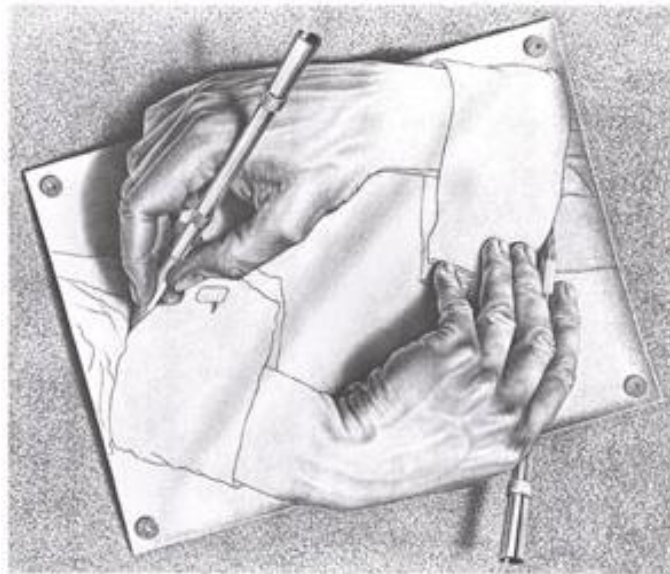


# MAE 451 Design Portfolio



DAVID S. DEWOLF

## Question

# 1

## DESIGN PROCESS AND METHODS

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MAE 451

A reflection of how your design team(s) approached the design projects in this semester.  
Why were different strategies taken by each team? Why do teams operate differently?  
What role did you gravitate towards in the team?

I was on several teams or groups through out the semester. I have to admit that each group did think differently from one another. Things such as the strategies, time tables, group rules, and expectations varied from one team to the next. The time I spent with these team members, I could see a difference in attitude as well as level of commitment.

I believe that different teams act differently from one another because of several factors. I believe that the most influencing variable which causes teams to be successful or not is the personality of each individual. Other variables that can be considered are group size, work load that needed to be completed, and the difficulty of each assignment.

Before I discuss on how my teams performed this semester I would like to discuss my personality type. Before I even ever filled out the DISC profile, my personality in general could be classified as a cautious individual. I'm constantly always checking things over and over to make sure things are done and well organized. Then after filling out the profile, my personality type was indeed classified as a cautious individual. My personality type was modeled as a practitioner. A practitioner values proficiency in specialized areas and is spurred on by a desire to be "good at something," they carefully monitor their own work performance. A cautious person likes problem solving, wants consistency, is time disciplined, and asks specific questions. I believe that these traits totally characterize my personality.

My first group in which I was involved in was the first teaming session held at school. When the students were split up and assigned to go to a room, I really didn't know what to expect when I got to the room. Once I got in the room, the TA split us up into groups and the assignment was given. The first thing our group did was to introduce

ourselves since this was the first time anyone of us had met each other. We all collaborated pretty good as we all agreed that the goal was to build the highest sky scrapper in the class. Building the structure went without any bad relations between any individuals. Anytime anyone had an idea about doing something to the structure, one would give extra input, but not without stepping on that persons feet. I felt that each person had their say on how to modify the structure evenly. I definitely found myself checking things over to make sure that the structure was within the rules specified. I did take notice that one individual was on the shy side as this individual didn't say much. I'm sure that if this group worked together over a bigger time frame that this individual would have opened up more to the group. I felt that the overall personality characteristic of the group was classified as cautiousness. After all was said and done, the group did meet its goals as we set out. Our group indeed did build the tallest sky scrapper in the class and was a rewarding experience.

The second group in which I was involved in was the one assembled by Dr. Lewis in MAE 451. I have to admit that this group didn't perform as well as the one I experienced in the first teaming session. I think that this group didn't perform up to expectations is because of communication within the group. After the group list were posted, we all met each other and swapped emails and agreed to meet in the library to get the first assignment done on the Fuel Cell. When it was time to meet, it seemed that every ones objective was to get out of there as soon as possible. The goal was to discuss on how to do the assignment, but the meeting wasn't treated like that. Everyone wanted to split up the work into individual parts as I disagreed with this type of set up. I don't believe that the best interest in a group is to just split up work randomly and go separate

ways and hand in the end to a specific individual to organize it. I believe that this is a total flaw that this group took and our grade was reflected upon this type of arrangement. I don't believe that everyone should do individual work separately because every individual thinks differently as some members may be more familiar with certain material than others.

The second assignment with this particular group didn't go as I planned as well. The assignment was to develop strength of preference for attributes of several automobiles. Like usual, the group got together at the last minute to discuss the assignment. After we all agreed on the relative importance of each attribute and did our voting for each attribute, the group just gave out individual parts once again. This time I agreed to do the entire write up section because I couldn't personally afford another bad group grade since homework is 50% of the class grade. I agreed to do it because the last report was choppy and disorganized. I told my members that I would write it up and email it to everyone to proof read at the end. I sent it to everyone and not one person even checked it to make any modifications to it. That personally bothered me because how can people just let things slide and not take any ambitions toward their school work. I was much more gratified when the report was sent back and the score was a 95 and all of the individuals thanked me on the write up.

As things couldn't have gotten worse, in my MAE 412 class, it was practically the same group members except two other new members. This group struggled just as much as it did in MAE 451. I did find some relief as one of the new members had the characteristics like me. I found that doing work was easier because I had someone I could talk to and discuss assignments with. I believe that the communication between the

other four members from the previous group was difficult because all four were buddies with each. Sometimes it's tough to break a barrier which exists within a certain click. It seems that this particular foursome thought and did things the same way. When Dr. Krovi gave us our first group assignment, it was me and the other new member who had to bring it to their attention that an assignment was due in the upcoming days. Like usual, they wanted to split it up and collect at end. I told the members that I'll do the Matlab requirements and that if anyone struggles just let me know and I'll do what I can do to help. This type of trend continued for the whole semester as two more group home works were given. I did receive some praise as one of the assignments I got our group an extra 25% bonus because of the Matlab simulations on slider cranks and four bars.

I did notice some change in attitude when it came crunch time to get our final project done. I didn't like how the group got together to build the catapult on the last weekend. I kept urging the group to get together to build the mechanism so we can test it more and more since 20% of the write up for that assignment was based on four accuracy shots. Each member would just give me the run around saying that they're busy or they have other things to do. It's this attitude that just makes me wonder how someone can get this far in one's educational career. When we got together to build the mechanism, it was the first time I took notice that the group was actually working like a group and not like an individual. It was the first time I saw everyone working together to build the four bar mechanism as it took us all day and night to finish the mechanism.

My other groups that I participated in seemed to work more freely than the other ones mentioned before. Groups made on the fly in MAE 451 seemed to work the best because the group was given a task to be done within a certain time frame of the class

period. The assignments given to our teams were fun and creative as I was involved in different teams. There was no bickering nor excuses as things had to get done. I believe when given a short period of time like the ones given in class, it brings the team closer together quicker than if given a future due date on a project. People like to push things off until the last minute and I felt that this is the biggest problem to deal with group work.

I believe that teams operate differently due to several factors. Teams act differently due to the atmosphere that they're put into, their individual attitudes, and one's strength of preference. Some individuals are motivated within to do good while others are motivated by other factors. Sometimes it's hard to communicate with a group within a group. I find it difficult to relate to people that are already established with each other. The communication lines within a group take time as there is a feeling out process. Teams that are successful are the ones that set certain goals along with group rules and regulations. Everyone needs to realize that there isn't "I" in TEAM in order for the group to reach its goal. It takes effort from every individual in group to optimize an assignment. I feel that individual roles are certainly not the way to go because it leads to uncertainty and reliability of individuals to get work done.

Since my personality is to get work done and solve problems, I usually gravitate to the cautious one in group assignments. I come to the table wanting to get the task done and expect to get it done in a quick manner. I don't like relying on others to get things done because you sit there wondering if it's going to get done at all. I don't like to hear excuses, dealing with uncertainty and poor team members when it comes to working within a group. I have learned that no matter how much you want a perfect world, there

are always going to be people in groups that take on various roles. The best that I can do personally do is to become the best team player and be open to suggestion.



## DESIGN PROCESS AND METHODS

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MAE 451

How you solve problems and why you think you solve problems this way. Also, discuss how some of your friends solve problems, design, imagine, and create (e.g., give them a problem they are unfamiliar with and observe them trying to solve it). Start with roommates and friends, but expand to other groups of people to see how their background affects their thought process – children, elderly people, international students, non-students, physically challenged people, etc.

I believe that I solve problems differently than my friends. Before I took this class I used to think that problems were a just quick fix. I would consider the consequences sometimes when I was confronted with a particular problem.

Now that I have taken the class and know more about decision making processes, I believe my problem solving has changed a bit. I've learned that an engineer tries to fix a problem, but must consider optimizing the solutions within certain parameters.

If I were confronted with an important decision I would use the method of applying weighted attribute formula for various alternatives to determine the best solution. The first thing that I would do would to quantify and set objective scales for each attribute. Then after that, I would asses the strength of preference for each of those attributes by making graphs that represent the preference. Then I would rate each alternative with respect to each attribute and put that value in some type of matrix format. The next step I would approach would be to determine the overall value of each alternative and sum up the total score to find the best solution. I would carefully look at the winner to see if it's clear cut winner, but if not I would reconsider doing the strength of preference for each attribute once again and proceed again. This type of decision making far out weighs decision making such as pair wise comparisons.

Once again, before I took this class I used to fall in the pair wise comparison category once in while when it came to making a decision. This is the decision making category that most of my friends fall into. Recently my friend John was getting problems with his squeaky brakes and without even thinking he just took it to Monroe Muffler and Brakes. I asked him why he took it there and he said because it cost the most, so they must have the best parts as well as quality. This shows that John made a quick decision

when confronted with the problem confrontation stage when dealing with a problem with his automobile. I recently asked my friend Jason if the Buffalo Bills were going to beat the Tennessee Titans this upcoming week. His response was "yes" because he said last week the Bills beat the New York Jets and the previous week the New York Jets beat the Tennessee Titans and said therefore we should beat the Titans. This type of thinking shows that Jason purely uses pair wise comparison in determining his final answer without considering any of the team's strength of preferences for the upcoming game.

I would have chosen different solutions when confronted with both of these problems which my friends were confronted with. I would have rated variables and developed alternatives in a formal manner. I believe that I solve problems differently now because now I consider each attribute with the alternative solutions. I solve problems regarding decisions this way because it's more logical and gives me more confidence that I'm making the best choice.

While observing John to solve his brake problem, I noticed that he didn't even consider fixing the problem himself or even ask anyone if they possible knew what was causing the squealing noise. His solutions were limited to one solution as he took it to the place down the road without any alternatives in mind. On the other hand when I was asking Jason why he said the Buffalo Bills were going to win as I asked him does it matter that the Buffalo Bills lost to the Jets early in the season. His answer was that it was early in the year and the team was still trying to find its identity. I asked him what makes you think that the Bills were going to win just because the Jets beat the Titans two weeks ago. He said because the Bills convincingly beat the Jets with the running attack of Travis Henry and we should have no problem with the Titans.

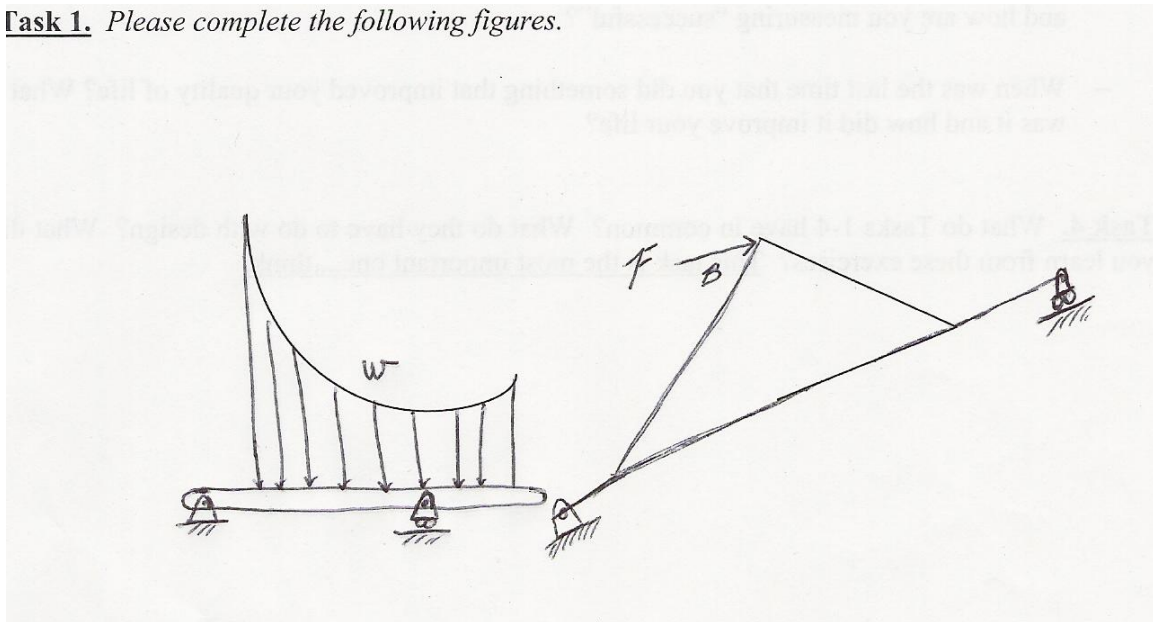
Generally my approach in solving both of these problems would be to get all the information to confront these two problems. Assuming that the problem is already well defined, but if not, then I would define the problem. Then I would create as many solutions as possible and evaluate each solution and how the solution affects my potential choice. For John's problem I would have taken off the wheel to see if it was just brake dust and check to see if it needed new pads or not. I would check the hardware first and decide what to do from there. I would talk to some friends to get their advice as well to see what they would do to solve the problem. Jason's problem on the flip side didn't even consider the head to head match up of the Bills and Titans. He just based his answer on comparison. He didn't even consider that when the Jets beat the Titans, that the Jets were playing at home, a big advantage for the Jets. He didn't even consider the Bills beat the Jets last week at home and the Bills play at Tennessee this week. He also didn't even consider that this week the Bills are playing against the number one run defense in the NFL. He just assumed that Travis Henry ran the ball great last week against the Jets that he was going to do it this upcoming game. These are the things that one needs to consider when choosing a formal decision that he lacks.

The following are results of a few conversations with an upcoming engineering graduate student, a friend who is not an engineer, and a friend who just started engineering this fall semester at ECC. I asked them how their background affects their thought process and I asked them how they design, imagine, and create as well.

The first conversation I had been with my friend who is looking to graduate in a couple of weeks in Civil Engineering. His background is that he comes from an upper class family and is getting his degree to please his family. Rick tells me he designs and

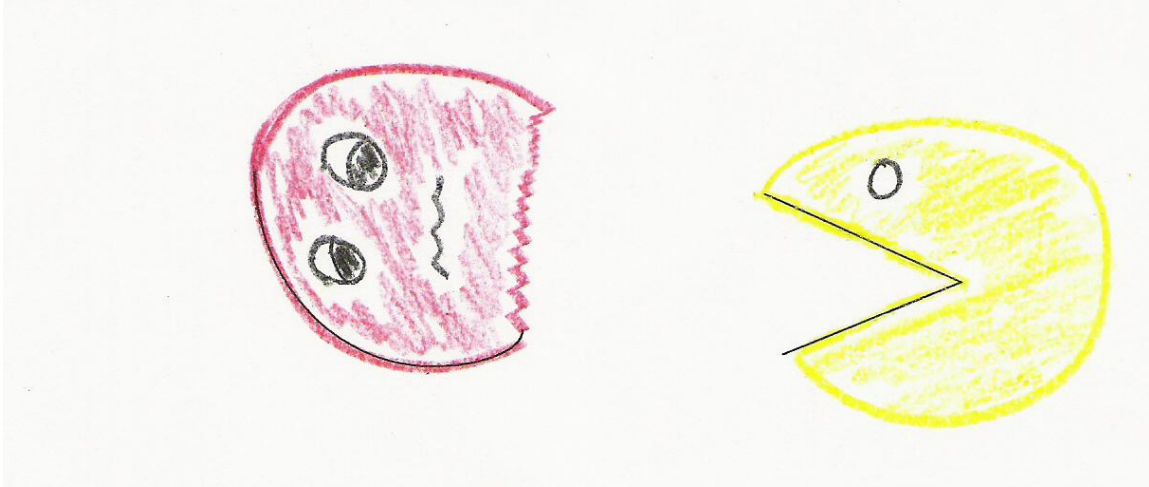
comes up with ideas which he thinks will work for him. From there it is a matter on how to tweak the design to fulfill the goal in mind. Be believes that his imagination process is the result of thinking about something constantly day/ night and trying new ideas that he's seen in his educational career until his goal is achieved. I believe that Rick doesn't apply himself to the fullest extent because everything he has is spoon fed to him and is going to school just to please his family wishes as his parents are well educated people. I believe that since Rick doesn't apply himself to the fullest, this will limit him in his engineering career as he proceeds in life. I believe this will limit his ability to create and design. When ever Rick has a problem with his car, like my other friend John, just takes it to the dealership without even considering alternatives to the problem. I also asked him to complete the drawing which was also assigned to us in our MAE 451 class. As you can see his Civil Engineering background helped him to complete the drawing.

**Task 1.** Please complete the following figures.



My next conversation I had with was my friend Paul who just started an engineering program at ECC. Paul's father is also an engineer who works for the city of Buffalo. Paul thinks engineering will be easy because he sees his father living life large. He thinks that engineering will be a breeze and walk right through the course work and will find a job because of his dad's connections. Paul spent a lot of his time in his dad workshop designing and building all types of models from RC race cars, to car models, and making airplanes. The availability of his dad's workshop is what has influenced him to be interested in these types of hobbies. He told me that if his dad didn't have a "Tool-Mans dream of machinery" that he probably wouldn't have been interested in these things. Due to Paul's background, I believe that he focuses all of his attention designing, imagination, and creating which will give him great hands on experience when it comes to engineering. Throughout his High School days, Paul excelled more than anyone in his technology classes as he also attended Harkness which is a school that teaches students hands on experience. His only bad fall is that he isn't as book smart as he would like to be in other subjects such as math and physics. He says he's going to try harder than ever to become successful like his father. It's this attitude I believe that Paul will succeed and someday will transfer to UB to further his educational career. I also believe his father's influence on him growing up will help him think critically when confronted with a major future decision. I also asked Paul to complete the following drawing just to see what he could do. I asked what he drew and said it was Pac-Man eating a ghost. I asked him why he thought of Pac-Man and he said he was playing the game the other day at Putt-Putt.

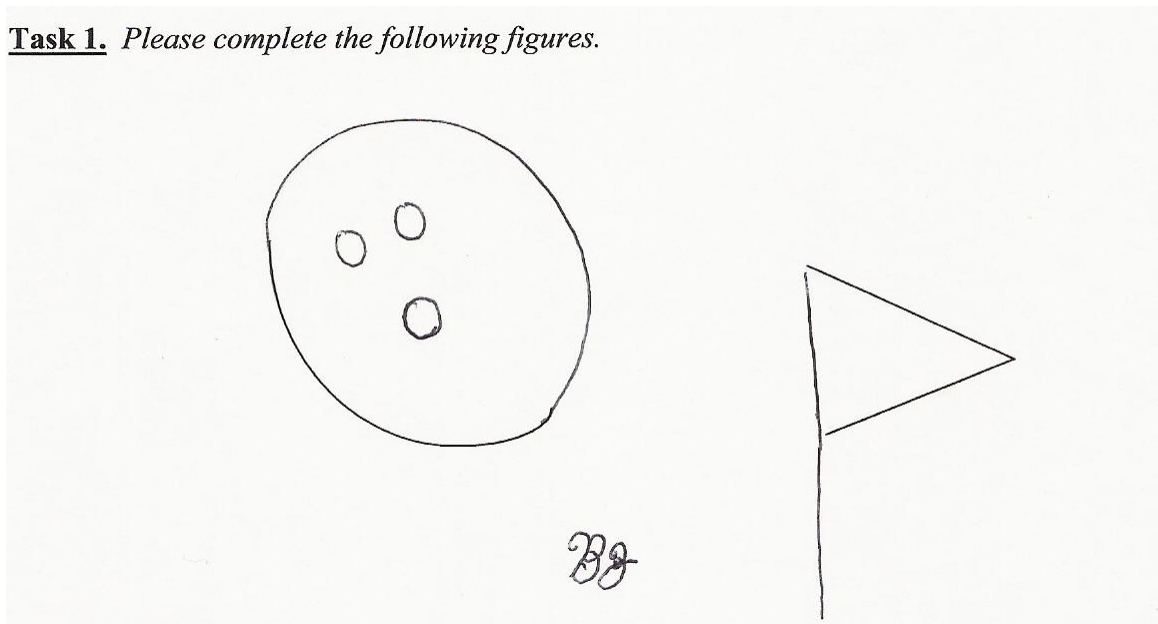
**Task 1.** *Please complete the following figures.*



My final conversation was with my buddy Bill who is an auto-mechanic. I first met Bill five years ago when I worked at Budget Rent a Car. We both worked in different departments but I found myself talking with him many times. Bill grew up on farm in which his father was big junk collector. He said his background greatly influenced him to work on automobiles and other devices. He said him and his father would work on all types of things from cars, televisions, wood works, and refrigerators. Bill graduated from Alfred State in 1988 and says his experience there should have influenced him more but hasn't till date. Right now he works in a factory busting his butt for \$7 an hour. I ask him why he doesn't get back into autos where you're good at and just keeps saying "I'm currently looking." To me I know that he is only fooling himself, Bill is one of those people who keep procrastinating and will never get anything accomplished. If Bill can ever realize his potential he can someday become success and get out of his financial debt. Bill is one of those people who is in big debt and can only survive minimally and thinks that it's just fine to get by. It's this type of thinking that will limit his ability to become more than he can in life. Don't get me wrong, he's

probably the best mechanic I've ever met and can think his way out of any physical problem when he's confronted with, but it's his mental state that isn't up to par. Like with the other two individuals, I also asked Bill to complete the following drawing as well just to see how he thinks and imagines. I asked what he drew and he said a bowling ball and a flag that reminded him just the other day that he picked these items up in someone's garbage one night when coming home from work. Bill is one of those guys who think that he can use everything in the world but never see any action once he claims he's going to do something with an item

**Task 1.** *Please complete the following figures.*





**Question**

**3**

## DESIGN PROCESS AND METHODS

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MAE 451

Your progress in developing your abilities to think creatively. Include all exercises that you have used to increase your creativity.

I believe that my ability to think creatively started when we learned about creativity and innovation in this class. I now know that if a business doesn't optimize and put interest towards innovation, they might not be in business much longer. The only way to survive in the business world is that a company has to innovative in order to succeed. Every company has to have a plan in order to make a reasonable profit. I also know that new products must be novel, creative, genuine, and aesthetical pleasing to a customer. I think I understand and can think much more creative now that I understand some basic stages of creativity.

I have found that I can think creatively while watching TV and getting forced connections between products. Like the assignment with the uses of bricks, I found many of my creative ways by forced connections. I also used brainstorming by jotting down as many ideas that I could. Then I came to point where I would see an object which would give me another idea. On the other hand in my MAE 377 product design class, I first used divergent thinking to come up as many ideas that I could. Once I got as many ideas that I could I then had to narrow down and converge to the best design which fulfilled the requirements of the assignment. I also found myself using the checklist of the "5 W's and H" questions. I had to ask myself who was this product targeted at, how, was it going to work, what was it going to look like, how was I going to solve and market the product, and when must t get done. I also considered a morphological matrix when it came down to considering certain accessories for my design product. My design product was a portable speed bag for a boxer or athlete of interest. Here is what my morphological matrix looked like and the final decision which I chose to pick.

Height	Material	Swivel Type	Bag size
adjustable	steel	ratchet	small
fixed	plastic	chain	medium
	aluminum	ball bearing	standard

I have also used group techniques for creatively as well through out the semester. I remember when Dr. Lewis broke the class up into groups and assigned different groups techniques to solve a particular problem. The specific problem was to find a way to find a contact lens. The technique that our group used was the “gallery method.” I really enjoyed this because every individual had time to come up with their specific ideas and after about five minutes or so everyone collaborated on each others design ideas. I liked this because this was the time where people could be critical as well as giving good advice on you ideas. I had a friend in the class whose group technique was the “6-3-5 Technique.” He said this by far was the craziest thing because the ideas were getting so unrealistic. We both agreed that this technique is good for divergent thinking when ideas are at a minimum.

My MAE 412 group members experienced the “gallery method” when we had to design our final project. We all got together and came up with ideas and exchanged ideas after a certain time frame. Then everyone had question about each others ideas and explained on how their specific mechanism worked. Then after everyone had a chance to re tweak their mechanism we all once again collaborated to come up with a final design.

I have also learned a lot from the “Deep Dive” video we watched earlier in the year that certain companies do indeed use divergent and convergent thinking. I liked how the company Ideo had group discussions and how each member was treated equally throughout the employee ladder when they were exchanging ideas to come up with a new

design for a shopping cart. What I liked most is when the group was at low to come up with ideas, showed a certain object to get the people to rethink by forced connection. I also liked how they used the gallery method and used votes to converge to the final design.

I believe since I was introduced to these innovation techniques, I'll be become a better person when it comes to designing product on a team. I also believe that I need to be in an appropriate environment for innovative thinking as well. I now know that certain innovative techniques should be used at certain times to jump start ideas such as forced connection objects. I have also learned that criticism shouldn't be accepted when it comes to divergent thinking or that bizarre idea sometimes lead to novel solutions. Finally, I have learned that the more quantity on the table means more options an individual or group has the better chances to finding a unique solution.

**Question**

**4**

## DESIGN PROCESS AND METHODS

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MAE 451

Your own reading list – books and articles – that you have read and are relevant to the material in this course.

My reading list relevant to this course has been limited mostly to the engineering book which I've bought through out the years. In addition to the books listed, I also enjoy reading Maxim magazine because in its "Top Gear" section it shows neat gadgets as well as new products on the market. I also enjoy Stuff magazine because it also show things which they call "Must-Buy of the Month." Like in the Maxim magazine it shows cool products and gives details about them as well. I also like to read articles from the magazine Consumer Report. I like this one a lot because it has a wide range of articles that relate to products and compares products as well. It's also isn't biased when telling you what products aren't worth buying and which products are up to par.

Here is a list of books that I frequently have used through out the semester that I used for the design part of my various projects:

- Mechanical Engineering Design

Joseph Edward Shigley and Charles Mischke, 5<sup>th</sup> Edition, McGraw-Hill

- Theory and Design for Mechanical Measurements

Richard Figliola and Donald Beasley, 3<sup>rd</sup> Edition, Wiley

- Design of Machinery: New Media Version

Robert Norton, 2<sup>nd</sup> Edition, McGraw-Hill

- Dynamic modeling and Control of Engineering Systems

J. Shearer, B. Kulakowski, J. Gardner, 2<sup>nd</sup> Edition, Prentice Hall

- Manufacturing Process for Engineering Materials

S. Kalpakjian and S. Schmid, 4<sup>th</sup> Edition, Prentice Hall

- Mastering Matlab 6: A comprehensive Tutorial and Reference

D. Hanselman and B. Littlefield, 1<sup>st</sup> Edition, Prentice Hall

Here are two articles that I have read recently on the internet on 6- $\sigma$  and engineering ethics from the National Society of Professional Engineers. I was quite surprised on how much 6- $\sigma$  can save a company and how company's in the future should strive towards 6- $\sigma$ . I also believe after reading the code of ethics that every engineer should be obligated to these rules and regulations.

Here is the article on 6- $\sigma$ :

### **Six Sigma - What is Six Sigma?**

Six Sigma at many organizations simply means a measure of quality that strives for near perfection. Six Sigma is a disciplined, data-driven approach and methodology for eliminating defects (driving towards six standard deviations between the mean and the nearest specification limit) in any process -- from manufacturing to transactional and from product to service.

The statistical representation of Six Sigma describes quantitatively how a process is performing. To achieve Six Sigma, a process must not produce more than 3.4 defects per million opportunities. A Six Sigma defect is defined as anything outside of customer specifications. A Six Sigma opportunity is then the total quantity of chances for a defect. Process sigma can easily be calculated using a Six Sigma calculator.

The fundamental objective of the Six Sigma methodology is the implementation of a measurement-based strategy that focuses on process improvement and variation reduction through the application of Six Sigma improvement projects. This is accomplished through the use of two Six Sigma sub-methodologies: DMAIC and DMADV. The Six Sigma DMAIC process (define, measure, analyze, improve, control) is an improvement system for existing processes falling below specification and looking for incremental improvement. The Six Sigma DMADV process (define, measure, analyze, design, verify) is an improvement system used to develop new processes or products at Six Sigma quality levels. It can also be employed if a current process requires more than just incremental improvement. Both Six Sigma processes are executed by Six Sigma Green Belts and Six Sigma Black Belts, and are overseen by Six Sigma Master Black Belts.

According to the Six Sigma Academy, Black Belts save companies approximately \$230,000 per project and can complete four to 6 projects per year. General Electric, one of the most successful companies implementing Six Sigma, has estimated benefits on the order of \$10 billion during the first five years of implementation. GE first began Six Sigma in 1995 after Motorola and Allied Signal blazed the Six Sigma trail. Since then, thousands of companies around the world have discovered the far reaching benefits of Six Sigma.

Many frameworks exist for implementing the Six Sigma methodology. Six Sigma Consultants all over the world have developed proprietary methodologies for implementing Six Sigma quality, based on the similar change management philosophies and applications of tools.

Here is an article from the National Society of Professional Engineers on ethics:

## **NSPE Code of Ethics for Engineers**

### **Preamble**

Engineering is an important and learned profession. As members of this profession, engineers are expected to exhibit the highest standards of honesty and integrity. Engineering has a direct and vital impact on the quality of life for all people. Accordingly, the services provided by engineers require honesty, impartiality, fairness, and equity, and must be dedicated to the protection of the public health, safety, and welfare. Engineers must perform under a standard of professional behavior that requires adherence to the highest principles of ethical conduct.

### **I. Fundamental Canons**

Engineers, in the fulfillment of their professional duties, shall:

- 1. Hold paramount the safety, health and welfare of the public.**
- 2. Perform services only in areas of their competence.**
- 3. Issue public statements only in an objective and truthful manner.**
- 4. Act for each employer or client as faithful agents or trustees.**
- 5. Avoid deceptive acts.**
- 6. Conduct themselves honorably, responsibly, ethically, and lawfully so as to enhance the honor, reputation, and usefulness of the profession.**

### **II. Rules of Practice**

- 1. Engineers shall hold paramount the safety, health, and welfare of the public.**

a. If engineers' judgment is overruled under circumstances that endanger life or property, they shall notify their employer or client and such other authority as may be appropriate.

b. Engineers shall approve only those engineering documents that are in conformity with applicable standards.

c. Engineers shall not reveal facts, data, or information without the prior consent of the client or employer except as authorized or required by law or this Code.

d. Engineers shall not permit the use of their name or associate in business ventures with any person or firm that they believe are engaged in fraudulent or dishonest enterprise.

e. Engineers shall not aid or abet the unlawful practice of engineering by a person or firm.

f. Engineers having knowledge of any alleged violation of this Code shall report thereon to appropriate professional bodies and, when relevant, also to public authorities, and cooperate with the proper authorities in furnishing such information or assistance as may be required.



## **2. Engineers shall perform services only in the areas of their competence.**

- a. Engineers shall undertake assignments only when qualified by education or experience in the specific technical fields involved.
- b. Engineers shall not affix their signatures to any plans or documents dealing with subject matter in which they lack competence, nor to any plan or document not prepared under their direction and control.
- c. Engineers may accept assignments and assume responsibility for coordination of an entire project and sign and seal the engineering documents for the entire project, provided that each technical segment is signed and sealed only by the qualified engineers who prepared the segment.

## **3. Engineers shall issue public statements only in an objective and truthful manner.**

- a. Engineers shall be objective and truthful in professional reports, statements, or testimony. They shall include all relevant and pertinent information in such reports, statements, or testimony, which should bear the date indicating when it was current.
- b. Engineers may express publicly technical opinions that are founded upon knowledge of the facts and competence in the subject matter.
- c. Engineers shall issue no statements, criticisms, or arguments on technical matters that are inspired or paid for by interested parties, unless they have prefaced their comments by explicitly identifying the interested parties on whose behalf they are speaking, and by revealing the existence of any interest the engineers may have in the matters.

## **4. Engineers shall act for each employer or client as faithful agents or trustees.**

- a. Engineers shall disclose all known or potential conflicts of interest that could influence or appear to influence their judgment or the quality of their services.
- b. Engineers shall not accept compensation, financial or otherwise, from more than one party for services on the same project, or for services pertaining to the same project, unless the circumstances are fully disclosed and agreed to by all interested parties.
- c. Engineers shall not solicit or accept financial or other valuable consideration, directly or indirectly, from outside agents in connection with the work for which they are responsible.
- d. Engineers in public service as members, advisors, or employees of a governmental or quasi-governmental body or department shall not participate in decisions with respect to services solicited or provided by them or their organizations in private or public engineering practice.
- e. Engineers shall not solicit or accept a contract from a governmental body on which a principal or officer of their organization serves as a member.

## **5. Engineers shall avoid deceptive acts.**

- a. Engineers shall not falsify their qualifications or permit misrepresentation of their or their associates' qualifications. They shall not misrepresent or exaggerate their responsibility in or for the subject matter of prior assignments. Brochures or other presentations incident to the

solicitation of [employment](#) shall not misrepresent pertinent facts concerning employers, employees, associates, joint venturers, or past accomplishments.

b. Engineers shall not offer, give, solicit or receive, either directly or indirectly, any contribution to influence the award of a contract by public authority, or which may be reasonably construed by the public as having the effect of intent to influencing the awarding of a contract. They shall not offer any gift or other valuable consideration in order to secure work. They shall not pay a commission, percentage, or brokerage fee in order to secure work, except to a bona fide employee or bona fide established commercial or marketing agencies retained by them.

### **III. Professional Obligations**

#### **1. Engineers shall be guided in all their relations by the highest standards of honesty and integrity.**

- a. Engineers shall acknowledge their errors and shall not distort or alter the facts.
- b. Engineers shall advise their clients or employers when they believe a project will not be successful.
- c. Engineers shall not accept outside [employment](#) to the detriment of their regular work or interest. Before accepting any outside engineering employment they will notify their employers.
- d. Engineers shall not attempt to attract an engineer from another employer by false or misleading pretenses.
- e. Engineers shall not promote their own interest at the expense of the dignity and integrity of the profession.

#### **2. Engineers shall at all times strive to serve the public interest.**

- a. Engineers shall seek opportunities to participate in civic affairs; career guidance for youths; and work for the advancement of the safety, health, and well-being of their community.
- b. Engineers shall not complete, sign, or seal plans and/or specifications that are not in conformity with applicable engineering standards. If the client or employer insists on such unprofessional conduct, they shall notify the proper authorities and withdraw from further service on the project.
- c. Engineers shall endeavor to extend public knowledge and appreciation of engineering and its achievements.

#### **3. Engineers shall avoid all conduct or practice that deceives the public.**

- a. Engineers shall avoid the use of statements containing a material misrepresentation of fact or omitting a material fact.
- b. Consistent with the foregoing, engineers may advertise for recruitment of personnel.
- c. Consistent with the foregoing, engineers may prepare articles for the lay or technical press, but such articles shall not imply credit to the author for work performed by others.

**4. Engineers shall not disclose, without consent, confidential information concerning the business affairs or technical processes of any present or former client or employer, or public body on which they serve.**

a. Engineers shall not, without the consent of all interested parties, promote or arrange for new [employment](#) or practice in connection with a specific project for which the engineer has gained particular and specialized knowledge.

b. Engineers shall not, without the consent of all interested parties, participate in or represent an adversary interest in connection with a specific project or proceeding in which the engineer has gained particular specialized knowledge on behalf of a former client or employer.

**5. Engineers shall not be influenced in their professional duties by conflicting interests.**

a. Engineers shall not accept financial or other considerations, including free engineering designs, from material or equipment suppliers for specifying their product.

b. Engineers shall not accept commissions or allowances, directly or indirectly, from contractors or other parties dealing with clients or employers of the engineer in connection with work for which the engineer is responsible.

**6. Engineers shall not attempt to obtain [employment](#) or advancement or professional engagements by untruthfully criticizing other engineers, or by other improper or questionable methods.**

a. Engineers shall not request, propose, or accept a commission on a contingent basis under circumstances in which their judgment may be compromised.

b. Engineers in salaried positions shall accept part-time engineering work only to the extent consistent with policies of the employer and in accordance with ethical considerations.

c. Engineers shall not, without consent, use equipment, supplies, laboratory, or office facilities of an employer to carry on outside private practice.

**7. Engineers shall not attempt to injure, maliciously or falsely, directly or indirectly, the professional reputation, prospects, practice, or [employment](#) of other engineers. Engineers who believe others are guilty of unethical or illegal practice shall present such information to the proper authority for action.**

a. Engineers in private practice shall not review the work of another engineer for the same client, except with the knowledge of such engineer, or unless the connection of such engineer with the work has been terminated.

b. Engineers in governmental, industrial, or educational employ are entitled to review and evaluate the work of other engineers when so required by their [employment](#) duties.

c. Engineers in sales or industrial employ are entitled to make engineering comparisons of represented products with products of other suppliers.

**8. Engineers shall accept personal responsibility for their professional activities, provided, however, that engineers may seek indemnification for services arising out of their practice for other than gross negligence, where the engineer's interests cannot otherwise be protected.**

- a. Engineers shall conform with state registration laws in the practice of engineering.
- b. Engineers shall not use association with a nonengineer, a corporation, or partnership as a "cloak" for unethical acts.

**9. Engineers shall give credit for engineering work to those to whom credit is due, and will recognize the proprietary interests of others.**

- a. Engineers shall, whenever possible, name the person or persons who may be individually responsible for designs, inventions, writings, or other accomplishments.
- b. Engineers using designs supplied by a client recognize that the designs remain the property of the client and may not be duplicated by the engineer for others without express permission.
- c. Engineers, before undertaking work for others in connection with which the engineer may make improvements, plans, designs, inventions, or other records that may justify [copyrights](#) or patents, should enter into a positive agreement regarding ownership.
- d. Engineers' designs, data, records, and notes referring exclusively to an employer's work are the employer's property. The employer should indemnify the engineer for use of the information for any purpose other than the original purpose.
- e. Engineers shall continue their professional development throughout their careers and should keep current in their specialty fields by engaging in professional practice, participating in continuing education courses, [reading](#) in the technical literature, and attending professional meetings and seminars.



## DESIGN PROCESS AND METHODS

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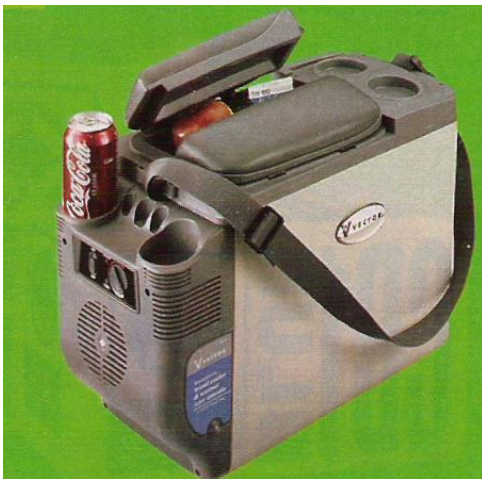
MAE 451

A “good” design list – examples of designs that you think are particular noteworthy for their effectiveness, efficiency, and/or elegance.

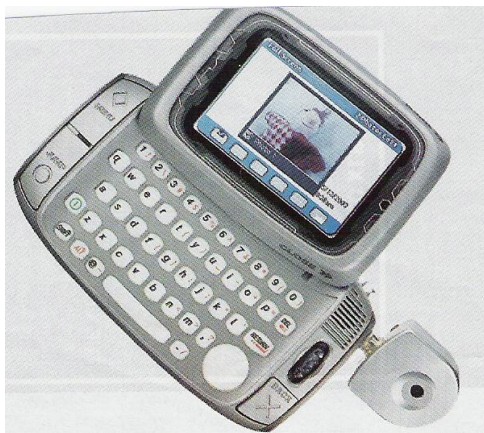
A “**Good Design**” list which I consider to be effective, efficient, and/or elegant:



The first good design that I personally like are the Nike Shox Supremacy. I feel that they’re the perfect shoe if you’re a basketball player or involved in some other type of athletics. I own these exact pair but the color I have is the black and red. I like how they look and how they are light weight. They are very durable and by far have the best traction I have ever felt in a pair of sneakers. I like how the shox’s look unique because no other current sneaker has this type of design. I’m willing to bet they’re a great seller as well.



I really enjoy this design because it’s a 12-Volt Super Cooler/Warmer console. It’s great because its capacity is 20 cans of you favorite beverage. The 12-Volt is rechargeable which makes it a great value. I also like how it has can holders, a strap for easy carrying, it’s a cooler and heater, and separate compartments for you fruit or vegetables. I feel this is an excellent value for only about \$70.



This is the T-Mobile Sidekick which really looks pleasing and is very efficient. It's very versatile as it can do internet mail, e-mail, Web browsing, and gaming. What I like most about it that it has the "QUERTY" keyboard on it unlike those dinky little letters on phones. I also like how it can take pictures and has the T-Mobile desktop Web interface. I like how it has a screen to see what you're doing as well.



My next design I love is the Samsung A600 PCS Camera Phone. I personally own one of these phones and I think it's very elegant and aesthetically pleasing. I like how the upper half can rotate 180° and has a crystal clear screen. I like the silver metallic look this phone has like the previous design above. It only weighs 4.4 oz which doesn't make it a hazel to carry around. I like how it can dial numbers by saying each number, play games, download various ringers, and can start the browser by simply speaking into the microphone. Finally, the picture quality that it takes isn't that bad compared to a basic camera.



My final good design that I like is the G-Clamp Backpack with Ollie blocks. I love this design because it's unique as one can carry their skateboard on a backpack. Where was this design when I skateboarded to help me lug around the board? I like how the Ollie blocks protect your wheels and trucks of the skateboard as you travel. I like how any standard board could fit in the backpack which makes it versatile. Not only do you carry your board around, you can fill the pockets as well with other items which gives you an extra advantage.



**Question**

**6**

## DESIGN PROCESS AND METHODS

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MAE 451

A “bad” design list – examples of designs that you think are inefficient, ineffective, inelegant, or provide solutions to the problem that are not worth solving. These can be products that simply irritate you as well.

A “**Bad Design**” list I consider to be inefficient, ineffective and products that I can’t tolerate are listed below.



The first bad design product I chose was the Personal Computing Environment masterpiece. I feel that it’s way too much and isn’t very realistic that an average person would own one of these entertainment video centers especially since it cost over \$6,000. It comes with a complete surround sound but so does my stereo system at home. I just don’t see this video entertainment center being effective in the near future. I think that the only market it has is the upper-upper-upper class!



My next bad design is this weight bench which is targeted for adults. The bad flaw with this design that when you try to attempt to do a set, the vertical posts are directly in your sweet spot for positioning your hands. Believe me I know, my friend has this exact one and is terrible. I was good for the first couple of weeks when we struggled to bench 75 lbs. As we got stronger, we needed a bench that had wider vertical

posts in order to bench in the 200 lb range. The system in general has no stability as well and this type of bench should be target towards beginners and not for adults.



My next design which just makes me sick is the XBOX controller. I hate how it looks as well as feels. My friend owns one and I can't stand when I have to play games on this system. I feel that I have to have a "3<sup>rd</sup> hand" in order to use the controller. I can't believe someone designed this product which can't even function to its fullest ability. XBOX competitor on the other hand Playstation2 has such a more pleasing and ergonomical controller.



This is the ideal controller every gaming system should strive for. This paddle fits your hand perfectly and you don't have to look down constantly like the XBOX controller to see if you're pressing the right buttons. I like how the Sony's controller has the dual shock effect which makes you feel your apart of the game itself and is compatible with the previous Playstation.



The next designs I can't tolerate are these sponge mops which are just too wispy. These mops seem to be good for only about five washes as they start to tear and rip off its mount. These mops just don't last as good as the industrial mops shown under the sponge mop.



These mops which are under the sponge ones last about 100 times longer and are much more effective. These mops you can put some real "elbow-grease" into scrubbing the floor as the sponge mops give out and squeeze all the cleaning fluid out as well. If I had any advice to a consumer it would be not to go cheap and spend the extra buck and get the better mop and if not you'll be replacing the old one every month or so.



My next design which is completely ineffective are these strength sneakers that claim to improve one's vertical jump, ones quickness, and one's athletic ability. I personally owned a pair of these Sky flex strength sneakers and I can personally tell you that they don't

help in any way, shape, or form. The only thing it gave me was shin splints and leg cramps. If you want a serious leg injury, these are the products for you. The best way me and my friend gained dramatic inches in our vertical jump was hard work through jump ropes and extensive leg workouts.



The final design that I find unappealing are the Buffalo Bills uniforms. When I first heard that the Bills were getting rid of those old practice jerseys I was very excited. Before they released the new uniforms, a radio station pre-released a conceptual new design that the Bills were considering. I kind of liked the new Buffalo in the letter B. Then when the jersey was released, I was mad that there wasn't even a Buffalo Symbol anywhere on the jersey itself. I wanted the new uniforms to have at least some type of new symbol like the Falcons had done with their new uniforms. Teams like the Patriots and Rams also have jerseys like the Falcons which just put them in a class of their own. I was even more disappointed that the Buffalo Bills didn't even change the helmet with the exception of a new color stripe down the middle. I feel that a couple of changes to the new uniforms would make the jersey that much cooler and more aesthetically appealing to everyone.



## DESIGN PROCESS AND METHODS

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MAE 451

A list of subjects that you would like to know more about and why?

I have a couple of subjects in which I would like to more about. I would like to know more about computer graphics, automobiles, system controls, mathematics, and space odyssey.

The reason that I'm interested in computer graphics is that I find it amazing the evolution of graphics in gaming systems. I just seems like yesterday I was playing Super Mario Brothers for the 8 Bit Nintendo system. I was probably about 8 years old when I first played the game and just fell into love with gaming system. I was quite amazed to see graphics of a character moving around on the screen jumping around and firing fire. A couple of years later Nintendo improved their 8 Bit system to a 16 Bit system and made viewing much better. I really got more interested into gaming graphics when I purchased a Playstation2. These graphics which this system has are just unbelievable. Games make you feel that your actually apart of the game and are so realistic. I would like to work for a company someday which innovates these games.

I've been interested in automobiles since the first time I was actually able to drive a car. I like how cars have improved their aesthetic looks over the past 10 years and would like to know and possible like to work on a team that deals with future innovative designs. I find it amazing in the past 10 years how the engineers have made the old metal cars into a new fiberglass feel. I love seeing conceptual design cars that don't going into production. I feel that some of these prototype cars could probably actually sell today but the only down fall is the price is relatively too high for the average public.

I've been getting more and more interest into system controls after taking the class this semester. I've learned quite a bit in the class on how systems operate and function. I've learned that creating systems is like an art and it's up to the engineer to

create the system to satisfy a need. I would like to expand my system controls knowledge to digital control. I would like to learn more about how engineers create a stable and accurate system such as CD's and other electronic devices.

My next subject that I would like to know more about is the subject of mathematics in general. I've always been fascinated with mathematics since I have ever started school. For some reason I have had good understanding of doing math problems at a very young age and when I was in 2<sup>nd</sup> Grade my teacher at the time let me teach the class for the day. I really enjoy teaching the subject and someday I wouldn't be surprised that I will continue my education in mathematics and get my teaching degree. I feel that I will be a happier person if I go this route than if I stick to engineering. I also like to read the little biography's in our textbooks of people such as Newton, the Bernoulli's, Pascal, and Euler who is by far the greatest mathematician. It's these peoples achievements which I read about that makes me want to strive in the mathematic and science field.

My final subject which I would like to know more about is space odyssey. I've been interested in this subject ever since watching cartoons in the morning particularly "The Jetsons." I always thought that it would be cool to travel outside our planet and perhaps to another galaxy. I probably know that it will never happen in my time but how cool would it be to live on another planet. I would like to know more technical knowledge of spaceflight. I think that when I graduated I might get a joint degree in aerospace engineering and get to know more about propulsion and rockets. I think working in the space program could be a life long dream.



## Question

# 8

## DESIGN PROCESS AND METHODS

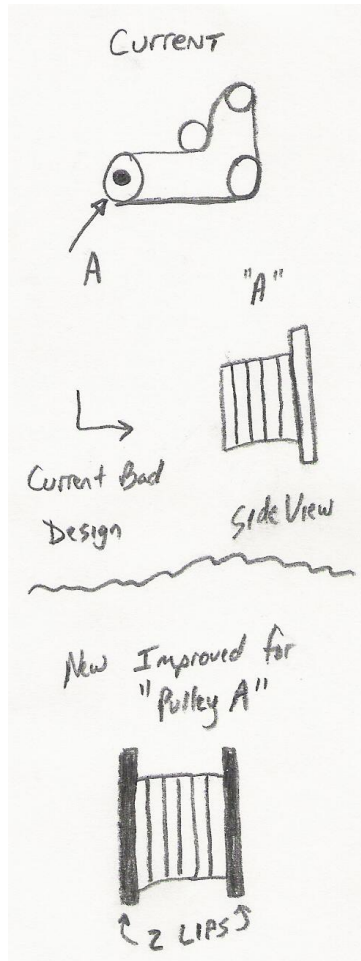
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### MAE 451

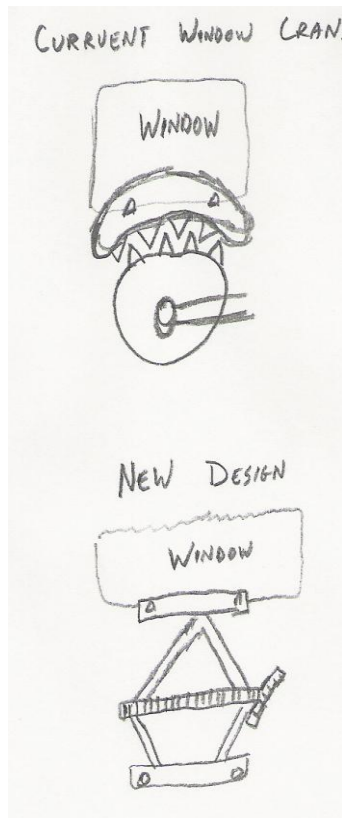
A list of personal design problems that interest you. Include problems where the design is for you specifically AND problems that you think can be improved or created primarily for others. Also include a list of examples of any products, devices, trinkets, processes, or anything else that you have designed or are designing.

For this section I will describe some design problems that interest me and how some designs could help others.

The first design problem in which I would like to dramatically improve would be the use of credit cards. I don't like how I can go into any department store and use my credit card and not even ever be asked for identification or another form of my signature. I think this system is badly flawed because if my credit card were to be stolen, anyone could max out my credit card and I would probably be stuck with the bill. I believe that an alternative solution to this problem could be to implement a finger print system. Your card should have your fingerprint on file and when your card is swiped at the register, you would have to press your fingerprint on a screen and then the computer would quickly check to see if it was a match. If it wasn't a match, then the sale would not be able to go through an alert could be sent out. The new system would also allow several family members to have their prints on the account as well in order for the entire family to use the credit card. Another simpler option could be that every time you needed to use your credit card, you need to enter a pin number that only a user would know. I believe if either of these two systems were implemented, everyone would be safe from credit card fraud in the future.



My next design I would like to introduce would be to improve the pulley system on my Pontiac Grand Am. There is nothing more frustrating going through car belts constantly. It seems that I have to replace a belt every two to three months because it slips off its tracks and the belt gets shredded. I've asked another owner of the same model and they're experiencing the problem as well but not as frequent as my automobile. The current design of "Pulley A" is that there is only one lip on the inside condition. I feel that if there was an extra lip on the outside of "Pulley A" that this would prevent the belt from slipping off at a lower distribution. I feel that the new design would be that much more material and would make the pulley symmetric which could make manufacturing much easier. This minor correction would give Pontiac a better name for itself.



My next design flaw that I have with my Pontiac is that the current window crank systems are junk. I've replaced the system 3 times and am currently driving around with two broken windows that don't crank up and down. The problem is that the cam's teeth are very weak. My buddy who also owns a Grand Am is going through the same problems that I face. Pontiac should seriously look into this problem and possibly make the cam and teeth out of a stronger material or come up with an entire new design. I've come up with an idea to correct the problem by using a "scissor like-jack" mechanism. Jacks work great because you can transmit the force downward

and back through the elevator through the worm gear. I think the cam's bad design flaw is that the weight of the window is what is causing the teeth to premature failure. I feel that if Pontiac made this type of new decision, customer satisfaction would be on the rise.

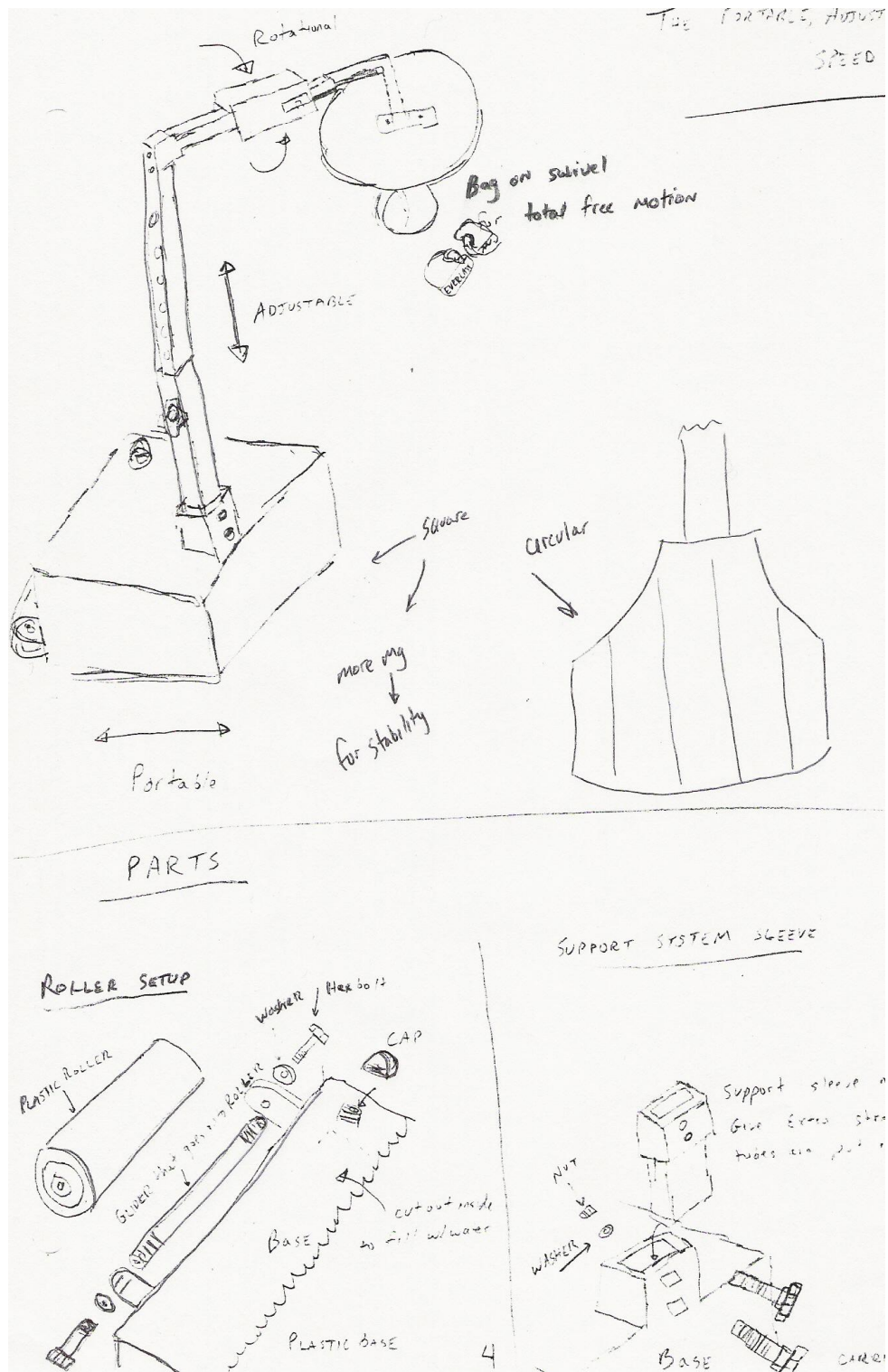
My next design that I would like to improve would be to implement some type of grinding system in the pipe line that goes from the toilet and out to the street. I think that if the sewer line for every one's house had some type of sink grinder, it would lead to less sewer back ups. The grinder should have some type of stainless steel blades that chop the incoming flow making sure that they won't be any future back ups. I had a friend whose sewer line backed up constantly and needed to rent a sewer snake to unplug it. This became very costly and this is where this design would have come in handy. The mechanism would have a sensor that every time an object went by it would trigger the

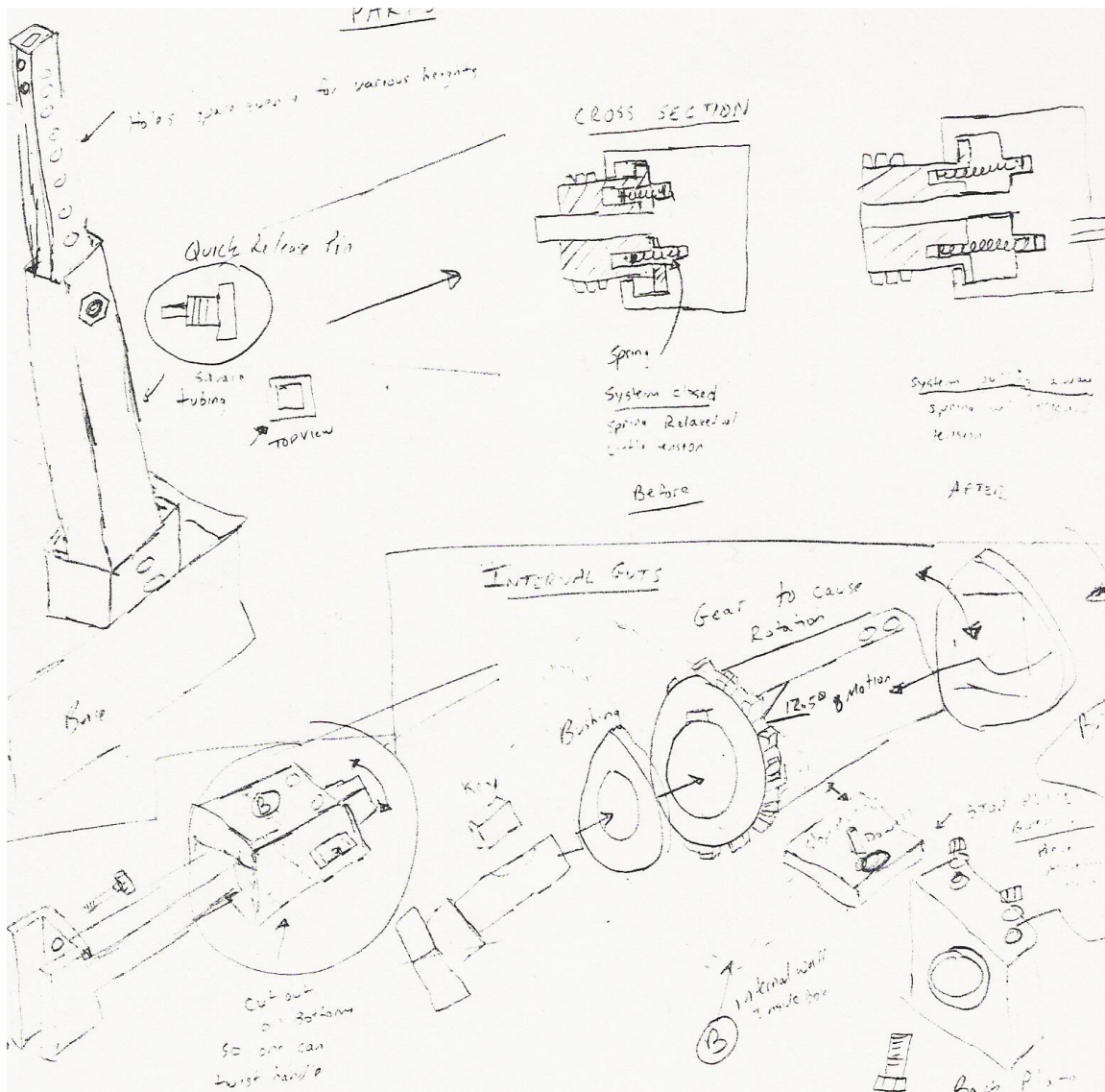
grinder to do its job. This pipe device would be great in the basement just before the plumbing line goes out and under the ground.

My final design proposal that I would like to see is that all computers have a standard CD/DVD disk drive. I feel that as an engineer, projects and work is only getting more complicated, a big storage device to transfer files are needed and the typical sloppy disks don't cut it anymore. It would be nice to see this in the future in the computer industry.

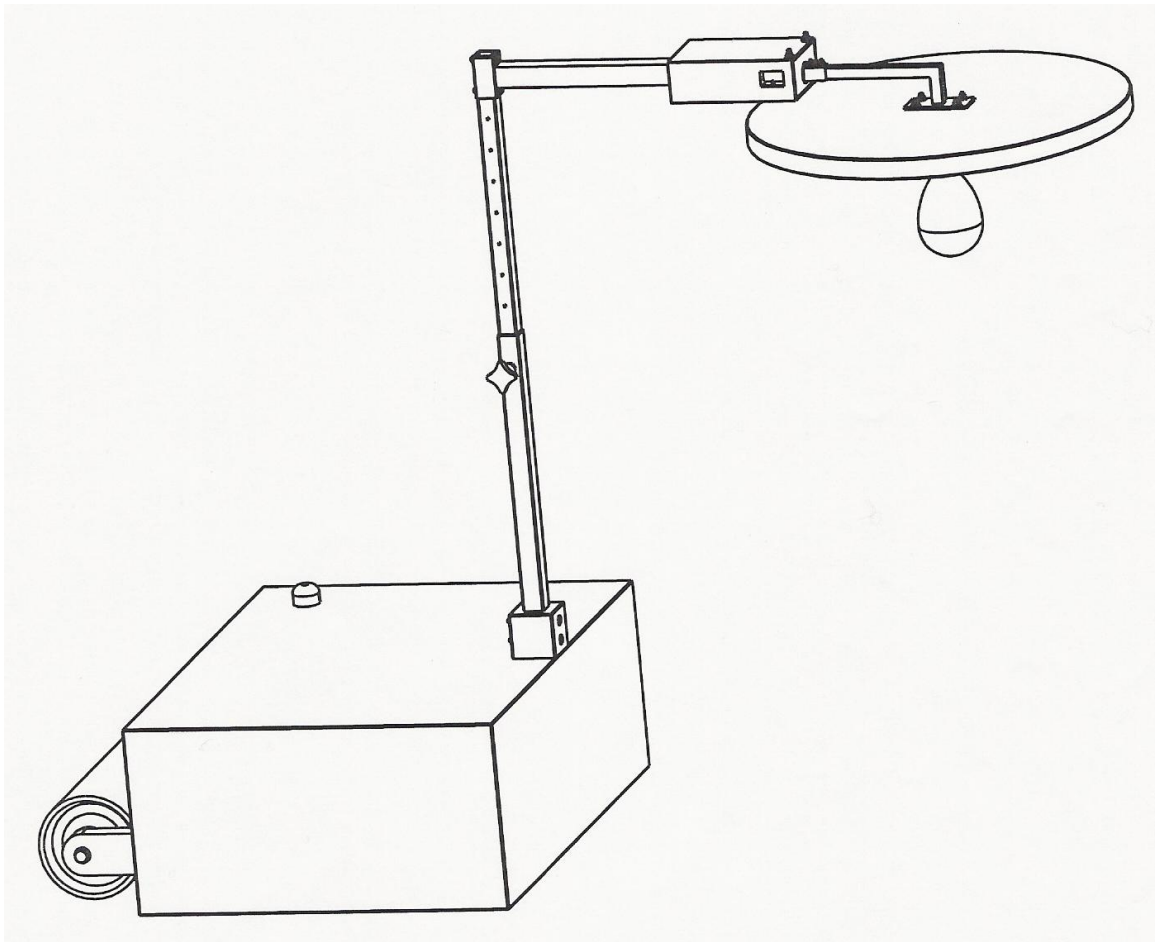
The following excerpts are designs that I have already designed in my other classes:

Here are some sketches from my MAE 377 Design process class:



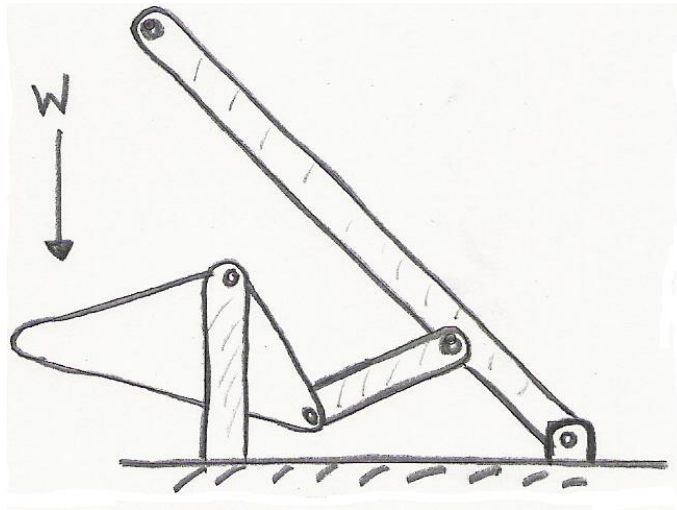


There were several processes I had to decide which designs I was going to go with. I used a form of the morphological matrix method and compared alternatives for each alternative. Here is what the Final Design looked like at the final stage:

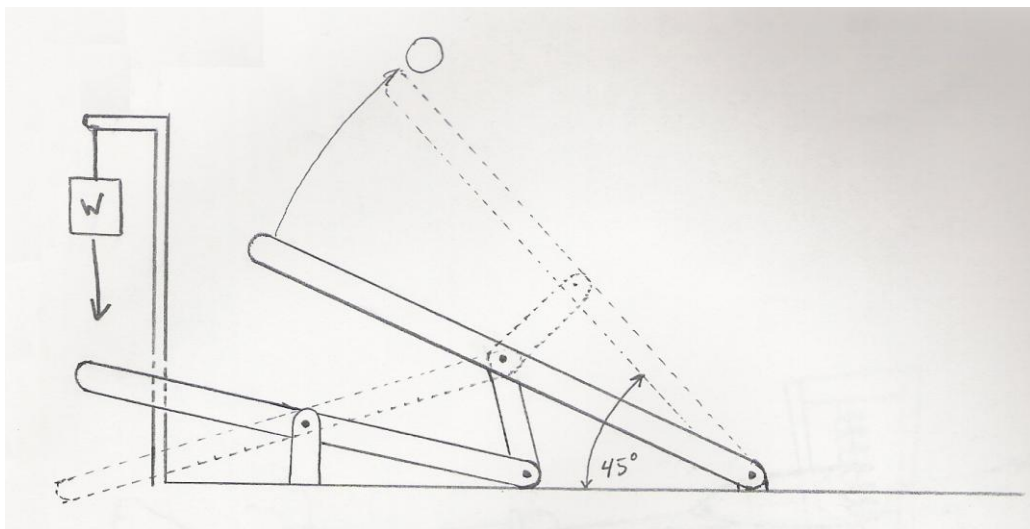




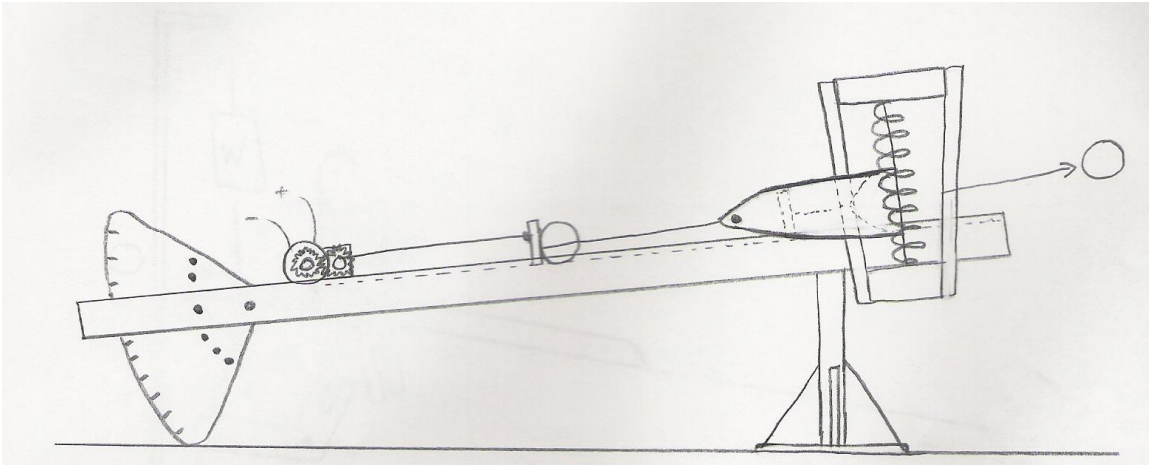
The next design that I was apart of was to design a catapult for my MAE 412 class. Here are several sketches that our group had to decide on for the final design concept.



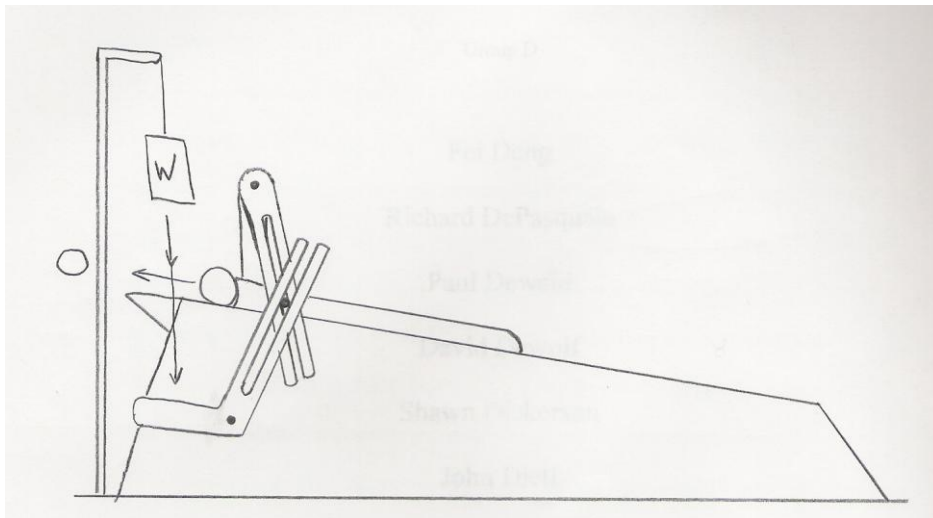
This first design idea is the one I proposed to the group. Here is the next proposal someone had in mind.



The next designs are cool trinkets that never came to reality but would have been neat to see if they would have really worked or not.



This was a spring loaded device that acted like a cannon. This device would have been difficult to implement because of the tightly packed gears and sensitive spring in the upper housing.



I believe that this slider/cannon mechanism would have worked just as well as our final group design.



Here is our final design project which our group built. We've decide instead of a wood link to use circular disk as it would transmit a tangential force.

Finally I enjoy working on my website over the past two years. Here I have all types of designs that I have interests in. Here is the website if you would like to checkout: <http://www.eng.buffalo.edu/~dsdewolf>

(Hint: to proceed to the other pages from my main page, you have to click the right icon)

## DESIGN PROCESS AND METHODS

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### MAE 451

Develop your design philosophy and your design strategy. This will be a compilation and reflection of the previous entries and should provide some synergy to your portfolio. Your philosophy should include descriptions of what should be designed, what constraints should be placed on design, what criteria should be applied to the definition of a “good” design, what makes a “bad” design, and how your strengths, background, and insights would apply to designing new products, systems, and devices.

My design philosophy on good designs all start on the effectiveness of the product. I personally like products which have an effective mean foremost because I believe that an effective designs more than individual purpose. These types of designs give you more than one function. It's like getting a value pack all wrap into one product. These types of products are things such as phones and organizers. The next thing that I value in a particular product is its elegance. How well does a certain product look and how is it perceived by others. I look at products too see if their aesthetically pleasing or not. It seems to me that every new type of electronic has that silver or metallic look which makes just about any product sleek. I also like to see if products are efficient as well. No one likes to consume more energy than is need when it comes to electronic devices. The main difference which sets the good products from the bad products is how well the company puts its efforts towards attributes.

My design strategies usually have to start with some type of constraints. Without constraints, the product design can have endless possibilities. The design constraints that I like to keep in mind are material selection, capital, time, and quality. It is very important to select the right material when designing a product. Material selection is very important because you don't want to be using more than you have to because this can be expensive. The best way to determine how much to use is to first optimize the problem and determine from there what the best case scenario is. Monetary constraints are just as well as important because capital can be limited on projects. Time constrains are also important because everyone knows that time is money and the money that you have today is less than what you will have in the future. As engineers, we know what's best and know limits on products because engineers are the ones who design products.

Engineers know how to create certain requirements to a product by design basic, linear, and surprise and delight requirements for a product. A successful engineer should know performance constraints and quality control of the manufacturing of a product. The good designs tend to stick to some of the basic constraints while the bad designs tend to get a bit off course to sticking to the fundamental constraints.

When I have design something I like to be in a comfortable atmosphere. A good working environment helps bring out the best which leads to successful ideas. I also like to use divergent thinking by brainstorming. I think using divergent thinking in the beginning of the design process gives you the most possible solutions to work with. I also like to use morphological matrices in order to consider attributes with each other. I also believe that when the conceptual design is coming to end you need to converge your solutions to a couple of final solutions. I also like to point out uncertainties in my designs and weigh out my alternatives to the solution. Sometimes it's best to get rid of these non-contenders which may influence the winning design. When it comes down to choosing the final design I like to use the value function formula to pick the final winning design. I like to use a weighted system to select the best design based on different solutions to a problem with quantifiable attributes. Then I like assigning weights that represent the level of importance of the attributes with respect to each other. Then I put the alternatives and attributes in a matrix and sum each row to determine the best solution.

There are other criteria that an engineer should keep in mind when designing a product. An engineer should try to keep the 12 guidelines in mind when designing a new product. A good engineer should keep the overall component count down because it is cheaper, keeps inventory down, and has less chance of failure. It's good to keep it simple

but not to complicate it because it's very difficult to manufacture a complex part. Engineers should minimize the use of separate fasteners. You don't want a product with a million different bolts, screws, or rivets because it's bad for inventory and quality control. It's also good to design with a base component which makes it easier for locating other components with respect to each other. It's also good to keep in mind not to reposition during assembly because automation could become expensive and could run into placement accuracy. Assembly should also be efficient by minimizing the least amount of steps required to assemble. It is also good to design products which avoid component characteristics which complicate retrieval. You don't want to design a product which can be misaligned when being retrieved. A good engineer designs components for a specific type of retrieval, handling, and insertion. It is typical to have manual assembly for fewer than 250,000 units' annual, robotic assembly for 250,000 to 2 million units annual, and a special purpose transfer machine which handles more than 2 million units annually. It's also very important to design components for end to end symmetry and design components considering their assertion to axis of symmetry for easy handling. An engineer should make use of leads and chamfers to facilitate insertion alignment to prevent any mishap. You should also maximize component accessibility as well. Finally, it's very important to be aware of the environmental effects of all materials used in production.

I believe that I have the tools and insight in order to be an effective designer now because of the information that I have learned over the past semester. I also believe that it helps that I've investigated with gadget which will help me understand how things work. I used to get the Sunday paper and used to do the various experiments in this one

section called “Beakman and Jack.” This was a good starting point in to understanding various science relations before ever learning some of these basic topics in school. I believe being introduced to many ideas at a young age; it will make me more familiar and help me in the design stage.



**Question**

**10**

DESIGN PROCESS AND METHODS

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MAE 451

What did you learn in this class?

I believe that I learned so much in the last semester that I can personally say which will benefit me in my future engineering career. Without taking this class, I would have missed out on the means of effective design process and the important steps in decision making. I now know that there are important factors one must consider in order to make the proper decision. Now that I have taken this class, I hope can make the best solution when faced with a real engineering problem. I now know the pitfalls one can fall into if you use pair wise comparisons and ordinal scales. I believe I have the skills and tools to recognize the important steps involved when picking the best alternative solution by using the decision matrix and the value function formula to determine the best alternative.

I've learned that creative thinking happens in many forms such as individual techniques as well as group techniques. I now know it's important to use divergent thinking in the preliminary stages to get as many possibilities as possible but then you need to use the convergent methods to come to a final conceptual design. I know that certain people learn and create under different circumstances.

I've become familiar that problems are ill-defined and constraints must be applied to a design in order to achieve a particular objective. I've learned that there is a difference between people who are inventors, artistic designers, people who find things by discovery, and people who are problem solvers. I also know that there is a basic structure when it comes to design a product. I had no idea that the structure was this big before taking this class. It is important as an engineer to stay within the parameters or constraints of the problem.

Just because you have a great design doesn't always mean it's going to work. I've learned that companies use the Net present value formula to predict whether or not if the design is worth investing into. I've become more familiar with compound interest because of the stock market game over the month of November. I've learned that investing is a gamble and there is no guarantee for success. I've learned that an engineer can influence on how well a product performs for a company. An engineer should usually know the limits and the target audience for a product and can design it accordingly by certain requirements such as basic, surprise and delight, and linear. Engineers can influence the demand by the material selection, the weight of the product, and the appearance. I've learned from the assignment on the relationship between weight and price that weight does influence the price more than I thought. I also now know that there are many factors which go into the cost of the product such as overhead, tooling, labor, materials, and expenses.

This class has taught me that an engineer has to consider design guidelines in order to be efficient. An engineer must also consider the process of optimization in order to be the best or get the best out of the design process. It is very important to choose the best design variables and create some type of mathematical problem statement with an objective function. For example, in the 1<sup>st</sup> order methods, I now know how to use the update equation and the steepest decent method for the best optimization.

I've become more familiar with distribution and quality control. I've seen that life isn't good enough at 99.9% effectiveness. I find it to be very important that the more quality control a company has to achieve 6 sigma, the safer its' customers can feel.

Before taking this class, I had no idea the steps or process one has to go through for a patent. I now know that a patent must be novel, useful, and be non-obvious. A patent doesn't give you the right to make, use, or sell an invention. It does on the other hand convey the rights to exclude others from making, using, or selling the patented invention for the term of the patent.

This class has helped me become a team player through the use of the teaming sessions which I attended this semester. I've learned to work with new group members on the fly and understand that different people bring certain attributes to the tables. Engineering is usually a team effort and doesn't always focus on individualism. I've become more familiar with the four basic personality types in which people have and how to approach these people.

Being introduced to ethics will make me a much better engineer. I know that there is a code of conduct which an engineer must follow. It's very important to keep the integrity of the profession while serving to the people and community. As become an engineer, I vow to follow the code of conduct. The most important thing that I've learned from this class is that we investigated on the various levels of engineering. This class was like no other class that I have taken here at the University. I think the most important things that I will keep in mind years down the road is that this class taught me about design teams, implementation of designs, and development of product design on the engineering level.