The Plant Wizard

"Revolutionizing the way you fertilize your plants…"

Case Study

December 8, 2000

Product Development Team:
Patty Burleson
Rebecca Griffith
Rachelle Kotrba
Agatha Petacci
Natalia Porto
Erica Roberts

Circled words = bad grammar

Underlined = like highlighting

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Better slogans?
"A revolution in home gardening?"
mess-free plant fertilizing ?

Eb.

Journal — This is very well done. It's an interesting narrative, not just a chronological recitation.

Week 1: 9/25 - 10/1

We began our search for product ideas by bringing lists of 10 potential products to class. Some ideas were wildly creative and weren't feasible to produce in one quarter. However, the exercise put us in the right mind frame to be creative and attack problems from a wide variety of perspectives. The product ideas were shared in small groups and the best 4-5 ideas were presented to the class. These ideas were then placed on the board and the most feasible and appealing were selected by votes. Groups started to form around four preferred ideas: portable shower, motorcycle sticker holder, wisdom-tooth ice pack and fertilizer device. As a second assignment, students had to participate in writing up a two-page description of the concept, target audience and required skills of at least two products they were interested in working on.

At the end of week one, six women - Patty Burleson, Rebecca Griffith, Rachelle Kotrba, Natalia Porto, Agatha Petacci and Erica Roberts - formed around two ideas: 1) the jaw/face ice pack for people who had their wisdom teeth pulled out and 2) the fertilizer packet for easing fertilizer application and measuring for home gardeners. The jaw/face pack was an initial idea that we unanimously agreed on. Unfortunately, a classmate soon discovered that the jaw/face pack was not feasible because there was already a patent remarkably similar to our concept. After deciding there was not much room for improving the already-existing concept, a disappointed team was faced with the dilemma of what product to pursue next.

Week 2: 10/2 - 10/8

At the beginning of week two, the group was unsure as to which project to pursue, since the fertilizer packet was uninteresting to three members and merely "okay" by a fourth. Session after session we generated possible ideas hoping that someone would brilliantly come up with something that would interest the whole group. Meanwhile, other groups, such as the shower group, were holding regular meetings and generating concept ideas. The pressure was on - we were at an impasse and we had not even begun. Additionally, our project ideas were limited by our lack of technical knowledge (all three engineers were in the shower group). After more brainstorming, a new idea was generated (open parking space indicators for parking lots) that sparked the interest of three members of the group (Agatha, Natalia and Rachelle,). Thus two ideas were on the table: 1) making the fertilization process for home gardeners easier; and 2) a signaling device to alert drivers of open parking spaces in parking lots.

At the end week two we were still unable to agree on a single project! Since the group was evenly split between the two ideas, Roger suggested that we perform parallel processing. We subdivided for a week to pursue the feasibility of the two concepts, agreeing to reconvene one week later to present our findings. It was agreed that if both groups felt that their respective concepts were feasible, the original group of six would split. One team, comprised of Natalia Porto, Rachelle Kotrba and Agatha Petacci moved forward with the parking lot idea; the other team, comprised of Rebecca Griffith, Patty Burleson and Erica Roberts, moved forward with the fertilizer idea.

Fertilizer Group on its Way to Success

The "Fertilizer Group" was excited to get moving, but realizing the magnitude of the task that lay ahead if the original group split, they began by setting goals for the week and delegating responsibilities to each person. They were working under the assumption that they would be a three-person team from here on. They agreed to maintain close contact with one another so as to avoid repetitive research. Two weekly meetings were set, one at 4:00pm after class on Thursdays and another at a variable time during the week. They unanimously agreed on no team leader as they had worked together before, were only a small team, and did not anticipate any conflicts or free riding. Each team member would have their own disk for reference and at each meeting the disks would be updated.

With only three members, matters were simplified. The first exploratory meeting to understand the real problem was an amicable one over beer and Mexican food. Before this time, Erica and Patty did not fully understand problems associated with home fertilizer. However, after getting their fingers dirty with blue fertilizer it started to come together. By understanding the real nature of the problem it was easier to get excited about finding a solution. Without a doubt they could find a solution. A variety of ideas, as well as creative ways to approach the problem, were shared. These concept ideas approached the problems from several different angles.

The three left the meeting excited about the possible directions they might take. So many ideas! For the next week it was decided that each team member would do at least one needs-assessment interview, buy a disk for the project and spend some time looking on the Internet about gardening and related products and ideas. ? What is a disk? A floppy?

Parking Lot Group's Wanderings

Oh, yes, these three were excited as well! It felt so good to imagine the huge parking lots of IKEAa', Price Clubs', etc filled with their invention. But in less than one week they realized that moving ahead on just enthusiasm and persuasiveness was quite impossible for this kind of project. Technical knowledge was also needed and the team did not possess any.

The initial idea though was very attractive. You enter the parking lot and are be guided by the flagged posts to the empty spot in the parking lot. As the car drives into the spot the post is miraculously bent under the car just to rise again and do it's indicating role after the car pulls out. The product revealed even more potential after an idea to use the flags as advertising space was brought to the table.

Very soon after some interviews, friendly conversations and Internet research, however, the parking lot team uncovered several factors that complicated the product's feasibility. These complications were included but were not limited to design specifications and potential hazards in use. Moreover, the group felt it had insufficient engineering skills to carry out the project. After rounds and rounds of discussions they decided to kindly ask the Fertilizer Group to take them back.

Week 3: 10/9 - 10/15

Reconvening

The original six reconvened on Thursday. The parking flag team decided to abandon the parking space indicator idea and once again join forces behind one concept: a better fertilizing system for home gardeners. There would be added logistical complications but everyone realized that having a larger group would divide the workload. To whole-heartedly join the fertilizer group, however, these new members had to understand the problem of the messy powder fertilizer. Like Patty and Erica, they had a hard time getting excited about something that they did not understand. To solve this problem, Rebecca once again brought her collection of fertilizing products and these new members had the opportunity to get their hands dirty and understand where the problems lie. (lay) (literally)

Committed to moving ahead as a group, we decided that we would finalize a customer survey by Friday evening, Oct. 13th. Saturday and Sunday were designated as interview days, and each member would take the survey and interview 5-6 potential users. The goal was to have a sample of at least 30 customer interviews of people who used houseplant fertilizer. How many did you get

Week 4: 10/16 - 10/22

On Monday, we met to translate customer comments into customer needs. On Tuesday we met to work on the storyboard to be presented in class the same day. Delivering the storyboards in class, however, showed us where the other groups were and where we fit in comparison. The shower group, in particular, looked like they were steps ahead. We knew that we had to pick up the pace but considering we had just decided less than a week ago to join forces again, we were doing fairly well. We also realized that we had not presented our entire process up to that point, as we were still figuring out what was expected in the storyboard presentations.

We tried to recall last year's groups' experiences up to this point and after reading the Baby Bath's case analysis we decided not to put too much weight in benchmarking our group against the others. In the Baby Bath case they actually fell into a false sense of security, as they perceived themselves ahead of the other groups. This was certainly not our case. However, we were building a strong foundation from which to work and we expected that this organization and attention to detail would pay off in the end. Besides, we knew that once we developed the GANTT chart, we would feel we had a better grasp on expectations and milestones that we needed to meet.

Because we knew we had some catching up to do, we decided to meet at our regularly scheduled "group" meeting on Thursday, but to also include an additional meeting on Friday morning to give us a good chunk of uninterrupted time. So far we had been doing an exceptional job working around six people's schedule.

That Friday morning we met early at a coffee shop and set to work. We did a rough division of labor, putting together two-member subgroups to handle what we felt were the three main areas of the project/contract book: Product Overview (Rebecca & Agatha); Marketing (Patty &

Rachelle); Manufacturing/Economic Analysis and Risks (Erica & Natalia). We did not expect that they would be fully responsible for all the content and information, but rather responsible for the deliverable at the end. We also divided up some of the more individual tasks, such as agenda setting, weekly minutes, etc. to stay on task and not become overwhelmed at the end.

It was time to analyze our survey and determine what fertilizer product customers really wanted. Our survey produced a few surprising results – there is a definite split between those who use powdered fertilizer and those who use the liquid form. Our survey told us that those who use liquid are happy with their product. Until this point it had not been clearly defined that there were two groups of fertilizer users with defined differences. It was specifically the powdered users who were not happy. While not satisfied with existing products on the market, for some baffling reason they were unwilling to switch to liquid. Do they derive some intrinsic pleasure from actually seeing the substance and dissolving it? This we did not know – although it did clarify our focus and help us realize that it was specifically the problem with powder fertilizer that we had to solve. Our project thus became one shade clearer as we decided to focus solely on a system for powder...

We concretely formulated, hashed out and translated our customer statements into needs. These needs were taken one step further and we converted those needs into metrics. Once done (although not an easy task), we continued the discussion on the prototype and our various concepts. We had sketched out some sub-problems and came up with various questions that needed to be addressed. We divided into sub-groups to brainstorm these ideas and bring back to the group on Monday/Tuesday.

Week 5: 10/23 - 10/29

After much blood and sweat, Agatha presented the GANTT at our next meeting. From there we were able to visually understand and verify where we should be and where we are going. We decided our current phase of concept testing and selection should be finished by week 6. We also agreed on the new product name: *Plant Wizard.*

We made some revised clarifications on metrics and specifications. It was decided that a metric could also be a way of testing. Metrics answer "what" not "how" and are a practical measurement. As our product is simpler than others, our list of metrics was comparatively shorter.

yes.

We began thinking about how we wanted our product to be placed in comparison with the competition. Not only did we need to take into account customer needs but our needs (i.e. feasibility of production). Our team unanimously agreed that we had been particularly successful in working together in a positive way and in scheduling frequent meetings. We therefore set another all-group meeting (minus one) for the next morning as we still felt we had some catching up to do. As we had previously enjoyed getting away from campus, the meeting was set for the following morning at Pete's Coffee to address the selection matrix and concept criteria, as well as prepare our presentation on prototyping scheduled for the following Tuesday. Each team member was expected to bring sketches of her ideas, think about the list of criteria that is essential for the selection matrix and have read the chapter on prototyping. Prototyping

presentation set aside, we decided we needed to narrow down our concept focus to two principle ideas.

Each team member presented final concept ideas (with drawings) and after much discussion, we used a matrix format to narrow the concepts down to two. The criteria used were: feasibility, manufacturability, ease of measuring, ease of mixing, mess-free, humidity proof, convenience, safety, cost, size, and operates as one unit. (Please see Appendix A, Concept Selection Matrix)

This resulted in two concepts: 1) pre-measured packets of fertilizer on a stick designed for single-use and 2) tea-powder spoon/grabber. Each team member was to think of how these prototypes might be constructed. All members recognized there could be further changes and talked about keeping open minds. For example, the loose tea spoon/grabber might still be combined with a different packaging format.

Week 6: 10/30 - 11/5

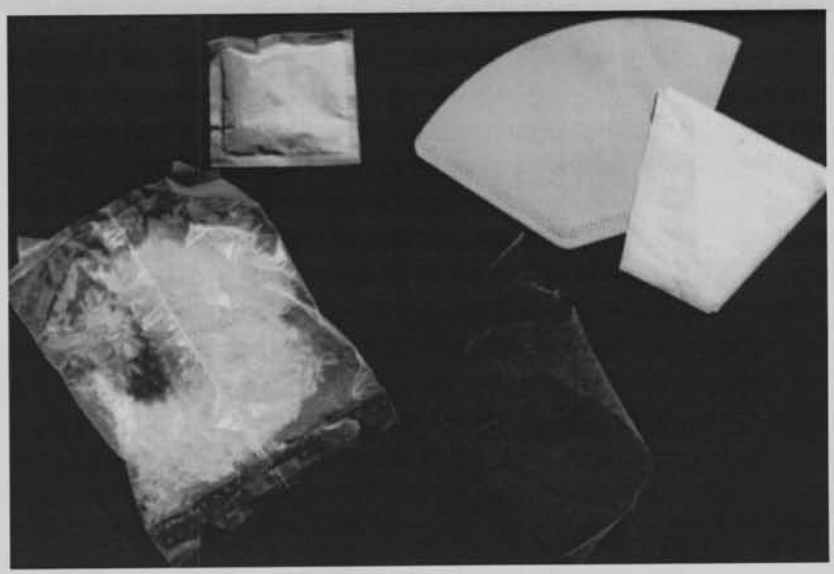
The week started with prototype groups working separately on wand and spoon/grabber ideas:

Wand Group

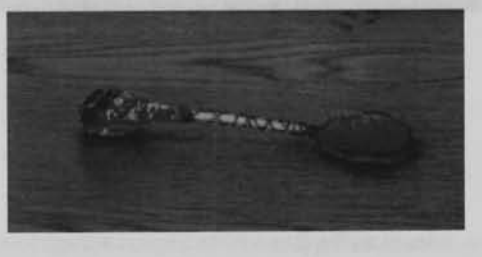
Patty and Erica met to get their hands dirty again to test the feasibility of some rough prototypes. Along with Rebecca, they collected various materials with which to experiment. They needed to find some sort of material that could effectively hold the fertilizer but at the same time be permeable so that the fertilizer could dissolve in just a few seconds. Some possible materials included rice paper, tea bags and coffee filters. Lollipops, bubble wands and skewers were to be tried for the stick portion of the wand. They spread out all of the various accoutrements and began the fun. It was like being in kindergarten again (except we were playing with fire and attempting to melt plastic).

At the end of the evening there was a rough (very rough) prototype. They found the following:

- Paper similar to tea bags and coffee filters did not allow the fertilizer to dissolve through.
- Dipping bags of fertilizer in the water like a tea bag did not provide effective leverage for stirring.
- Any shape other than a round bag resulted in blue residual gathering in the corners.



The *Success Rice* paper effectively held the fertilizer, and with additional holes punched in, it allowed the fertilizer to completely dissolve in water. The final prototype was a pouch filled with one teaspoon of pre-measured fertilizer to a lollipop with some wire. Patty spent over a half of an hour making one pouch and used a whole pack of matches, an iron and a burner to get the plastic to melt. With this slow process the 50 or so prototypes that were originally envisioned ended up being one rather rough prototype, with much refining potential.



Spoon/Grabber group

The spoon group left their Friday meeting convinced that the spoon/grabber idea was a winning concept. Although it lost some points to the pre-measured fertilizer packages in the course of project selection, it was agreed that the spoon/grabber would target a broader market because of its lower overall price.

However, excitement began to wane after some prototyping sessions that revealed the spoon did not grab enough, it did not close completely and finally it just broke (see sketch of grabber concept in concept generation section). Of course, special additions could be made, the design could be slightly reworked and the grabber could actually perform as planned, but feasibility of completing the work in the 5 weeks remaining seemed doubtful.

In the next day meeting Agatha, Natalia and Rachelle discussed the new possibility of designing a highly curved, but still traditional, spoon that would reach any corner of the redesigned Miracle-Gro® box. Nevertheless, they decided to abandon this path when presented with the rather promising results of the wand group, once again, rejoining the group of 6.

Together again

After performing our research along two separate paths, we reconvened again. This meeting was particularly effective as we covered six topics: We discussed the two concepts of the pre-measured pouches vs. the grabber. And we selected the concept (BIG DAY!!!). We chose (obviously) the disposable, pre-measured stick. Natalia, always brimming with ideas, was still

bringing up new concepts during the meeting: she even brought a hand-made prototype of her idea. Despite the fact that her idea was good and had potential, as a team we decided that the idea generation phase had to end somewhere. We were anxious to move forward and decided we had spent ample time exploring alternative concepts.

We also looked at where we were according to the Gantt and talked about our milestones and set the meeting date for the first prototype production run.

Week 7: 11/6 - 11/12

Design Review

We presented our preliminary prototype to the class and received positive feedback on our design. One suggestion came from an engineering classmate and related to the process of making the plastic pouches. He suggested using the hot plate of a coffee maker and a cookie cutter to melt together the two plastic pieces. An assembly line with division of labor could now be designed and the process could be sped up considerably.

Safety: Don't mix food & chemicals on same table! (Not joking)

After this feedback, it was time for our first mass production. The coffee maker solution allowed us to produce 27 prototypes for consumer testing. During this production phase we also took the opportunity to explore different types of packaging. Did we want a box or a can? Would they be individually wrapped? More tests would be needed before these questions could be answered. It was hypothesized the can would be a better decision for two different reasons – the wands were so light that the box might fall over when stored, and the can could be sealed to prevent humidity from altering fertilizer consistency. We then ran humidity tests to help determine which type of packaging (inner and outer) we needed for our product.

We also tested two of our produced prototypes in the watering can and they dissolved VERY quickly without any mess. We discussed the likelihood that customers would want a way to remember to fertilize, and if we could incorporate this into the stick idea. We decided we needed to change the way in which we designed the break off point IF consumers liked having that option, as the end broke easily while stirring. We learned during our first manufacturing run that we should test a concept before producing too many pieces. We had already widdled over 100 sticks before realizing they were too thin to stir effectively.

Other complications during the production process included: Did we want to think about the thicker sticks (coffee sticks) or did we not want to go down that road? Possible complication could be sealing the hole around the packet since it will create a larger "connection point" than the skewer sticks do. Although that may not be a problem, we decided to test it at the beginning of our next production run.

Week 8: 11/13 - 11/19

We broke up into two groups to do the Customer Feedback Survey.

Group One

Agatha, Rachelle and Rebecca thought this would be easy and fun, but, instead, walked around downtown La Jolla being rejected left and right, as people were either too busy or did not use plant fertilizer. As they were about to give up, they tried one last shop, *The Village Greenery*. While the two ladies were hesitant at first, one lady soon became quite interested in the product. She enthusiastically tested the prototype, all along answering the survey questions and providing additional feedback.

After the survey was complete, they offered her and her co-worker the snacks they had brought along. Seeing the looks on their faces and expressions of gratitude, they realized they should have provided the food up-front and the two ladies may have been more willing to help from the start.

might

Group Two

Natalia and Erica also had a similar experience with surveys. Being a beautiful day, they were excited to be outside, away from the computer lab and actually getting a bit of feedback on the *Plant Wizard*. La Jolla was also their destination with Von's flower department as the first stop. The survey started off a bit disappointing as they realized that most people do not actually want to take ten minutes to discuss a fertilizer wand. This indifference continued until they happened to find a gentleman who showed great interest in the project and helped recruit people for the survey. Almost all of the people had only positive things to say about the new product – the survey reaffirmed that the group was on the right track and that the *Plant Wizard* would find acceptance from the targeted consumer market segment.

Evolution of the *Plant Wizard*

Right to left = backwards.

Week 9: 11/20 - 11/26

We decided that a live demonstration of our product as compared to the old product was a bit too risky. Instead, we would be one step ahead if we produced a short video, which would allow for us to control the unexpected. The idea of using the Quick-Time Video, as Roger continuously suggested, was shot down. Rather we opted for producing our own demonstration on VHS and displaying it on a VCR during the presentation. At this point in the game we were all a bit leery about experimenting with new technology. We saw the potential of hours of additional work, for which none of us had the time. We agreed to meet on the Sunday of Thanksgiving week to produce the video and begin to organize Tuesday's presentation.

The video, of course, took more time then we anticipated. The old fashioned method turned out to be not so easy, as for some reason the image produced was continually fuzzy. By the time we

were happy with it (even though we were unable to play it back that evening, we took it on faith that it would look good), we were ready to call it a night, leaving the organization of the presentation for Monday. We felt at this point like we were organized and were all reassured by Natalia's comment at the end of the evening that the presentation would be no problem. If she felt this way, then surely the rest of us did not have to worry.

Week 10: 11/27 - 12/3

This was the big week. Presentation on Tuesday, Contract Book due Friday!

Monday

On Monday bright and early we attacked the presentation, coming up with a rough format for the flow of the presentation and then breaking up to do various activities. We had six hours to pull things together before presenting to Roger for feedback. The day flew by and before we knew it, it was 5:30. Unfortunately, at this point we did not know who was going to be presenting or have hard numbers to back up our assumptions. We delegated once again, sending Agatha, Rachelle and Rebecca to speak with Roger while the rest of the force fine-tuned the presentation. We were not ready to practice the presentation at this point, but instead, walked through the points we wanted to make. But...we still had NO numbers!

However, this point needs to be clarified. In fact, we did have numbers, but these numbers were based on assumptions that proved far too simple for the analysis we wanted to do. Additionally, these numbers kept changing wildly as we had no real concept of the number range that we should be aiming for. Should the NPV be around 100 million or should it be closer to 40? By changing a few assumptions, our NPV was swinging across the board – and we still had not accounted for things like cannibalization of existing products. Our numbers had to be thrown out and the analysis had to be started from scratch. The economic analysis at this point was getting ridiculous – we were in way our head. The spreadsheet we were using was far too simple to do the kinds of calculations we wanted. As a result, we spent hours trying to modify what was supposed to be a simple and helpful addition to the analysis. Additionally, Natalia and Erica were going beyond reason. At 11:00 pm, for example, they were trying to add in development costs for an environmentally friendly permeable pouch in Year 2! (This would change all existing calculations). Luckily, they realized that they had to let go and move on.
The night ended somewhere from 2:00-5:00am for all of us.

Tuesday

The day started at 7:00am for us, working right up until the presentation (2:30), with nobody even taking a break for lunch!

Reactions to the presentation.

Wednesday

We took the day off to work on Investments' presentations and other classes.

Thursday

It then came down to actually putting the Contract Book together. We had countless hours of work into this project and as always, we thought it would not take much time to put all the pieces together into the book's final form. HA! Considering some parts of the book were still having the finishing touches placed on them, with more revisions and additions, we still could not put the entire thing together. At 4:00pm, we broke into teams, with some working on scanning pictures, placing them, then formatting the entire document, while others worked on finishing up the economic analysis and that dreaded NPV!!!

At 3:00am, we headed to Kinko's to bind and put our baby to rest. Wow, did it look great! Another bit of advice to future students: No matter how you feel during the course of the quarter, seeing that final product makes you realize all that hard work and long hours were definitely worth it!

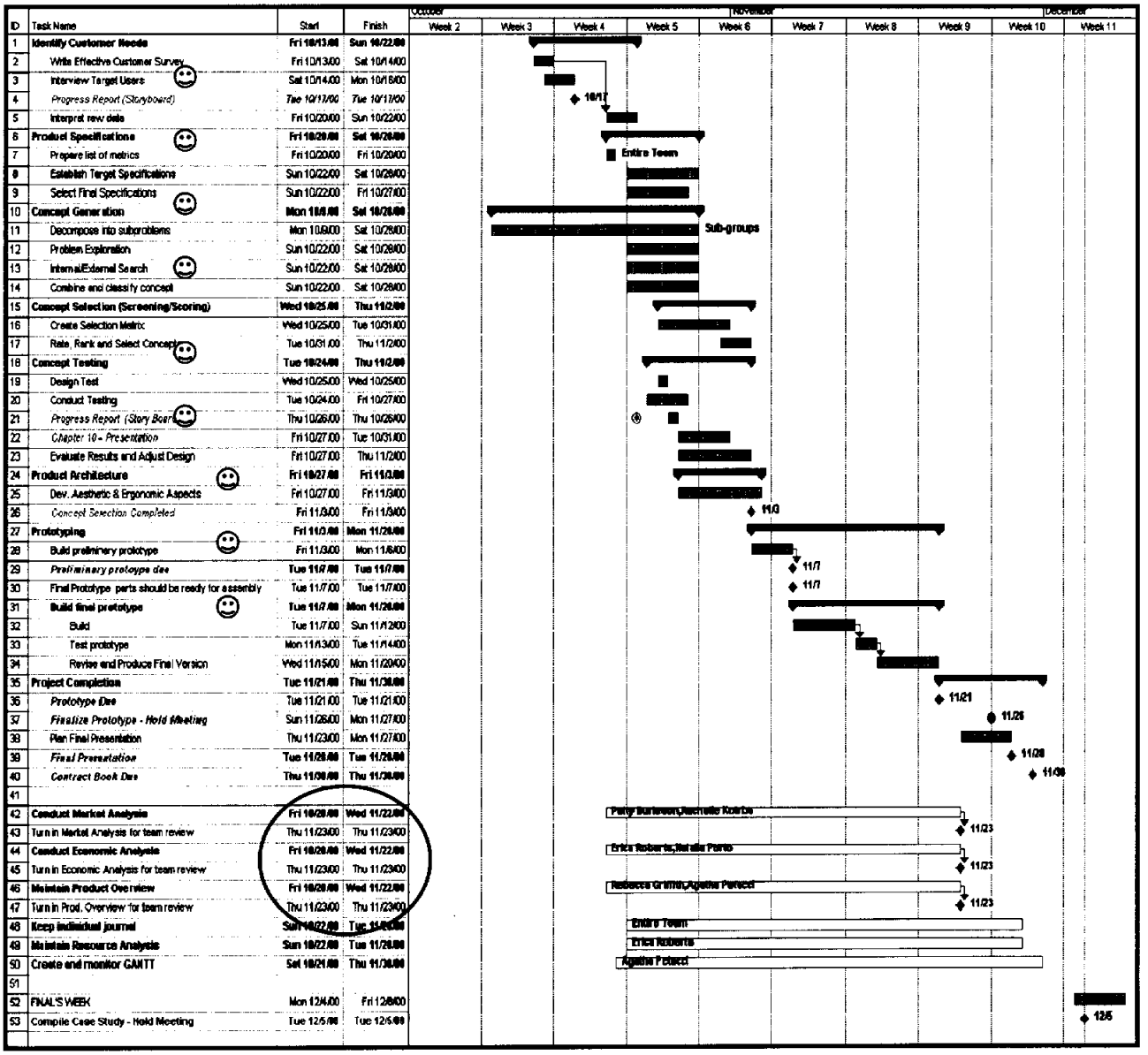
One day early.

Friday

Some of us slept, some of us worked, some of us left town. It did not matter because none of us were worrying about the Contract Book!

Project Schedule

GANTT Chart



ID	Task Name	Start	Finish
1	**Identify Customer Needs**	Fri 10/13/00	Sun 10/22/00
2	Write Effective Customer Survey	Fri 10/13/00	Sat 10/14/00
3	Interview Target Users	Sat 10/14/00	Mon 10/16/00
4	*Progress Report (Storyboard)*	*Tue 10/17/00*	*Tue 10/17/00*
5	Interpret raw data	Fri 10/20/00	Sun 10/22/00
6	**Product Specifications**	Fri 10/20/00	Sat 10/28/00
7	Prepare list of metrics	Fri 10/20/00	Fri 10/20/00
8	Establish Target Specifications	Sun 10/22/00	Sat 10/28/00
9	Select Final Specifications	Sun 10/22/00	Fri 10/27/00
10	**Concept Generation**	Mon 10/9/00	Sat 10/28/00
11	Decompose into subproblems	Mon 10/9/00	Sat 10/28/00
12	Problem Exploration	Sun 10/22/00	Sat 10/28/00
13	Internal/External Search	Sun 10/22/00	Sat 10/28/00
14	Combine and classify concept	Sun 10/22/00	Sat 10/28/00
15	**Concept Selection (Screening/Scoring)**	Wed 10/25/00	Thu 11/2/00
16	Create Selection Metric	Wed 10/25/00	Tue 10/31/00
17	Rate, Rank and Select Concept	Tue 10/31/00	Thu 11/2/00
18	**Concept Testing**	Tue 10/24/00	Thu 11/2/00
19	Design Test	Wed 10/25/00	Wed 10/25/00
20	Conduct Testing	Tue 10/24/00	Fri 10/27/00
21	*Progress Report (Story Board)*	Thu 10/26/00	Thu 10/26/00
22	*Chapter 10 - Presentation*	Fri 10/27/00	Tue 10/31/00
23	Evaluate Results and Adjust Design	Fri 10/27/00	Thu 11/2/00
24	**Product Architecture**	Fri 10/27/00	Fri 11/3/00
25	Dev. Aesthetic & Ergonomic Aspects	Fri 10/27/00	Fri 11/3/00
26	*Concept Selection Completed*	Fri 11/3/00	Fri 11/3/00
27	**Prototyping**	Fri 11/3/00	Mon 11/20/00
28	Build preliminary prototype	Fri 11/3/00	Mon 11/6/00
29	*Preliminary prototype due*	Tue 11/7/00	Tue 11/7/00
30	Final Prototype parts should be ready for assembly	Tue 11/7/00	Tue 11/7/00
31	**Build final prototype**	Tue 11/7/00	Mon 11/20/00
32	Build	Tue 11/7/00	Sun 11/12/00
33	Test prototype	Mon 11/13/00	Tue 11/14/00
34	Revise and Produce Final Version	Wed 11/15/00	Mon 11/20/00
35	**Project Completion**	Tue 11/21/00	Thu 11/30/00
36	*Prototype Due*	Tue 11/21/00	Tue 11/21/00
37	*Finalize Prototype - Hold Meeting*	Sun 11/26/00	Mon 11/27/00
38	Plan Final Presentation	Thu 11/23/00	Mon 11/27/00
39	*Final Presentation*	Tue 11/28/00	Tue 11/28/00
40	*Contract Book Due*	Thu 11/30/00	Thu 11/30/00
41			
42	**Conduct Market Analysis**	Fri 10/20/00	Wed 11/22/00
43	Turn in Market Analysis for team review	Thu 11/23/00	Thu 11/23/00
44	**Conduct Economic Analysis**	Fri 10/20/00	Wed 11/22/00
45	Turn in Economic Analysis for team review	Thu 11/23/00	Thu 11/23/00
46	**Maintain Product Overview**	Fri 10/20/00	Wed 11/22/00
47	Turn in Prod. Overview for team review	Thu 11/23/00	Thu 11/23/00
48	**Keep individual journal**	Sat 10/21/00	Tue 11/28/00
49	**Maintain Resource Analysis**	Sun 10/22/00	Tue 11/28/00
50	Create and monitor GANTT	Sat 10/21/00	Thu 11/30/00
51			
52	FINALS WEEK	Mon 12/4/00	Fri 12/8/00
53	Compile Case Study - Hold Meeting	Tue 12/5/00	Tue 12/5/00

This GANTT chart was the schedule that drove our project starting from week 5. Our GANTT was put together rather late, in comparison to other teams, mostly because our group was not consolidated into one until about the end of week 4 - when process selection was finally completed!. Prior to agreeing on the concept we wished to proceed with as a team, we worked as parallel groups of three on two separate occasions. (see 'Tough-decision Case Study for more details).

Despite not existing at that moment, the GANTT includes some description of the tasks accomplished prior to week 5 in order to reflect deadlines and work undertaken in those earlier weeks, despite the absence of a master schedule.

In the GANTT above, missed deadlines were encircled in red and met deadlines were marked with a happy face.

Analysis

Starting week 6, after Agatha presented us with an initial version, necessary modifications were made and the team agreed to firmly commit to meeting milestones and deliverable deadlines (We really felt the pressure was on at this point!). This commitment held up for most of the project's life, as very few deadlines met with delays. One set of missed milestones were the sub-team deadlines of 11/23 for the Market, Economic and Product Overview Analysis. Even though partial products were produced by 11/23 the finished products were still being worked on prior to the presentation, even up to a few hours before it – significantly raising the team's level of stress.

On the other hand, other milestones were met without delays and had significant positive impact on the successful outcome of the project. One such milestone was that of 11/7 which marked the beginning of our prototype building stage. Having learned from prior teams spending endless hours on prototype building and running into a lot of last minute problems, we were resolved to keep to this milestone no matter what. And indeed we did. Despite differing schedules all team members had purchased the required materials by 11/7. Even more importantly, when one team member was not able to meet for the first prototype building schedule, the team decided to proceed as planned, to ensure timely continuation of the project. This commitment to important deadlines, such as creating prototypes, really paid off for our team because we actually managed to fit in two prototype building times before our final presentation and perfect the "manufacturing process" to such a point that we created over 60 *wands* in total.

Lessons to be learned

Create a GANTT chart early in the life of a project. Even if the first version is a basic outline level, it can really help a team to identify important deadlines within semester and personal time constraints.

Make the GANTT chart your friend and not an enemy. Microsoft Project's GANTT creating software allows for a incredible amount of detail in setting a master schedule, allocating resources, designating time, etc. The key to making the GANTT your friend, is to make it thorough but manageable. Too much detail could make the document too difficult to track and to understand.

Resources Analysis

Labor was delegated into smaller teams of either two or three. Group meetings were held a minimum of two times per week.

Our work has been divided into the 13 categories shown in the table below. For simplification each individual category is general and encompasses several tasks i.e. An example would be the heading "customer survey" which encompasses creating, executing and evaluating the survey.

Evaluation Method: One team meeting with six people is six hours of work.

Human Resources	**Hours Spent**
Initial Idea Generation	45
Customer Survey	42
GANNT Chart	18
Needs Interpretation / Metrics	35
Concept Generation / Selection	90 12%
Alpha Prototypes	27
Storyboards	24
Alpha Prototype Mass Production	38
Final Prototype	59
Presentation	92 12%
*Contract Book**	168 22%
Case Study	60 8%
Other	76 10%
Total hrs	**774**
Average hours per week	**64.5**
Average hours per person Per week	**10.75**

end of quote

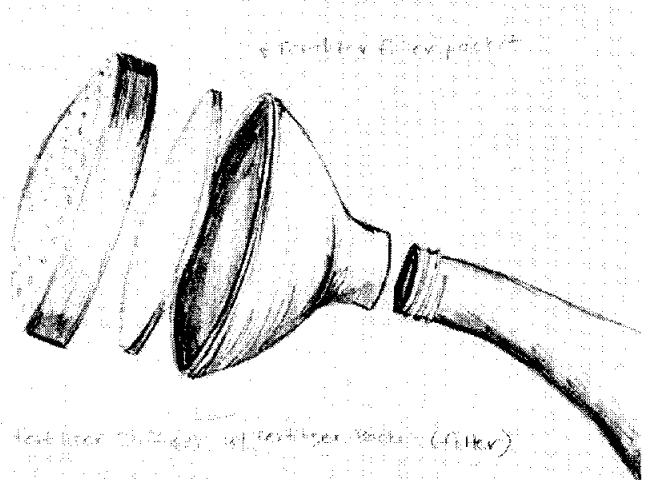
Very useful. Also show %

* The contract book was divided into three categories: economic analysis (Natalia & Erica), marketing analysis (Patty & Rachelle) and product development (Agatha & Rebecca).

Concept Generation & Selection

The Plant Wizard Team's concept generation/selection process was extensive and proved to be critical to the success of our project, as well an excellent learning experience for us all. The original idea of the fertilizer diffuser cap quickly expanded into a list of 12 different concepts. This proves that rather than limiting ourselves to the original idea (as we were warned against doing), we actually spent a lot of time ensuring that we had considered as many ideas as possible given our time constraints.

Original Concept – The Fertilizer Diffuser Cap



Concept Generation

As previously mentioned, our team's concept generation process was lengthy (in comparison to other groups), but also a very crucial part of our team's process and our product's success. We conducted concept generation exercises in the following ways:

- Sub-team brainstorming sessions
- Individual brainstorming sessions (usually in the form of dreams that "haunted" us in the night because we were all so involved in the project)
- Team discussions (all 6 members)

The individual brainstorming sessions generated the most ideas, while the sub-group sessions paid the most attention to detail. The first concept generation exercise took place when the team still consisted of three people. The group went to a Longs Drugs to look at existing gardening, as well as kitchen, products and to brainstorm about ideas. Five different concepts came out of this meeting (one of which was ironically a stick with a pre-measured pouch). The brainstorming session produced the following:

1. The new product could be a solution used with any watering can i.e.:
   - Compressed tablet of fertilizer with holes that water can go through for perfect measurement. The tablet would fit into the head of the watering can.
   - Pre-measured small bags with dissolvable covering.
   - Disposable sticks with a mesh bag at the end containing pre-measured fertilizer (appearing similar to a loose tea bag holder) that is used to stir the fertilizer and then is thrown away.
   - Double-ended stick with two different sizes of measuring bags convenient for stirring.

2. Miracle-Gro® packaging could be changed for more convenience:
   - Similar to a pepper shaker with a twisting motion for exact measurement. The container would be accompanied by a long plastic spoon for stirring the fertilizer.

3. A whole new system can be designed and the actual watering can be altered:
   - Built in container along wall of watering can to contain the fertilizer. A spray button (similar to that on an iron) would release a pre-determined amount of fertilizer.
   - Specific cap for watering can that functions as a dial to release fertilizer.

From this point on, the concept generation process was on-going. We couldn't stop thinking about ways to create an improved household fertilizing system! Each of the six team members spent considerable time generating ideas on their own, and almost every day one of us came to school with a new idea to share with the team.

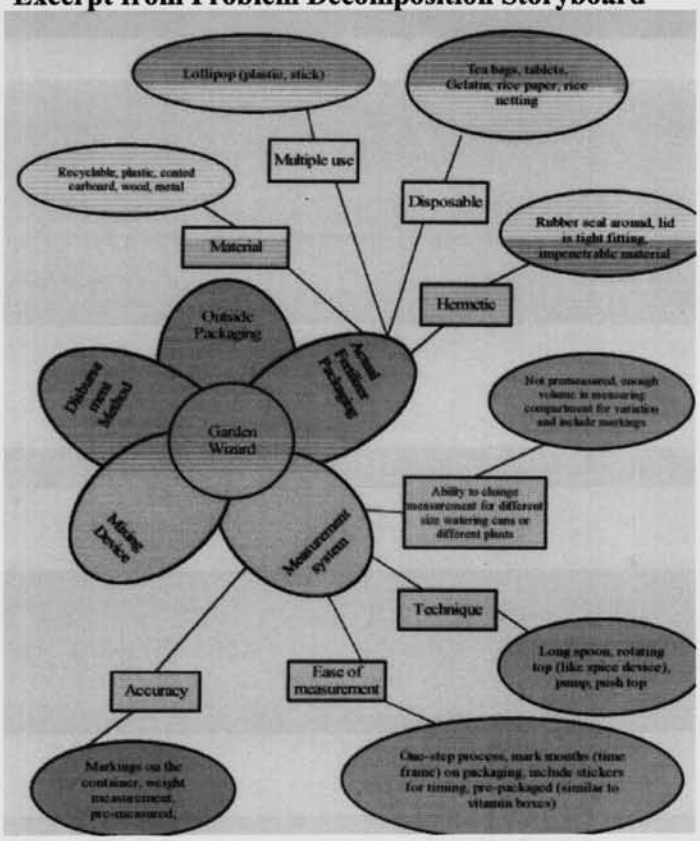
Understanding that at some point concept generation would have to stop and that we would have to move on in order to complete a working prototype by the deadline, we decided to discuss

concepts and develop a plan for moving forward at one of our weekly group meetings. At this meeting we decided to break the problem down into sub-problems and to divide into sub-groups of two to brainstorm about solutions. The problem was broken down into the following sections:

- Package
- Disbursement of Fertilizer
- Measurement of Fertilizer
- Mixing Device
- Fastening of Mixing device to package
- Mixing of Fertilizer
- Cleanliness

The ideas from the Problem Decomposition exercises were presented in the following week's story board:

Excerpt from Problem Decomposition Storyboard



Concept Selection

It was decided that the team meeting immediately following the Problem Decomposition Story Board would be the "Concept Selection Meeting". Using feasibility as our criteria, we narrowed the concept list down to six products, and went through our concept selection exercise. (Please see Appendix A for our Concept Selection Matrix and Appendix B for examples of the concepts considered). It should be mentioned that we decided to "cut a corner" and not perform the concept scoring exercise. Our concept selection exercise clearly eliminated all but two concepts

and everyone on the team agreed that manufacturability (i.e. the feasibility that the six of us could produce the prototype), degree of mess, and convenience were the most heavily weighted selection criteria. Going through the process of deciding on weights for every criteria and ranking our concepts accordingly was deemed unnecessary.

After meeting, we narrowed our concepts down to two: the "grabber" or "scooper" and the pre-measured pouch. We thought that the deciding factor would be to determine our target market segment. To make a final decision we broke into two groups to further explore the two possibilities. Each group produced a rough prototype of their concept:

Two Alpha Prototypes

include a ruler.
Use top down?
This is hard to see

When the sub-groups reconvened, we decided to move forward with the disposable, pre-measured, "lollipop" concept. The subgroup felt confident that it was manufacturable and that it would address customer needs. We all felt comfortable moving forward with this concept, as it ranked highest in our selection exercise.

Analysis

In hindsight, our team spent a lot of time generating ideas, but we feel this was an important part of our product's success. By the time we decided in the *Plant Wizard* pre-measured, disposable fertilizer wands we had considered so many things that whenever ideas were mentioned in class discussions, we had already generated those same ideas, considered them, and eliminated them based on criteria that each member of our team felt comfortable with. In this way, we felt our lengthy generation processes brought legitimacy to our final product. We could address almost any question or idea that was thrown at us! (See Problem Mini-Case for further discussion of our decision-making process)

Key Decisions Made

1) To focus ONLY on solutions for fertilizing HOUSEHOLD plants
2) To focus on a solution for powdered fertilizers
3) To position ourselves as a product design and development team within an existing fertilizer company (Scotts Company)

These decisions were regarded as key because they had a substantial impact on the way in which we proceeded. As the journal explains, each decision narrowed our focus, enabling us to move forward. For example, prior to deciding that we were positioning ourselves as part of The Scotts Company, we were concerned with how to create a simple product that could be used with ANY

powdered fertilizer (i.e. some sort of system that gardeners could purchase and then dump their fertilizer into). While some members of the group felt the being an adaptable product was important, others had already bought into the pre-measured concept. Making the aforementioned decision allowed for us all to be on the same page, and for us to rule out some of the system ideas which were excellent concepts, but probably not feasible given our lack of technical expertise and time.

Lessons to be Learned

One of the most important lessons to be learned for our concept generation/selection experience is that it's good to generate a lot of ideas and to be open to any product concept that team members mention. However, it is equally as important to set a date that your team will STOP generating new ideas and that you will decide on a concept. If your end product is relatively simple to produce (and you will ALWAYS think it's simpler than it actually is) you can probably afford to generate ideas a little longer than other groups with more technical products. In our case, the concept generation phase went on for a long time because we had a difficult time making a decision, not because we had planned it to. Nevertheless, as we have mentioned, we feel it actually helped us in the end.

Activity Mini-Case: Customer Surveys

Customer Needs Surveys

We began our customer surveys rather late, as we had decided rather late in the game (October 12) to work as a group of six on the fertilizer concept. Thus, we had between October 12 and the evening of Friday, October 13 to create a customer survey. Saturday and Sunday were designated as interview days. The goal was to have a simple survey that would help us clearly define customer needs without taking more than 10 minutes of the participants time. We decided that we wanted to survey at least 30 customers who used houseplant fertilizer. One group member was responsible for creating the survey, and the remaining five were each responsible for actually taking it to interview 5-6 potential users.

When the group reconvened to discuss survey results, we recognized several problems with the survey **format** as well as the surveying **process**. These problems included:

- Some questions that may have been helpful were missing, such as brands used and how often fertilizer was purchased (format)
- Not enough open-ended questions (format)
- Lack of incentive for survey participants (process)
- Difficulty finding survey participants (process)
- Difficulty getting open-ended comments from participants (process)

After analyzing the problems, we decided that they would have been resolved had we done the following:

- Discussed who our customers were **(format)**
- Tested the survey on an objective participant before we used them in the field. (format)
- Scouted out specific places to survey (process)

Always test surveys!

- Assigned specific places to group members (process)
- Decided on an optimal combination of lay vs. professional users (process)
- Decided on an optimal combination of fertilizer users vs. sellers (process)
- Offered an incentive to people (process)

We felt like the surveys were very useful, however. The most outstanding example was the breakthrough realization that users of powdered fertilizer were loyal users. (Later we would find out that these users were particularly loyal to the powdered Miracle-Gro brand.) Neither the stick nor liquid methods outweighed their loyalty to the powdered form, even though they agreed that it was messy, inconvenient, and difficult to measure precisely. (The surveys also allowed us to cluster customer needs into the latter three basic needs.) The result was that we were able to **narrow our problem** to resolving the three most persistent, unmet needs of powder fertilizer users.

Customer Prototype Feedback Surveys

When we did our second survey, we were only able to implement some of our previous realizations, due to time constraints. We implemented the following:

- Discussed ahead of time what we wanted to learn from the surveys.
- Looked up places in the near vicinity where potential participants might gather
- Offered an incentive to participants.
- Added more open-ended questions to the survey

Regardless of our preparation, survey groups reported difficulty finding not only willing, but truly helpful participants. We did provide snacks as an incentive, but were unsure how to offer them. One group reported seeing obvious signs of gratitude on their participants' faces when they initially forgot to offer the snacks and finally did so at the end of the survey process.

Lessons to be Learned

Always pretest (prototype) a survey!

In addition to the tips offered above, we suggest the following for future groups:

- Think through not only the content and format of the surveys. What is the crucial information you want? Do you want information that can be quantitatively scored, or do you need more open-ended statements?
- Think through the surveying process. Where is the best place to do the surveys? What can you do to get people to talk to you? How long will each survey take?
- When you undertake the surveying process, do so with a positive attitude. Recognize that many people will reject requests to participate in surveys. Allocate adequate time to finding good survey participants. Look for places where people are at ease and have the time to chat (Flagging someone down who is purposefully striding down the street will not get many takers.)

This is an example of specialist vs. generalist teams. A course in surveying would have taught all these things - but you figured them out.

Problem Mini-Case: Concept Selection

The Problem

We had a difficult time making final decisions to move forward with particular concepts, whether initial project concepts or final prototype concepts.

Factors contributing to the problem

- Size of group: Any group suffers from communication problems, but the larger the group (six in our case), the more likely these problems will occur.
- Gender dynamics: six *female* team members meant that we were unwilling to disturb group harmony by making a decision that was not supported unanimously.
- Group dynamics: the group was heavily weighted with strong personalities, each with an opinion.
- Decision-making Processes: we had not come up with a clear process for making final decisions.
- Time: a proliferation of ideas kept coming without any clear-cut timeline for closing the door to new ideas.
- Group Experience: for example, the fact that no team member with engineering experience hindered our ability to evaluate suggestions for feasibility.

How did we deal with the problem?

We split the group into two to perform **parallel processing** on two different occasions: the initial concept selection stage (fertilizer problem vs. parking lot problem) and at the intermediate concept selection stage (disposable fertilizer solution vs. fertilizer grabber). In addition, we imposed a strict time limit on both occasions to perform the appropriate research and testing of ideas, with the explicit mandate for each group to have a recommendation when we reconvened.

Analysis

A key strength of our group was a remarkable ability to be flexible. However, the Achilles' heel was the group's hesitation to make concrete decisions that would necessarily leave some ideas behind. Group members were prolific in dreaming up new ideas, and were equally convinced of the merits of their respective ideas. While our decision to parallel process was the **key to breaking through an impasse on two different occasions**, however, we recognize it could have backfired. For example, we were probably ill-prepared for the scenario in which both groups returned to the bargaining table with conflicting recommendations.

In the first split, when we were choosing between the fertilizer project and the parking lot project, we had reconciled ourselves to the possibility that the two groups might find equally positive results for the discrete projects. We decided that we would be content to split into two groups. The Fertilizer Group actually moved forward based on this assumption. As a result, they were unprepared to catch the other group up on a week's worth of activities and brainstorming.

In the second split, when we were choosing between going with a disposable fertilizer packer vs. a better way to extract fertilizer from a container, we again were unprepared for the scenario that each group would recommend following through with its respective concept. We were fortunate that the "disposable" group returned with a recommendation to move forward, while the "grabber" group returned with the recommendation of not moving forward with that idea.

Lessons to be Learned

Of the six factors contributing to our problem, there were many over which we had no control, such as gender and group dynamics. We do, however, offer the following future recommendations:

Group size:	Optimal size: 4-5.
Gender dynamics:	Recognize the dynamics and have patience.
Group dynamics:	Again, recognize the dynamics and have patience. It is rare that teams are comprised of the perfect mix of personalities.
Decision-making Process:	Establish ground rules from the beginning for making final decisions.
Time:	Establish a clear-cut timeline from the beginning. Once our GANTT was developed, we used this as our deadline-setter, including deadlines for ending the concept generation process.
Group Experience:	Vary the group to include team members with different experience/strengths/background, i.e., engineering, finance.

Individual Post-Scripts (in alphabetical order)

Patty Burleson

PDPD is incredibly time-consuming, whether your product requires technical expertise or not. In fact, the level of technical expertise required for the production of the prototype really does nothing to ease the overall time requirements of the product design process, it just determines where the bulk of your time will go. I started out a little disappointed to be working on what I considered a fluffy project at first. However, I learned that a well-designed product is a well-designed product. The process inevitably takes into account many factors, some more subjective than others, but all important to a quality final product. I would still say to those who do not have engineering experience to use the opportunity to learn something new, rather than shy away from a challenge. All within reason, of course. Roger wouldn't let you undertake a project that he didn't see as feasible within the allotted time frame. In the end, though, the class provided an incredibly rewarding and holistic learning experience. I still don't get thrilled looking at the fertilizer lollypop. Its cute, it makes sense, I feel good about it, but the learning that the lollypop represents is the most important thing.

As for team dynamics, I was lucky. Despite me, they were great. I personally hate group projects for several reasons. I put a premium on efficiency. I like to work autonomously and tend to be impatient when I feel another person is not thinking through a problem in the most efficient manner. I see little value in whole-group activities that could be accomplished by a

single person or in smaller sub-groups. I also hate group projects because I draw a strict line between work and play. I want to work from morning to night during the week, if need be, but I don't want to see anyone on the weekends unless it is to go out. Interminable group meetings that spill over to the weekend annoy me. And I'm stubborn and like to have my own way.

Yet regardless of my personal preferences, this project required lots of group activities, group decisions, group meetings, and even group meetings on the weekends. It also required lots of compromise and negotiation. The fact that all the women on the team are personal friends did not even help. Yet in the final analysis, the team experience was also the most worthwhile of any I have encountered while at IRPS. In the past I have been fortunate to be able to work alone, or to lead teams and thus to delegate as I saw fit. By contrast, in this situation I was forced to work within the dynamics of a more egalitarian group. The result was learning to be patient and relax. I learned that if I felt strongly enough about something, I would have to negotiate to get my way. I would also have to prioritize my battles, and compromise on points that were not as important to me. In the meantime, I did have fun, even if we were supposed to be working, dammit.

Rebecca Griffith

I would like to start by saying that I highly recommend taking this class. It's true that it is extremely time consuming, challenging, and at times nerve wracking, but it will also be one of your best learning experiences at IR/PS. While it is difficult to take a ten-week project and condense it into just a few "take-aways", the following is my top five list of recommendations to future students:

1) Read the book (or at least skim it) within the first couple weeks of class. You will find that this class is extremely end-loaded. While the reading assignments are spread throughout the quarter, it will behoove you to at least skim the entire book in the beginning – while you have the time! Some of the chapters may have little meaning at first, but as the project progresses you will be glad that you are at least familiar with concepts such as: performance specifications, concept selection, design for manufacturability, trade-off decisions, and product development economics. This is not to say, however, that you should follow the book step by step without eliminating anything. Our group, for example, did some things out of order and skipped other sections all together. Part of understanding trade-off decisions is knowing that it is OK to cut corners (as long as you are cutting the right ones)!

2) Know your team members!!! Team dynamics is one of the most interesting things about this project. Our group was comprised of 6 women whose personalities and past experiences (i.e. work experience) were all very different. While we did have our moments of frustration, we had an overwhelmingly positive experience. Rather than ending the quarter not speaking (as we have heard happened in the past) we actually became better friends as a result of this project. Our success as a team stemmed from the fact that we got to know each other very well, and, as a result, could understand where one another was coming from. We also respected each other and valued what each of us brought to the table. All of these factors allowed us to play off each other's strengths and to work well as a team.

3) Recall that almost everything takes longer than you think it will. $(5T+10)^2$ Take how long you plan to spend on a specific task, add ten, multiply it by five, and then square it!!! OK, this may bit a bit of an exaggeration, but developing a new product (and doing it well) is very time consuming. It is alleged that students always underestimate the amount of time it takes to ramp-up, take a product to market, and capture the optimal market share. I would apply this same theory to completing projects. It is better to assume it will take you longer and to be pleasantly surprised when you complete a task ahead of schedule than to consistently miss milestones. Disclaimer: This advice is NOT to be mistaken for a management style (I Sing the Body Electronic), it is simply a way of managing expectations within the context of this class.

4) Keep in mind the goal – to create a **"gee-wiz"** product. One of the most helpful things that Roger said was: "When you're done, if you've succeeded, your product will seem embarrassingly easy." Result = The *Plant Wizard* pre-measured, disposable fertilizer wand! Think of how EASY incredible athletes make their sport look…if you've done a good job it won't be obvious that you missed nights of sleep and agonized over your product.

5) HAVE FUN! This is, in my opinion, one of the most important things to remember in order to make PDPD a POSITIVE learning experience. Maintain a good sense of humor! Our group took the project very seriously, but we never had a problem laughing at ourselves. So, if it's 2 a.m. and your concentrating **very** hard to ensure that you apply the appropriate pressure to the vitamin cap so that the heat from the coffee maker makes a good seal around the success rice paper -- take a moment to stop and think about what you're doing and recall that it's frequently very healthy to NOT take yourself too seriously!

Rachelle Kotrba

I thoroughly enjoyed the class. I knew going in that it would require a lot of work, but I believed it was a class worth the time and effort. Many members of our six-person group had worked together on previous projects, so that was a bonus on my end. We all seemed to share the common goal of learning as much as possible. Working toward a grade was never the issue. This is always true in PDPD. I wonder why, and how to replicate it.

Problems with team dynamics were never an issue, although frustrations are inevitable due to strong opinions formulating from six different women. We did, however, learn to compromise and set guidelines and timelines, which some members had a harder time following than others.

Scheduling problems never reached an extreme either. I did not, however, so much enjoy the Sunday evening sessions, but that was due to my own schedule. It became apparent about halfway through the project, when the workload increased, that Sunday evening was another good time for everyone to meet. However, I work Thursday – Sunday, with Sunday evening being my only chance to re-group for the upcoming week. Some members view Sunday as the beginning of the school week, while I view Sunday as the end of a very long school - and work – week. Considering this time worked well for others, and everyone else was juggling hectic schedules as well, I tried not to let it pose a major personal problem for me. Whether it happened only 2-3 Sundays due to my resistance or for some other reason, I am glad it was kept to a minimum.

For the first eight weeks all six of us were on the same page with everyone pretty much knowing what everyone else was doing. This was not so much the case in the final two weeks. While a division of labor was inevitable to do each part well and to finish the project, toward the end I felt too distant from some segments. We sent emails and shared some drafts, but I was always wishing to re-group in that last week or so, to catch *everyone* up on all the progress. Were we individually going in the right direction? Was too much detail placed on particular issues? Too little? Were we becoming too personally wrapped up in the issues? Could we somehow be more efficient? There was, however, already the division, and up until the final night many of us did not know the final results of some segments.

Looking back, I would have been more direct and insistent on taking the time to get everyone on the same page, offer input, etc. Our group has not suffered personally, but in terms of efficiency and time constraints, a more productive approach could have been implemented.

Agatha Petacci

So here we are (everything becomes WE after spending over 150 hours together!) at the end of a long quarter of hard work and valuable rewards ... and I am at a loss for words...at least for a few seconds!! I guess the most important thing to say is that even though this class took an incredible amount of time, I never really resented it. Being quite practical and enthusiastic about learning useful skills, this course was a great hands-on experience for me. What I learned has helped me to recognize the effort that goes into a lot of the products and services that surround us and I look forward to applying the tools we gained to a my own job some day. But beyond the work skills I've gained, I am thankful for the people I had the opportunity to learn them from. I am not just talking about Roger (our Prof) but also about my five teammates. In the course of 10 weeks I have learned from seeing them at their best and at their worse (not a typo!), shining during a presentation, cracking under pressure, beaming with ideas, shying away from the team , patiently listening to one another, and abhorring numbers! The marvelous thing is that even though they saw the same from me, I have yet to hear one word of negative criticism from any of them! And that is what made this a great class! We all worked with one another, empowered by and aware of our talents and imperfections – exactly what it takes to work well within any team, be it work, school or a sports team. Like in 'I Sing the Body Electronics', 'The Goal' or other team success stories, two minds work better than one, and good team can work wonders (even without any number or technical skills! Ha!). Thanks for a great quarter!

Natalia Porto

Oh, you cannot imagine how I was "boiling" when I came back from the summer break. No classes on Latin America or comparative public policy again! And now I am forced to take these business courses with strange names. How would you like to have all these OPSs and PDPDs on your schedule?

At this time I didn't.

- I didn't like all these buzz words to start with.

- Or textbook's revelation such as "Pre-production prototypes are the first products produced by the production process".
- Or this weird fertilizer product I didn't understand and didn't care about.
- And finally the professor who makes you think that you are signing for a torture class and whom you mandatory need to call Roger.

God, I was heading for something too incomprehensible.

Now when the quarter and all our PDPD efforts are nearly over I am ready to admit that I got used to this class and even more..... I LOVED IT! I loved it for its rapid pace, for the creativity involved in each step, for the small size of class where everybody was listened to and cared for. I certainly appreciated the knowledge received and the fact that I am finally able to "format" my future professional moves.

The contract book and the present case analysis would most probably answer all the reader's questions about the product and its evolution, the prototypes and Gantt charts, the pressures and the highlights of the course. I am sure that future PDPD people will quickly figure out how to cope with the novelty of course's topics and how to use textbooks and cases in their favor. They will also rapidly learn how to convince Roger to like their product and consequently how to solicit all the knowledge and energy he is capable to render (and believe me it is quite a lot!) What I want to offer here is my insight on why you need to take this course.

We, IRPS students, come from very different backgrounds and many of us are ready to shift to a completely new field of work. We enter our second year of IRPS smarter and more knowledgeable, but still incredulous that we are capable of taking this new path. We dread the job interviews because we do not feel completely prepared for the new challenges. We possibly feel that the knowledge is still insufficient. In my point of view PDPD can become an extremely helpful mechanism at this very moment.

Most of you will come to this class with a very shaky idea of what the course is about. You will be expecting some "academic" learning time but it will not be given to you. From the very first week you will be thrown in the product development team, with a mission to deliver a product in ten weeks. There will be no excuses for procrastination. You will be constantly pushed towards yet another milestone. In fact, very soon you will not need this push – you will be expeditiously moving towards the final product by yourself. And you will make it! You will be surprised and proud to see that you not only completed the project, but that you produced the contract book which can become your companion in the job interviews. You will feel a great sense of accomplishment and will start valuing yourself higher. And that is what I praise PDPD for!

A couple of words about our group. I strongly believe that PDPD students of the years to come will have all the reasons to envy us.

- We were a huge group – but six of us managed to work the schedule so splendidly.
- We were all extremely busy and faulted a couple of times on our promises – but never-never the colleague was charged with doing less or not on time. On the contrary, everybody was ready to assist and take over if necessary.

- We had "concept clashes" – but the arguments were always listened to and considered. The criticisms were never taken personally. This energetic offering of your idea combined with respecting the ideas of others moved us rapidly to the best concept, the best execution mode.
- We were strong, smart, original and kind to each other. And that is why we made it!

Thank you to my teammates and classmates and, of course, to our "external consultant" Roger and good luck to future PDPD inventors!

Erica Roberts

This has certainly been both a rewarding and a challenging experience. The project gave room for creativity, and unlike many other academic classes, I am walking away feeling like I learned something useful rather than just more theory. I now look at products in a new light and am constantly evaluating industrial design and thinking about better and alternative concepts for great solving a problem. The process of creating our product also strengthened my understanding of teamwork, the importance of organization, time management, and delegation of responsibilities.

I have decided to highlight the issue of teamwork because I feel that it was a critical factor in our success. After reading previous groups disaster stories we were especially cognizant of the importance of teamwork. We began in complete disagreement on which project to pursue. After a brief split up, we came together once again - all committed to solve the problem of messy fertilizer. Throughout the process we worked particularly well with one another and were able to reach decisions in a consensual manner. Each decision was made only after everyone's input was considered and to my knowledge everyone felt like they were actively involved in each step of the process. We did not skip any steps and if anything, we spent more time than necessary to ensure that we were adequately approaching the process from different perspectives. Everyone contributed what she felt she could and it was understood if someone had a previous engagement. This worked particularly well because no one was a free rider and if anyone had any problems with their particular part there was always someone to contribute what they could. As our team operated in a particularly consensual manner, which by nature tends to be more time consuming, I must say that there were times when I felt a bit anxious to speed up a decision and move on in the interest of time.

Additionally, our team was characterized with a high level of attention to detail. While I also care about producing a quality product, I am also juggling lots of different time consuming activities and try to prioritize my activities. Thus especially toward the end I found myself noticing more and more that we were spending time on things that I found to be of little importance. Particularly, when we were altering our spreadsheet for the 15th time I began to realize that I am not a person who places high importance to perfection when I have spent two consecutive nights in the computer lab until midnight. Other members of our group however, felt that we needed to turn in a report with perfect numbers despite imperfect information. However, despite these differences in working styles, our team remained supportive and helpful to one another to the very end.

Yes. It's the nature of prof. life that there is never enough time to be thorough about everything

The only advice that I might be able to offer future students is to realize when the point comes that the returns to hours put into the project exceed benefits reaped. There is a point when

attention to detail must be forsaken to maintain a balanced life. This project is one class and must be kept in perspective. To the professor, I might reiterate that I found the presentation to be difficult because we were not presenting on what we had been so carefully working on all quarter – product design and development. Rather we were trying to pull numbers out of the air, make them look credible and defend them in front of experienced businessmen. Maybe, somehow, the presentation could reflect a bit more the actual design and development process.

I can ask ~~for~~ 5 minutes first on methodology.

But, there is a lesson in the way we did it. "Good design" per se is of limited value. You must also come up with something that can be profitably implanted.

Great job. Interesting reading, educational. Great job of deriving lessons from experience. The only gap is that you do not tie your experiences & lessons to outside knowledge. For example, analogies to situations in other cases.

But, given how little time was spent in class on other cases, this is inevitable. It's a flaw in how I implement the course. Maybe I'm too results oriented – Toni's concern.

APPENDIX A: Concept Selection Matrix

Condense to an average?

*Selection Criteria**	CONCEPTS Tea Grabber	System A	Current Method (reference)	System B	Pre-measured, Disposable	Diffuser Cap
Manufacturability	++, 3 x +	4 x 0	4 x 0	2 x 0, -, +	4 x ++	4 x -
Ease of Measuring	++, 3 x +	2 x -, 0, +	4 x 0	2 x -, 2 x 0	4 x ++	4 x ++
Ease of Mixing	4 x ++	4 x 0	4 x 0	4 x 0	2 x ++, 2 x +	4 x ++
Degree of Mess	4 x +	4 x +	4 x 0	4 x +	4 x ++	4 x +
Humidity Resistance	4 x 0	4 x +	4 x 0	4 x +	4 x +	4 x -
Convenience	2 x ++, 2 x +	3 x 0, +	4 x 0	2 x 0, -, +	4 x ++	3 x 0, +
Operates as One Unit	4 x +	4 x 0	4 x 0	4 x 0	4 x +	4 x +
Cost	4 x 0	4 x - -	4 x 0	4 x -	4 x 0	4 x 0
Size	4 x 0	4 x -	4 x 0	4 x 0	4 x 0	4 x 0
Sum +'s	32	10	0	10	46	25
Sum 0's	12	16	36	18	8	11
Sum –'s	0	14	0	8	0	8
Net Score	32	-4	0	2	46	17
Rank (1 is higher)	2	6	5	4	1	3
Decision	**Consider**	Eliminate	Eliminate	Eliminate	**Consider**	Eliminate

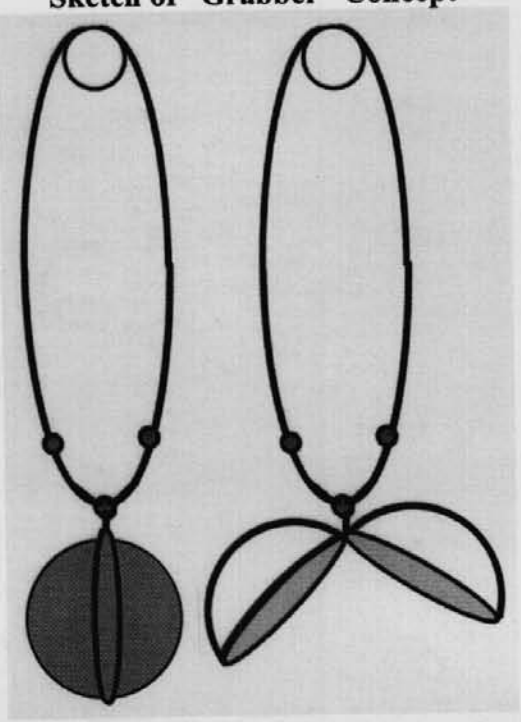
Biggest variation

* In an effort to differentiate and more accurately rank the concepts a scoring system of ++, +, 0, -, or - - was used to score the concepts on each of the selection criteria (++ is the highest score and - - is the lowest score). Each concept also received 4 votes, as four group members were present during the concept selection process.

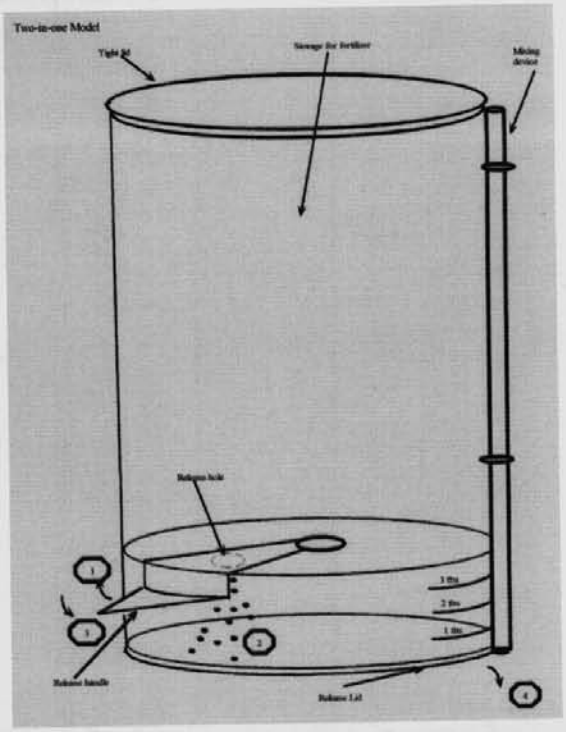
The 2 really stand out.

APPENDIX B: Examples of Concepts Considered

Sketch of "Grabber" Concept



Sketch of System B Concept



APPENDIX B (CONT)

Sketch of System A Concept