5,515	5,515	5,515	5,515	5,515	5,515	5,515	5,515	5,515	5,515	0
Cash Position -end of month	3,710	7,420	11,130	14,840	18,550	22,260	25,970	29,680	33,390	37,100	40,810	44,520	48,230	44,520

# Appendix N- Workstation (Old and New)



## Appendix O- Time Studies

Process Step	Original Process					New Process					New Workstation				
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Remove packaging from all	7:46	7:28	7:58	7:32	7:41	7:26	7:19	5:01	6:58	6:47	6:51	6:49	6:47	6:49	6:49
Lay out all Components in proper						:30	:31	:22	:28	:31	:28	:26	:28	:26	:26
Open side panel of case	:40	:38	:38	:37	:34	:28	:29	:26	:28	:22	:22	:28	:28	:22	:28
Install standoffs to match motherboard screw hole layout.	3:30	3:27	3:21	3:18	3:14	2:54	2:51	2:46	2:51	2:29	2:41	2:32	2:25	2:30	2:25
Install the CPU on the motherboard	:35	:35	:34	:33	:33	:30	:30		:27	:29	:22	:21	:21	:22	:21
Install the CPU fan on the CPU	2:16	2:14	2:58	2:12	2:11	2:00	1:59		1:49	1:57	1:08	1:14	1:04	1:01	1:04
Install the RAM into the open memory	1:08	1:05	1:45	1:05	1:04	1:01	:57	:54	:55	:49	:36	:33	:33	:31	:31
Remove the back panel plate for the motherboard attachments	:32	:31	:32	:30	:31	:25	:28			:22	:25	:22	:24	:22	:22
install the back panel plate that came with the motherboard	:31	:30	:30	:31	:31	:24	:25		:25	:28	:28	:25	:24	:28	:25
Screw the motherboard into the case	3:21	3:19	3:19	3:17	3:16	2:48	3:00		2:52	2:54	1:48	1:38	1:36	1:38	1:38
Install the optical drive into the case	3:42	3:38	3:35	3:34	3:31	3:03	2:42		2:41	2:33	2:22	2:13	2:02	2:02	2:13
Install the hard drive into the case	3:29	3:26	4:45	3:21	3:18	3:01	2:54	3:08	2:48	2:51	2:39	2:47	2:37	2:37	2:37
Install the graphics card and any other peripherals onto the motherboard	3:42	3:37	4:28	3:34	3:29	3:02	2:31	3:05	3:03	2:41	2:18	2:21	2:11	2:18	2:18
Plug in all power connectors from the power supply onto the motherboard	2:04	2:03	2:03	2:02	2:01	1:59	1:47		1:51	1:54	1:47	1:54	1:34	1:34	1:27
Plug in all power connectors from the power supply to the optical drive, hard	2:11	2:08	3:32	2:06	2:05	2:02	1:54	1:21	1:56	1:51	1:51	1:56	1:46	1:46	1:51
Connect SATA cables from the hard drive (SATA0) and the optical	1:02	1:01	1:32	1:02	:59	:57	:54	1:07	1:08	:53	:58	:54	:52	:54	:58
Use zip ties to neatly tie back and hold together all system cabling	3:14	3:13	3:21	3:09	3:12	3:04	2:54	3:11	2:49	2:38	2:29	2:36	2:31	2:29	2:31
Total Assembly Time	40:25	39:34	44:33	38:21	38:08	35:38	34:37	21:21	33:51	32:32	29:30	29:31	28:01	28:09	28:24

Process	Computer	Build Type	Time (Min:Sec)
Original	Computer 1	Basic	40:25
	Computer 2	Basic	39:34
	Computer 3	Gaming	44:33
	Computer 4	Basic	38:21
	Computer 5	Basic	38:08
	Average		40:20
New Process	Computer 6	Basic	35:38
	Computer 7	Basic	34:37
	Computer 8	Upgrade	21:21
	Computer 9	Basic	33:51
	Computer 10	Basic	32:32
	Average - Outlier		32:55
New WS	Computer 11	Basic	29:30
	Computer 12	Basic	29:31
	Computer 13	Basic	28:01
	Computer 14	Basic	28:09
	Computer 15	Basic	28:24
	Average		28:43