A COMPREHENSIVE TOOL TO PRIORITIZE MULTIPLE

ENGINEERING R & D PROJECTS

Except where reference is made to the work of others, the work described in this thesis is my own or was done in collaboration with my advisory committee. This thesis does not include proprietary or classified information.

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Srinivas Kummarasetti

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A COMPREHENSIVE TOOL TO PRIORITIZE MULTIPLE ENGINEERING R & D PROJECTS

Srinivas Kummarasetti

A Thesis

Submitted to

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A COMPREHENSIVE TOOL TO PRIORITIZE MULTIPLE

ENGINEERING R & D PROJECTS

Srinivas Kummarasetti

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Signature of Author

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Date of Graduation

VITA

Srinivas Kummarasetti, second of three children of Subhash and Prabhavathi Kummarasetti, was born in Vijayawada, Andhra Pradesh, India on August 19, 1977. He grew up in various towns, including Vijayawada, Tanuku, Kondapalli, and Rajahmundry in Andhra Pradesh, India and graduated from Nalada Residential Junior College in 1994. He first joined the Bachelor of Science program at Rajahmundry, but moved on to the Bachelor of Engineering program in Mechanical Engineering at S. R. K. R. Engineering College, Bhimavaram, AP, India, graduating in July, 2000. He then joined the workforce at Southern Structural Systems, Bangalore, India for a year, after which he entered the Graduate School at Auburn University in the Department of Mechanical Engineering, graduating in December 2005 with a Master of Science in Mechanical Engineering.

THESIS ABSTRACT

A COMPREHENSIVE TOOL TO PRIORITIZE MULTIPLE

ENGINEERING R & D PROJECTS

Srinivas Kummarasetti

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Directed by P. K. Raju

When trying to allocate funds to different projects, people encounter many situations where they need a methodology that can address the issues that arise and provide a quick solution. In the case study described in this thesis, Sanjeev Kumar, CEO of Superstar Specialties, Inc., was faced with a decision on how to allocate resources among fifteen proposed R&D projects that were slated to start in August 2005. The board had allocated him $4.91 million to spend on R&D for the next budget year. As the CEO of a $400 million company with five business units, Sanjeev had to choose the best prospects from among the different R&D projects that had been proposed.

A research methodology specifically designed to assist in such decisions was developed for this case study. This type of methodology is often used when the questions being posed are “how” and the focus is on how to make profits. This tool will serve

primarily to prioritize projects based on company wide uniform metrics. The particular type of case study chosen to present the analysis was an embedded single-case design.

Sources of data for case studies may come from documents, computer software, market research, direct observation, and participant-observation. This investigation utilized all of these methods, with the exception of market research. The data and methodology were provided by Dr. Earl Wagener, the CEO of Tetramer Technologies, and interviews were conducted to further analyze and explain aspects of the problem. This research conclusively demonstrates the importance of prioritization of projects and also shows how measuring and weighting different projects based on company wide uniform metrics can be helpful.

ACKNOWLEDGEMENTS

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Style manual or journal used: Modern Language Association .

Computer software used: Adobe Premiere, Macromedia Dreamweaver and Fireworks, Microsoft Word and Excel. .

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OBJECTIVE

This thesis has several objectives, namely:

- A discussion of how companies make choices among multiple projects constrained by limited resources and the need to prioritize them
- To understand the relationship between company wide critical success factors, their relative importance, and how these are used in prioritizing projects
- To analyze multiple R&D projects using the Business/Project analysis tool
- To communicate recommendations, negotiate with others, and produce a final list of prioritized projects that will best ensure business success.

In real life situations, companies (and individuals) have to make many choices, for example they may have to choose the best project(s) which would maximize profits for the company. However, due to limited resources it is often necessary to make choices based on existing knowledge. In this thesis, the case study demonstrates that in spite of many projects having been proposed, due to limited resources Superstar Specialties had to choose only a few projects for funding.

When prioritizing projects, every project has its own metrics, or measuring units. However, when comparing different projects it is helpful to use common metrics so that the projects can be easily compared. In order to use a company wide set of uniform

metrics, it is necessary to understand the relationship between the different factors that govern a company. The critical success factors must be identified from among the issues that arise when the project is first proposed, and/or additional issues that may arise once the project is underway. Understanding the relative importance of these critical success factors is very important.

Superstar Specialties is pursuing fifteen projects in each of its segments, although for simplicity only one project being pursued in one segment will be considered here. These projects can be used to evaluate the prioritization process using the tool developed for this study. An extensive discussion actually took place during the prioritization process, but this case study is designed as five days of discussion.

Once the prioritization of the projects is complete, the next important aspect considered by the tool is to choose the right project for the company to pursue. Questions often arise due to projects that are highly rated but are performing poorly, or projects that perform well but offer only poor future prospects for the company. Also, there may be interesting projects that are popular with the company's customers but are performing badly in every other respect, and so on. Because of the numerous questions arising during this process, this will be time consuming and there will be many important decisions to be made. Managers may decide to drop projects or acquire new ones, but the ensuing discussion and decision must be based on the issues that were listed during the prioritization process.

RESEARCH METHODOLOGY[1]

The value of using a case study as a research strategy is that it looks at a decision or set of decisions in detail, examining why they were taken, how they were implemented, and with what result.

The case study research strategy generally takes the form of a series of research questions such as “how”, “why” and focuses on contemporary events. Case study research involves direct observation and systematic interviewing and some of its strength is its ability to handle a wide variety of evidence, including documents, archival records, interviews, direct observations, participant-observation, and artifacts. Case studies, like experiments, are generalizable to theoretical propositions and not to populations or universes. In this sense, the case study does not represent a “sample,” and the investigator’s goal is to expand and generalize theories (analytic generalization) rather than to enumerate frequencies (statistical generalization).

A research design is a logic that links the data to be collected and the conclusions to be drawn to the initial questions of a study. The preparation for a case study includes enhancing the skills of the investigator in appropriate areas, training and preparation for the specific case study, the development of a case study protocol, and the conduct of a pilot case study. Some principles that are important to the data collection effort in

[1] Most of the topics covered in this chapter are from Yin, Robert K., *Case Study Research: Design and Methods*, Newbury Park, CA: Sage, 1988.

doing case studies are: multiple sources of evidence, a case study data base, and a chain of evidence. With regard to the investigator's skills, many people believe they are sufficiently skilled to do case studies because they think the method is easy to use. In the words of Dr. Yin, "Case study research is among the hardest types of research to do". For a case study to succeed, a protocol must be developed and refined, and a pilot study conducted.

Figure 1 shows the timeline that was followed for this research methodology. A detailed timeline for each step of the methodology will be shown in subsequent figures.

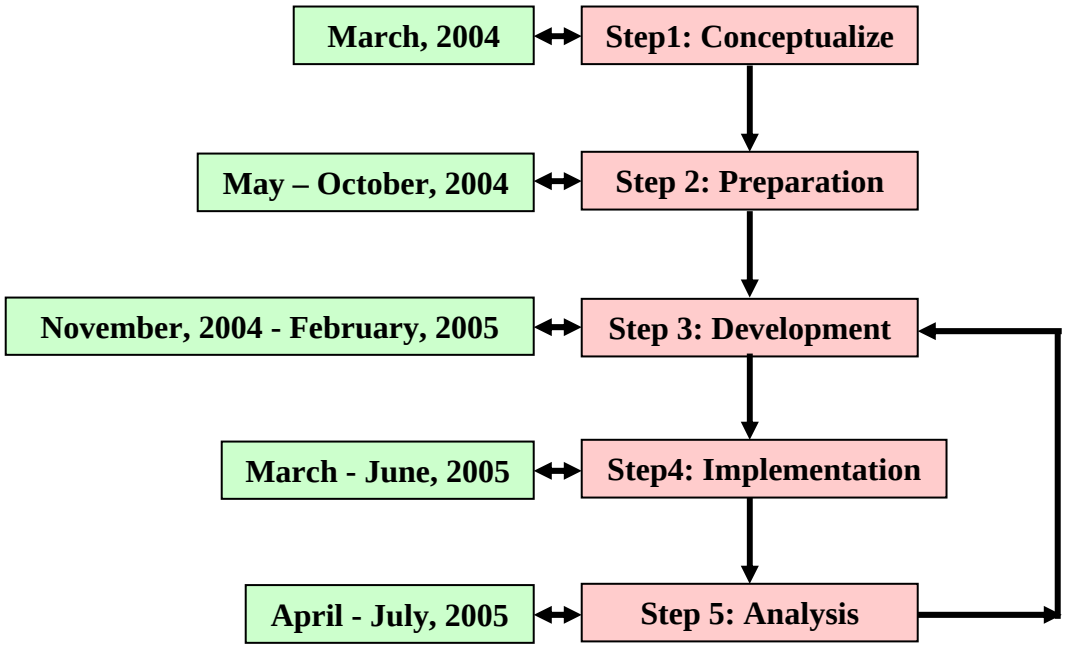

Figure 1: Designing and Conducting Case Study Research

Conceptualization for this research methodology began in February 2004, as shown in Figure 2. Discussions were conducted through visits, phone conversations, and e-mails with Dr. Earl Wagener on how to develop a "Prioritization Process" into a case study. The data for the methodology was received in March, 2004. After an explanation

of the research methodology in mid March, an initial protocol outline was created for the case study (Figure 2).

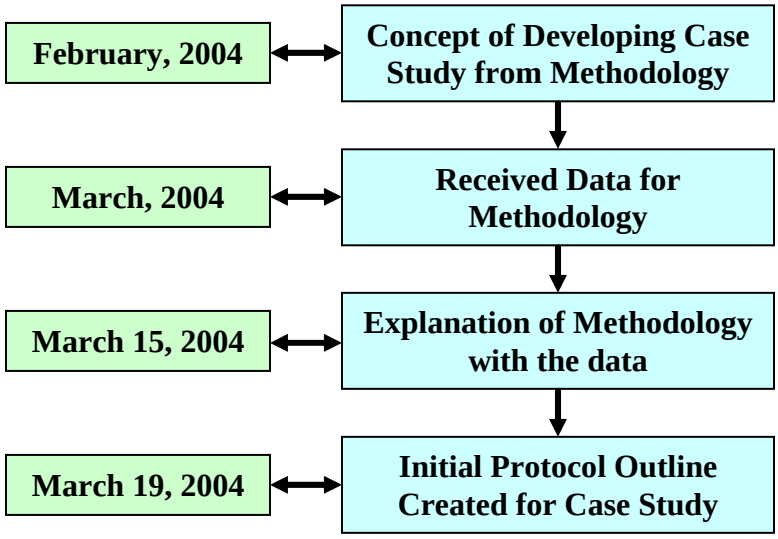

Figure 2: Detailed Timeline for "Conceptualization"

Once the case study was conceptualized, preparation of the case study took around six months, with four revisions of the case study and three revisions of the data for the methodology. As shown in Figures 2 and 3, development of the initial write-up for the case study took around two months.

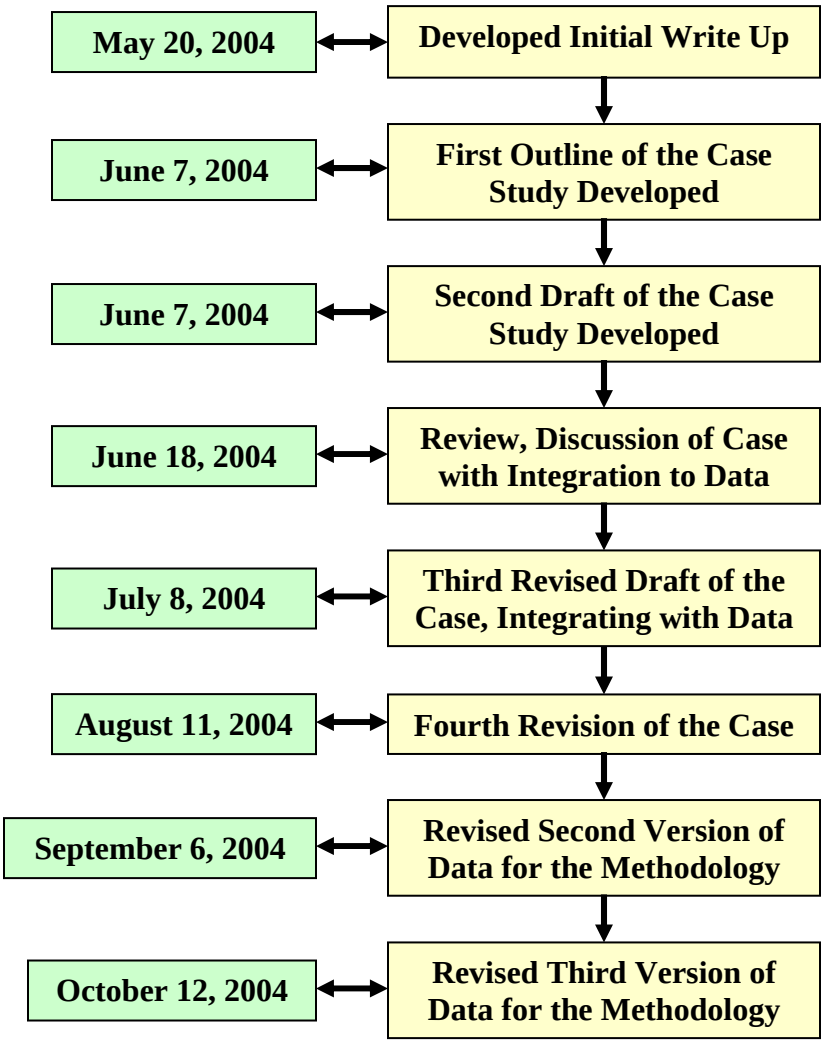

Figure 3: Detailed Time line for "Preparation for Specific Case Study"

During November and December of 2004, after discussions and revisions of the case study, an initial draft of the protocol was developed. In the following two months the protocol was integrated into the case study for implementation in classroom presentations (Figure 4). The protocol contains the procedures and general rules that should be followed in using the case study, and looks like a table of contents.

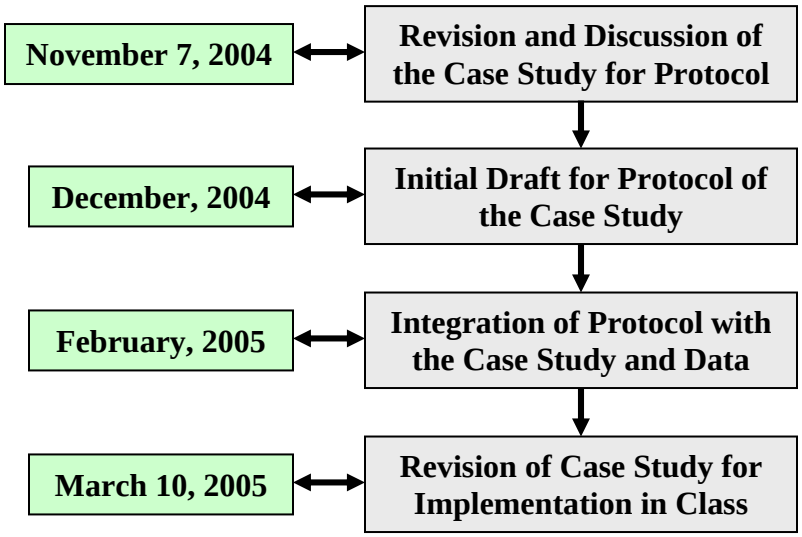

Figure 4: Detailed Timeline for "Development of Case Study Protocol"

As shown in Figure 5, the Superstar Case Study was implemented in two classes at Auburn University. More about this implementation can be found in the chapter 'Implementation of the case'. In March of 2005, the pilot case study was presented to BUSI/ENGR 3520, Integrating Business and Engineering Theories in Practice, comprised mostly of sophomore and junior level students. After preliminary analysis of the case study was performed and based on the students' comments, the case study was revised further. An abridged and modified version of the case was also implemented in STAT 2610, a preliminary course on statistics at Auburn University.

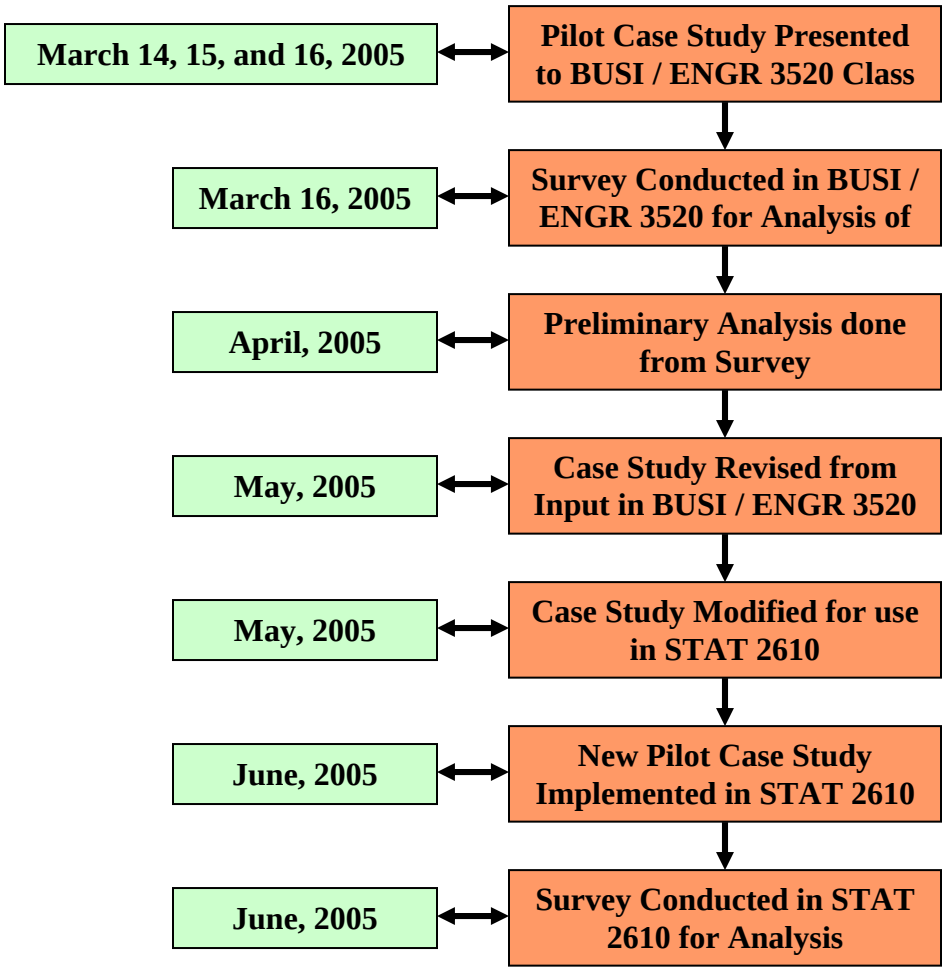

Figure 5: Detailed Timeline for "Implementation and Analysis of Case Study Evidence"

GROUNDING OF THE CASE STUDY IN LITERATURE

Prioritizing of R&D projects is a concept that is a huge concern for many companies (Figure 6). There are many books on how to manage and market R&D, but R&D prioritization has not been widely studied and most books devote only a few pages to it. There are many different ways that R&D projects can be prioritized, including the Payback Method, the Average Return on Investment Method, and Cost-Effectiveness Analysis, along with many other ranking methods. The lack of a high quality method of prioritizing R&D has led to many companies that are spending more than a million

dollars a year on R&D (see Figures 6 and 7) and having no idea how to focus their R&D costs on critical success factors specific to their company needs. With the High Quality Method of Prioritization developed by Dr. Wagener, companies will now have the ability that they need to tailor their R&D to meet their goals.

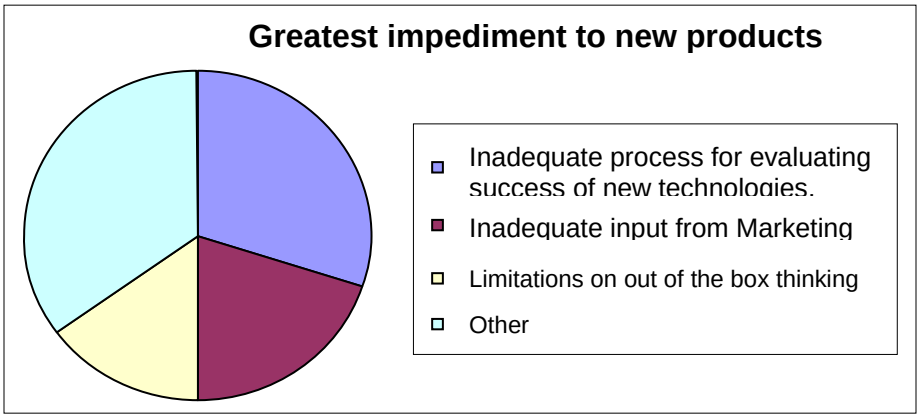

Figure 6: Greatest Impediments to New Products

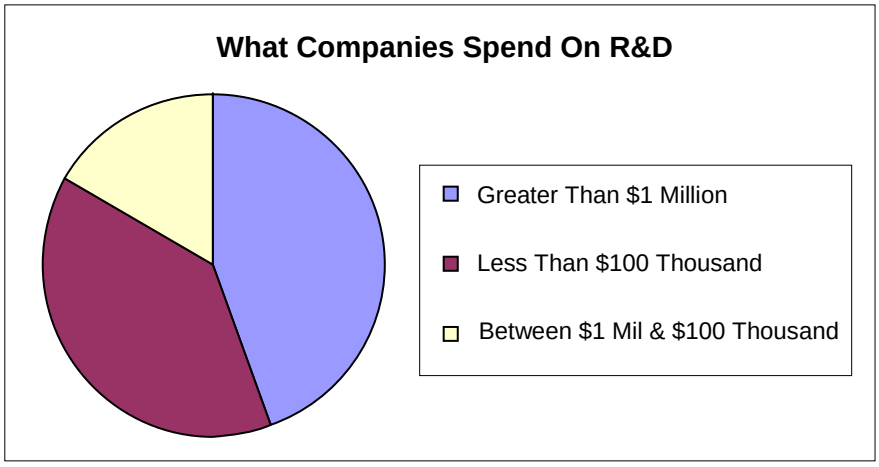

Figure 7: What Companies Spend On R&D

The charts in Figures 6 and 7 were developed using the Nine Sigma Survey on R&D, which can be found at http://www.ggcomm.com/ninesigma/NineSigmaSurveyResults.doc

METHODOLOGY FOR THE CASE

This case study was designed to study the use of a business and/or project analysis interactive tool for unbiased prioritization of business units, business segments and research projects based on organization-wide uniform metrics. After an organization has identified its internal issues, this tool can be used to compare projects in terms of a set of critical success factors. It is particularly powerful since it can be customized to include the most relevant targets that are expected to enhance an organization's business and technical success. The process is simple and straightforward, with a strong emphasis on common sense. The tool's reliance on the organization's leaders selecting the content, weight and success ranges makes it unique since it creates a company-wide uniform template that can be designed specifically for that organization's strategic goals for achieving more robust, profitable growth while improving the organization's competitive advantage in the market place.

There are three basic steps requiring an organization's involvement, consideration and consensus, as listed below.

STEP 1: Select the critical success factors that measure success for the organization

These are the critical success factors that the organization's leaders agree are the key to improvement. The actual number of critical success factors is not important,

although too many will be hard to keep track of and will also weaken the issue. Some companies use as many as fourteen factors, but most limit themselves to no more than ten. The important part in this step is that the top management should arrive at a consensus on which critical success factors, if improved, would have the most powerful effect on the organization's future. Focusing on the critical success factors is the important issue in this step.

Some critical success factors that are often used are:

1. Cumulative projected growth in dollars of profit in a particular time frame.
2. Value to the organization's customer.
3. Competitive advantage
4. Percentage profit for the last full year (or the current year projected)
5. Technical / Commercial feasibility
6. Total sales for the last full year
7. Market attractiveness
8. Total profit for last full year
9. Current development costs for the business segment
10. Strategic fit for the organization
11. Percentage sales from new products
12. Sales growth from new products over past years
13. Percentage sales overseas
14. Manufacturing quality
15. Customer service quality
16. Percentage sales goals met

For the non-quantitative critical success factors, there is a list of questions that must be discussed by each business team in order to determine the organization's ability to optimize that critical success factor. These questions have been derived from gurus such as Porter, Deming, and Moore and quickly reach the fundamental issues associated with that value. Of course, more issues can be easily added to this list.

STEP 2: Assign relative weights to the selected Critical Success Factors

This step forces the organization to prioritize the critical success factors that mean the most to the strategic direction of the company. Weights are assigned so that the total percentage for all the critical success factors adds up to 100%. For example if ten critical success factors were chosen, the weighting might look as in the example in Table 1.

No.	Critical Success Factor	Weight
1	Cumulative projected growth in dollars of profit	20 %
2	Value to the organization's customer.	15 %
3	Competitive advantage	10 %
4	Percentage profit for the last full year	10 %
5	Technical / Commercial feasibility	10 %
6	Total sales for the last full year	10 %
7	Market attractiveness	10 %
8	Total profit for last full year	5 %
9	Current development costs for the business segment	5 %
10	Strategic fit for the organization	5 %
Total		**100 %**

Table 1: Example showing weights of the Critical Success Factors

Note: These weights are examples only.

STEP 3: Assign ranges for each critical success factor.

As before, the ranges selected will be set as part of the organization's executive committee's consensus, which will give the organization total control over the process. These ranges will become the uniform template that will ease communication between the organization's diverse departments.

THE CASE

PROBLEM STATEMENT

Mr. Sanjeev Kumar, CEO of Superstar Specialties, welcomed Ms. Laura Baldwin, the vice-president of Superstar Personal Care. Laura said, “Sanjeev, I think you might have guessed the reason for my visit. As you know, personal care products require a lot of research and development. And research and development costs a lot of money. Today I came here to ask you to provide me with more funds for continuing research and development of the NOAGE Lotion. As you know this is one of the products that is in demand and is becoming really popular. We at the personal care segment are doing research to release a better product into the market.” Listening to her Sanjeev said, “Laura, it is really good to know that you are making a product that can hide age and I would like to see this product in action. We have limited funds that we can divert towards research and production. So, I have to get back to you before I can make a decision. May be we can have a meeting with all the other vice presidents.”

Meeting with vice presidents of food, and energy earlier that week, Sanjeev was in a dilemma as how to allocate his $4.91 million budget among the fifteen proposed projects that required financial resources of $7.37 million. He knew there were commercial prioritization software available in the market which could help him to distribute the board’s money to different projects effectively. These allocations have to

ensure the goal of achieving 25% gross profit over the next three years for the company. Sanjeev had to decide which projects to fund that will give him a high probability of meeting the profit goals. Also, he had to decide if any or all of the segments were achieving their profit goals and how to categorize these segments into “grow”, “maintain” or “harvest” categories. He had to choose few highly rated projects from fifteen projects, to keep his company growing. He contacted Dr. Wagener who was a pioneer in the field of prioritizing R & D projects to help him in this endeavor.

INTRODUCTION

Sanjeev Kumar, CEO of Superstar Specialties, Inc., was faced with the decision to allocate resources among the 15 proposed R&D projects slated to start in August 2005. The board had allocated him $4.91 million to spend on R&D for the next budget year. As the CEO of a $400 million company with five business units (energy, food, construction, personal care, and transportation units), Sanjeev had to decide among the different R&D projects.

He contacted Earl Wagener of The Chemquest Group, Inc. a consulting firm that specializes in using Business/Project Analysis tools to help companies choose among multiple R&D projects. Earl had worked in many chemical industries during the past 30 years and had been a Vice President for R&D at a large chemical company. As a consultant of the Chemquest group, he was available to work with Superstar Specialties, Inc.

The board of Superstar Specialties had agreed that they needed to grow the company’s gross profit by 25% aggregate over the next three years. Sanjeev called for a

five-day retreat session hosted by Dr. Wagener where he and his top management (Marketing, R&D, Sales, Finance, five units, and Manufacturing) would participate. The objective of this retreat was to come up with a prioritized list of R&D projects that would be funded by the company. He wanted to ensure that the final choices were arrived at after careful analysis, were the appropriate ones for the company to achieve its profit objectives, and acceptable to most of the top management team.

EXECUTIVES INVITED TO THE RETREAT

The following executive members consisting of CEO and vice-presidents, in alphabetical order, participated in the retreat.

- Earl Wagner, Consultant, Chemquest group.
- Frank Bennett, Vice president for Manufacturing, Super Specialties, Inc.
- Jason Green, Vice president, Superstar Transportation
- Jay Parish, Vice president, Superstar Energy
- Kelly Addison, Vice president for Marketing, Superstar Specialties, Inc.
- Laura Baldwin, Vice president, Superstar Personal Care
- Lloyd River, Chief Finance Officer (CFO), Superstar Specialties, Inc.
- Paul Woodward, Vice president for R & D, Superstar Specialties, Inc.
- Phillip Yardley, Vice president for Sales, Superstar Specialties, Inc.
- Randy Blade, Vice president, Superstar Constructions
- Roy Wyatt, Vice president, Superstar Foods
- Sanjeev Kumar, CEO, Superstar Specialties, Inc.

DAY ONE

The agenda for day one was set as follows:

- Opening remarks – Sanjeev Kumar
- Company overview – Sanjeev Kumar
- Need for prioritization process – Earl Wagener
- Projects overview – Paul Woodward

OPENING REMARKS

Sanjeev Kumar, CEO of the Superstar Specialties Company started the retreat by stating, “Dear colleagues and friends, welcome to the retreat session for the company. As you all know we have invited Dr. Earl Wagener, Director of technology analysis and planning of the Chemquest Group to help us in prioritizing the R & D projects in our company. He will help us in a five day retreat program, where we will go through a process of analyzing the R & D projects and choose the ones that are best suitable for this company. I was looking at the various proposals that were put in front of me for review and for funding opportunities. Analyzing the fifteen different projects that were proposed, I want your help in choosing the right projects that will help grow this corporation. Let me make clear that every project is worth pursuing, but due to limited funds we cannot approve all the research projects.”

Sanjeev Continued, “As I look into the proposals, the funds needed for all the projects are $7.37 million, whereas the board has budgeted only $4.91 million, for the coming year. So Dr. Wagener will help us in choosing the projects that will improve our business further. I don’t want you to be disappointed by the results at the end of the

retreat session, but work toward the improvement of the company. I think it will be tremendously beneficial for all of you to participate in the process of setting these priorities, since we will be creating uniform company wide metrics by which our business segments and research projects will be measured and aligned to have maximum impact. As you know, our previous system used individual metric systems within each business with very little real overlap of success factors other than the obvious ones of profit and sales. And even then there were differences as to how internal profit was measured. The documents produced from this retreat will help set standard strategic and tactical direction and goals for our company. These documents will provide us a live dash board to measure the progress toward achieving the 25% growth profit; we will be able to see in a transparent fashion how these projects will help the company.**”**

COMPANY OVERVIEW – SANJEEV KUMAR

Superstar Specialties, Inc. has five units which in turn has multiple segments as shown in Figure 1. Also each business segment can sponsor multiple projects under it. Figure 1 lists the units, segments, and proposed projects in the company.

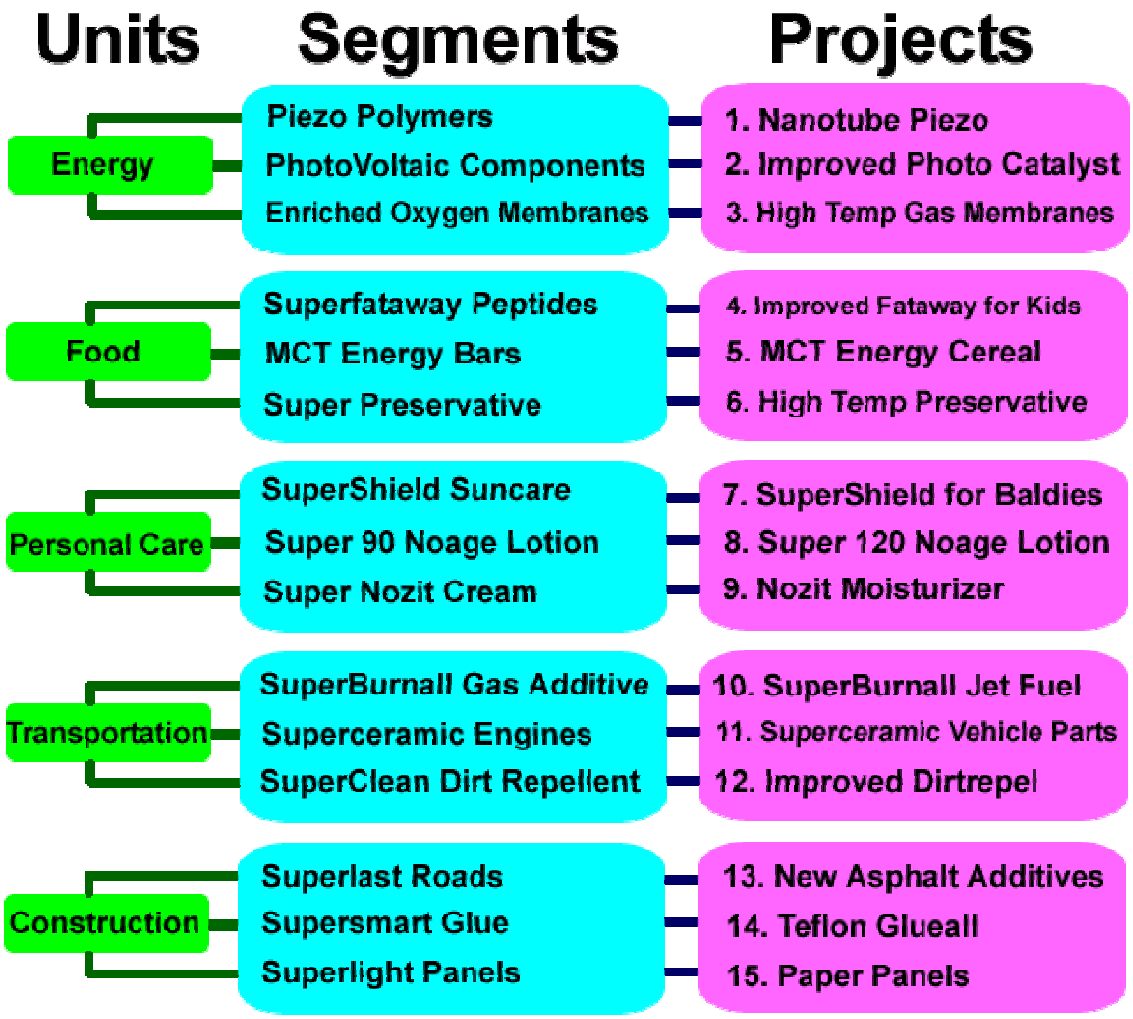

Figure 8: Units, Segments and Projects of Superstar Specialties Inc.

NEED FOR PRIORITIZATION PROCESS

Sanjeev introduced Dr. Wagener to each of his vice-presidents. Dr. Wagener stated, “Ladies and Gentleman, we have a great task ahead and limited time to achieve it, and let us jump right into the process. Venturing into new businesses, your goal is deceptively simple: to convince your internal and external stakeholders that your team can create and maintain a competitive advantage for which real, live customers will be motivated to pay real money to you instead to your competition. The methodology that I am going to show will help in analyzing your projects, shows the business opportunities and ultimately show you the projects that will provide competitive advantage. The methodology is particularly powerful since it can be customized to include the critical success factors that are most relevant for your business.

Before proceeding any further, let me emphasize that, once established using a consensus process, the methodology will then be independent of individual influences. Individual disagreements will be actively considered, discussed and then voted on. What I have found is that the usual arguments are resolved by placing suitable ranges on what is “success” and what is “failure”.

The process is simple and straightforward with a strong emphasis on common sense, yet it is reliant on Superstar Specialties leadership selecting the critical success factors, their weightings, and their success/failures ranges to make it unique. The method creates a company-wide uniform template specifically for Superstar Specialties to achieve the strategic goals of achieving more robust profitable growth while improving competitive advantage in the marketplace.

All of you in the Executive Team will be involved in this process. I will give comments and suggestions as and when necessary. You will be frustrated at times, but if you are patient and work with me and your colleagues, I can guarantee that you will obtain value by attending this retreat. So, with all the executive members present, let's start with the process. Would you please state which projects you prefer before proceeding further?"

Paul, VP for R & D stated, "I want to say that the projects HIGH TEMPERATURE PRESERVATIVE, NEW ASPHALT ADDITIVE and SUPER SHIELD FOR BALDIES, are the projects that I want to be funded, they look like very good projects to me and will give very good market value to the company. Also I should add that the projects SUPER 120 NOAGE, and NANOTUBE PIEZO POLYMERS are also very good projects that we can pursue further."

Listening to Paul, Roy, VP for Food segment, chipped in, "I would say that IMPROVED FATAWAY FOR CHILDREN and MCT ENERGY CEREAL BAR are also good projects along with HIGH TEMPERATURE PRESERVATIVES. The names of the products indicate that when the projects will be operational, it will give us large profits."

Laura, VP for Personal Care segment said, "NOZIT MOISTURIZER will also be a perfect product to be funded, also I am in total agreement with Paul that SUPERSHIELD FOR BALDIES and SUPER 120 NOAGE will be good projects. But I do not deny the fact that IMPROVED FATAWAY FOR CHILDREN and MCE ENERGY CEREAL are also good projects that can be pursued."

Dr. Wagener sensed that every person in the room wanted to argue for their own project and also that the vice presidents came up with projects that they liked. He said, "Colleagues, let us not argue about the priorities of the different projects at this time. The methodology will make things more transparent over time. It will help me if someone can brief the executives here about the different projects that are under consideration."

Immediately Paul, VP for R & D said, "Being the vice president for the R & D projects, let me introduce the executives to the different projects that are in the research stage and I will briefly state the purpose of the projects."

PROJECTS OVERVIEW – PAUL WOODWARD

Paul Stated, "We have five different business units and each unit is sponsoring at least three different projects. I will explain each proposed project in these units. The segments and the potential projects in the energy unit are shown in figure 2."

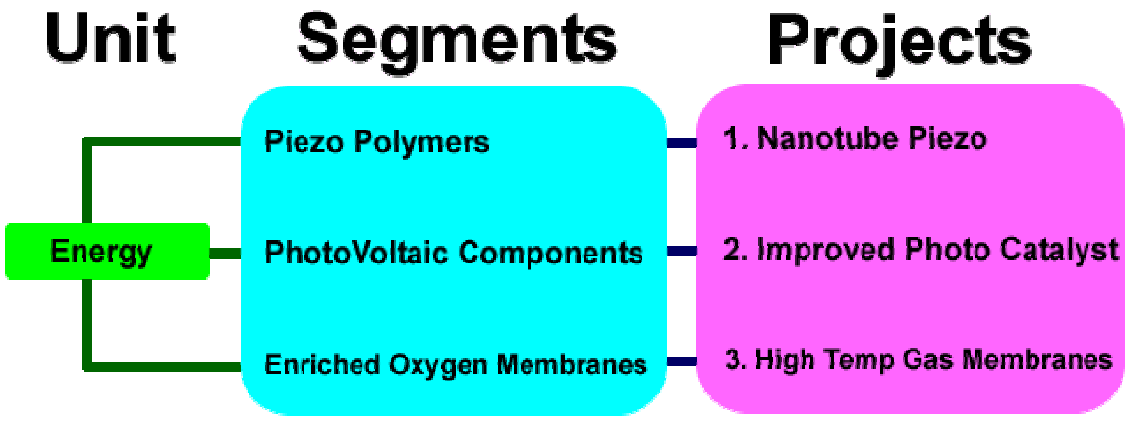

Figure 9: Overview of Business Unit Energy

PROJECT 1: NANOTUBE PIEZO

Paul, VP for R & D stated, "Let me start with business unit Energy as shown in figure 2. Piezo polymers create electricity from mechanical motion. The research project

is to put nanotubes inside a piezo polymer and get a greater response from the polymer than it would have from current commercial piezo polymers. For example in automobiles tires vibrate, wind shield slightly vibrates, and the panels on the side vibrate as you drive along. You can put a piezo polymer in these places and you can create electricity as you drive. Any place with vibration you can generate electricity. So the objective of this project is to blend nanotubes into polymers thereby developing products that provide competitive advantage for us."

PROJECT 2: IMPROVED PHOTO CATALYST

Paul continued, "The second project is IMPROVED PHOTO CATALYST. Photovoltaic components do not use fossil fuels or nuclear power to generate electricity, there by reducing the emissions that contribute to global warming. In IMPROVED PHOTO CATALYST we are developing technology that can produce electricity efficiently and quickly."

PROJECT 3: HIGH TEMPERATURE GAS MEMBRANES

Talking about the third project HIGH TEMPERATURE GAS MEMBRANES shown in figure 2 Paul said, "How could you make the membrane operate at a higher temperature? Because there are many places where there hot gases are coming out and safety engineers want to improve the ability to get oxygen out and it is possible with membranes that are made of plastics, ceramics or high TG polymers? The project is to identify the materials that can achieve this purpose."

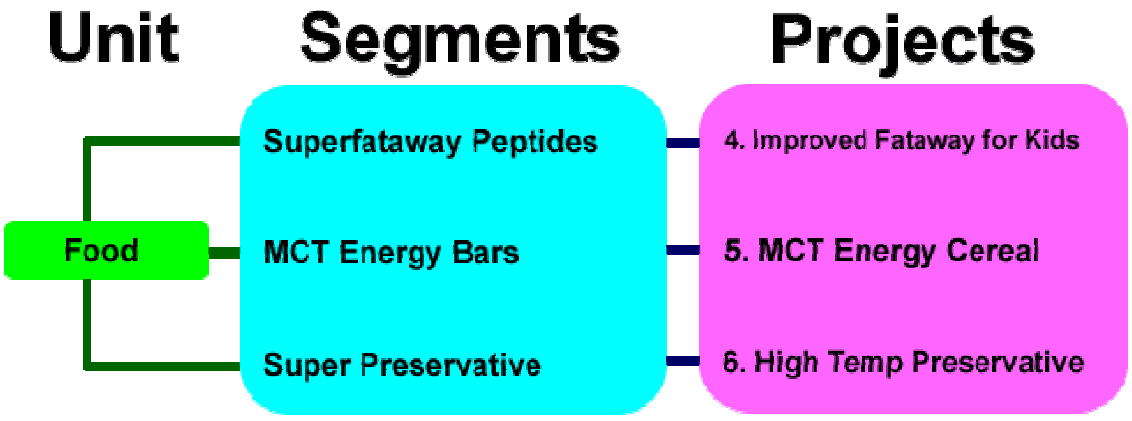

Figure 10: Overview of Business Unit Food

PROJECT 4: IMPROVED FATAWAY FOR KIDS

Paul continued, "The next business unit that is proposing projects is Food as shown in figure 3. The project we are looking at is IMPROVED FATAWAY FOR KIDS. Everybody is worried about becoming thin and pose a question, how do you actually take a pill and lose weight? And there are many rather sophisticated ways to do that and the idea of this team is to have an overall superfataway product."

PROJECT 5: MCT ENERGY CEREAL

Continuing the discussion, Paul said, "The fifth project that we are considering is MCT ENERGY CEREAL as shown in figure 3. MCT's or medium chain triglycerides are very high energy short chains molecules. This particular fat is from triglycerides which burn very rapidly and gives you the same amount of energy but do not add to weight or the choleric weight and certainly reduces cholesterol as well. And now the question is can we make a cereal out of this medium chain triglycerides?"

PROJECT 6: HIGH TEMPERATURE PRESERVATIVE

Talking about the sixth project HIGH TEMPERATURE PRESERVATIVE as shown in figure 4 Paul said, “In many cases, we are worried about foods. The main concern here is about the preservatives from the stand point of bacterial growth. At higher temperature the preservatives break down, so do we have any preservatives that can withstand higher temperatures?”

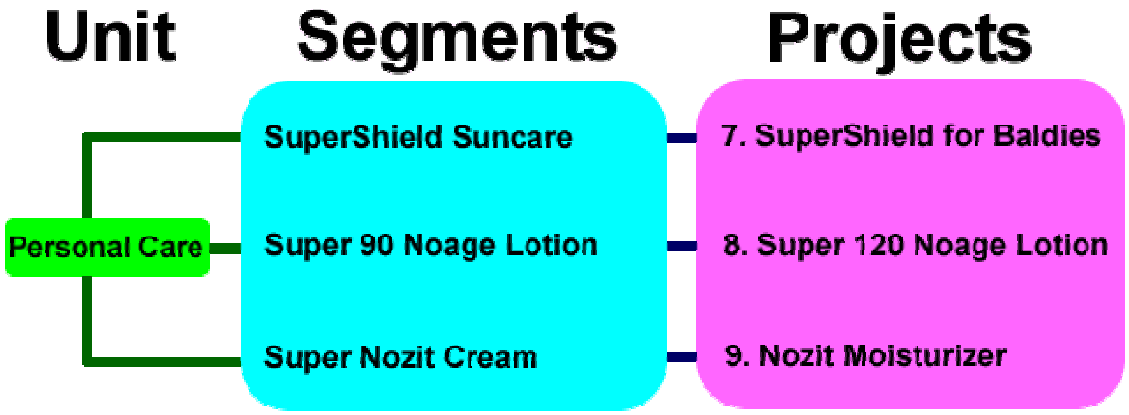

Figure 11: Overview of Business Unit Personal Care

PROJECT 7: SUPERSHIELD FOR BALDIES

Talking about the next unit, personal care, as shown in figure 4 Paul said, “In Personal Care people are worried about melanoma. If we develop SUPERSHIELD FOR BALDIES as an extension of our proprietary sunscreen technology then we may have a successful product.”

PROJECT 8: SUPER 120 NOAGE LOTION

Paul continued, “Age lotion is a huge and probably a profitable type of market, everybody is getting older and nobody wants wrinkles. We have got the super 90 noage

lotion that should be good up until age 60 and the project SUPER 120 NOAGE LOATION is shown in figure 4 is to hide wrinkles up to age 90."

PROJECT 9: NOZIT MOISTURIZER

Talking on project 9 Paul said, "I've got a teenager, she is so worried about zits and this product is targeted at this market. The project NOZIT MOISTURIZER will have moisturizing effects on the skin as well as remove the zits."

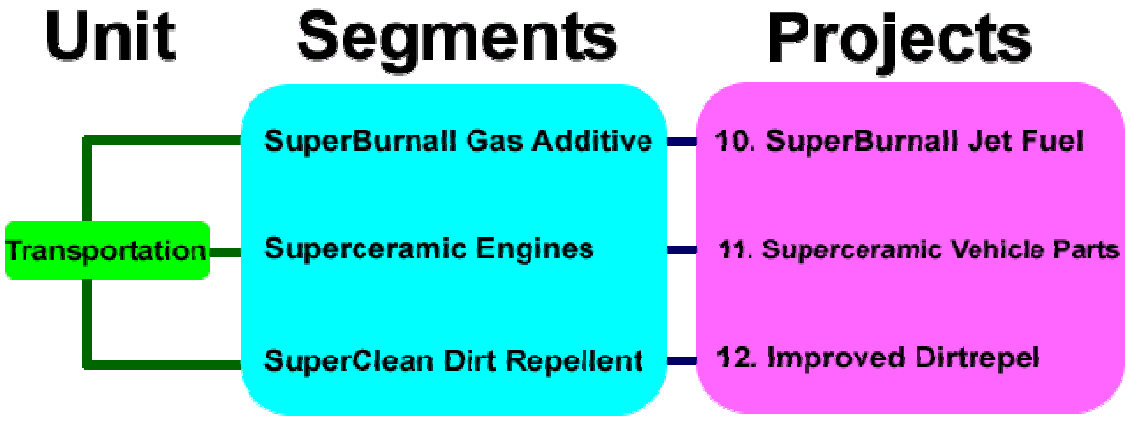

Figure 12: Overview of Business Unit Transportation

PROJECT 10: SUPERBURNALL JET FUEL

Briefing about the projects in the transportation unit as shown in figure 5 Paul said, "In Transportation, gasoline comes out of the combustion engines with 25% of it unburnt. So this project adds a gas additive that lets only 20% or 18% comes out as unburnt. If we could get an additive that actually increases the combustion by just 5% then the amount of foreign oil we depend on goes down. SUPERBURNALL JET FUEL will perform the same functions in aircraft engine jets."

PROJECT 11: SUPERCERAMIC VEHICLE PARTS

Paul continued, “A hybrid electric vehicle with a gas turbine engine, compared with spark ignition engines widely used today, would weigh less, last longer, be more fuel-efficient, could burn a variety of fuels, and would have lower emissions of nitrogen oxides and carbon gases. The SUPERCERAMIC VEHICLE PARTS project develops technology to make reliable ceramics and advanced processing technology to minimize the number and size of flaws in ceramics so that it can be used it in the engines.”

PROJECT 12: IMPROVED DIRTREPEL

Talking about IMPROVED DIRTREPEL project Paul said, “Everybody wants dirt repellent to make your kitchen and your car look good. We have developed unique waxes that have a slightly negative charge to them. Dirt being inherently negative in charge doesn’t really stick to the wax. The IMPROVED DIRTREPEL project will produce just that kind of wax.”

PROJECT 13: NEW ASPHALT ADDITIVES

Continuing his discussion on projects in construction unit Paul said, “The project SUPERLAST ROADS as shown in figure 6 is being tested in Auburn at NASA center for asphalt technology. This project investigates how to add asphalt additives and make the roads last for a longer period under various temperature and load conditions.”

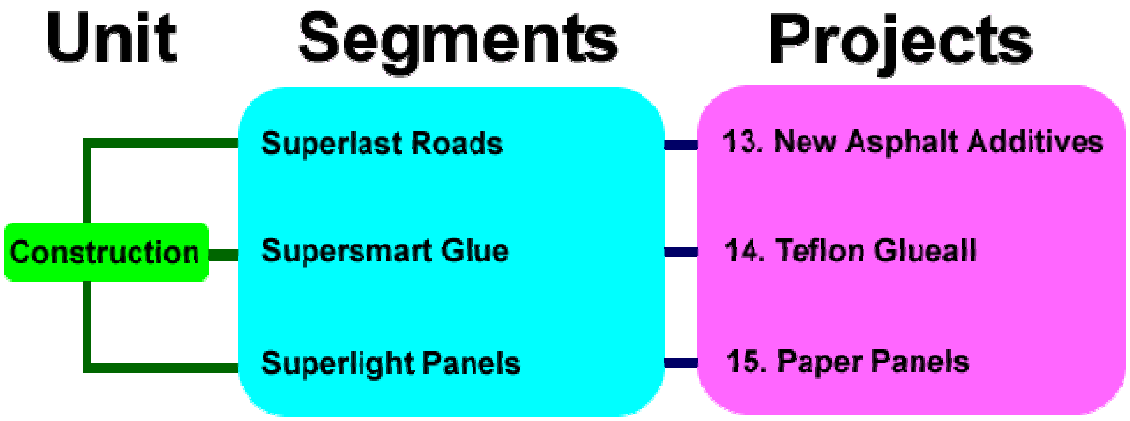

Figure 13: Overview of Business Unit Construction

PROJECT 14: TEFLON GLUEALL

Paul said, "With electrical impulses the glue will stick and release, so we can create smart glue. When you want to temporarily stick items, and when you want to remove them apart you zap the glue with electricity and it comes off and can be used in different settings. This glue will work with Teflon or even polyethylene."

PROJECT 15: PAPER PANELS

Talking about the last project in construction unit Paul said, "This is a project that uses micro spheres. You take a polymer and blow it up into a ball then it has the same strength except of course now with 50% air. In PAPER PANELS project, you put these micro spheres into gypsum board, and get much lighter panels with same strength. These can be used in many applications."

Finishing the discussion Paul said, "This is a brief discussion to provide you a flavor of what all projects we are proposing in our company. So by now everybody should have an understanding of the projects being proposed in our company."

Dr. Wagener stated, “Thank you very much Paul, for an excellent overview of the proposal projects. There are some very exciting projects at Superstar Specialties and I can see why prioritization has been such a tough job for the executive committee in the past. Let me explain the prioritization process next.”

DAY TWO

The agenda for day two was set as follows:

- Prioritization Process – Earl Wagener
- Overview of process to be followed by top management – Sanjeev Kumar
- Decision on critical issues by Unit – Vice Presidents

BUSINESS SEGMENT PROJECT ROLLUP

Dr. Wagener said, “Let me demonstrate how selecting the critical success factors specific to the success of Superstar Specialties, weighting them, and putting ranges on them will make the process of selecting your best business segments and projects not only much easier, but with an egalitarian sense of fairness. It is vital that these values be set, used, and if necessary, modified by the executive committee only. Input can, and should come from any level of the company, but the final decisions should only be made by the executive leadership.

The important steps in selecting the critical success factors are:

1. The process starts with the executive committee deciding the critical success factors most vital to the financial health and growth of the company. Some common examples are: total sales, three-year sales growth, total actual profit, percent profit, three-year profit growth, value of the customer, competitive

advantage, market attractiveness, strategic fit, global sales growth, manufacturing six sigma progress, % new product sales, technical feasibility and costs. Although there could be many more, it is important not to have too many or too few. A good target is 10, with as few as 8, and not more than 12 factors.

2. Each of the critical success factors has to be weighted so that the sum of the weighting percentages is 100.
3. Quantitative ranges have to be put on each of the critical success factors. This becomes the set of real time metrics by which strategic decisions can be made.

The values entered in each step represent the combination of experience, business plans and gut feel instincts that are the essence of the business activities. This process probably will take, in my experience, a couple of days of discussion. The end result will be a list of prioritized projects to be funded and implemented."

Sanjeev interrupted, "Dr. Wagener, at the last Board of Directors meeting, we agreed to increase Superstar Specialties, Inc.'s gross profit by 25% over the next three years. This whole process should achieve that. I think that should be our objective for this meeting.

Dr. Wagener, trying to clear some of the concerns of the CEO and other members on the committee, said, "Excellent!! I'm glad to see that your board is so focused. This type of focus is what we need to anchor the objectives and determine the ranges and values we set later. Therefore, we all agree that the objective of the company is to increase the gross profit by 25% over the next three years, and that will be a solid start. This will be first topic that I would like the committee to start working on. As this is a team effort, I suggest every VP to give a brief talk on the issues or concerns they think

will affect the decision process for Superstar Specialties Inc. I would like the CEO, Sanjeev, to start with the discussion and give a brief talk on the issues facing the company. I will summarize the discussion and create a list (Table 2)."

CEO'S PERSPECTIVE

Sanjeev started, "My first concern is the fact that many of our businesses are no longer growing in either profits or sales. These are business that we were once proud of, but we seem to have lost our ability to change with the markets, keep up our competitive advantage, or have a pipeline of new products that will keep our company growing. We have bet on a few wrong projects, and I think we are losing perspective on how to do business!

Colleagues, I am bothered most by not having a clear answer to the question; what should Superstar's business strategy be by product segment? Where are we most likely to get 25% profit growth? We have a lot of different tactics that can affect strategic decisions in each market such as market growth, competitor activity, supplier and customer business health, overseas dynamics, changing customer values, changing political environments, company resources, and people morale, so we have to be clear on our strategic and tactical directions. We don't have that clarity today so I would consider that my primary issue. To achieve our goal of 25% profit growth, we need to be more focused on profit growth. As we introduce new products in the market, it is more important to me to have profit growth than sales growth. Although we do have a longer-term strategy in our current 3 year plans, the reality is our activity lately is heavily skewed towards short-term projects. We need a better screening process for incoming

projects, both at a Corporate R&D level and at the Business Unit level. We need to develop more effective lines of communications between all functional groups, business, locations and levels of employees. Communication is critical in developing a productive environment, and we need to measure how well every business segment is doing."

Sanjeev said, "Our Board of Directors has told me that although we are successful by most measures, we are showing signs of becoming more unstable as competitive pressures have increased and the value chain in each of our markets has tightened up.

As I was looking back at our performance, Superstar Specialties, Inc. does not always fully exploit acquired technology and new product lines. We are in a few commodities (versus specialty value added) business where we are weak, - not cost competitive on manufacturing and raw material cost basis and lack critical mass. What businesses should we really be in? How does Superstar Specialties, Inc. define "strategic":

- Biggest market share, or
- Best growth opportunities, or
- Best competitive advantage, or
- Technical Competencies, or
- High Profitability, or
- Sales base is high, or
- All of above?

Which of these are most important to Superstar Specialties, Inc. with regard to growth? We need to focus on the most significant issues. We have to reduce number of R&D projects to those that bring major value and focus to business.

Many of our competitors are much larger that we are and have more resources. What decision model can we develop going forward that will best utilize our strengths in the right markets to avoid getting killed by the more aggressive of our competitors who would love to see our company fade away? How do we account for changes in strategic/market direction? How do we disseminate/instill common values and metrics across all functional departments? What substitute/disruptive technologies should we be concerned about? I will like each of you to talk on issues that you find worth discussing."

MARKETING VICE PRESIDENT'S PERSPECTIVE

As soon as Sanjeev finished giving his speech, Kelly, vice president for marketing thought that he should add a couple of points and said, "Our existing products are an untapped goldmine. One of my biggest issues is that there is 'informational friction' when it comes to facilitating internal searches for off-the-shelf solutions. This should be the fastest and cheapest method of growth. How do we decide which products to emphasize for quick results? We need to create a Central Project File to follow Research and Development – Some new products get "lost" along the way in development whether it's some specific performance characteristic, cost constraint, or the results of samples sent for evaluation. I suggest a standardized "project page" accessible to sales/technical/etc. with fields each group can fill with data or anyone can via "interviewing" the other groups. Which technologies should we take overseas? Are there key technologies for which we are weak? What geographies, regions do we need to be in? If we focus resources in strategic markets where we have technology and market knowledge and little market share, we can double or triple our business."

CFO'S PERSPECTIVE

Lloyd, Chief Finance Officer, added his concerns, "I am excited about being here, I really want to hear about growth and distinguish between good projects and bad projects that are costing us more developmental costs than usual. A quarter of the capital that we spend is directly for maintenance and that money does not go anywhere, and that is one of the reason that I want to spend more than 50% of the capital on the most profitable projects. We would like to spend money where we can get good returns. Total company capital is $40 million annually including sustaining and maintaining company needs. We need more VP's to take ownership of projects since when there are too many projects, effort is diluted. We need to focus on the growth of our profit and not just total profit. Some products make 60% profit and some only make 30%. Our costs are not being measured closely enough. Also the cost of living or inflation increases everyday, and this in turn increases everything from salaries, services, etc. and we have to cover all those. A short-term mentality affects morale, effectiveness, and could affect strategic decisions. What are strengths and weaknesses of our key competitors? What skill/capability gaps does Superstar have?"

R & D VICE PRESIDENT'S PERSPECTIVE

Vice president for R & D, Paul, stated, "I agree very much with what Sanjeev is saying in terms of the projects and what I want to do is to make sure that prioritization and alignment of the projects are done correctly. We know that many departments look at R & D as an expense instead of investment, but you have to understand that R & D is investment to keep the current projects growing. Future projects are needed to sustain and

give profits. Let us do an analysis of the projects since our method for allocating technical resources is unclear. We don't have a clear understanding of what brings value to the end user. How do we as a company improve our competitiveness and ability to differentiate Superstar Specialties, Inc. from other companies? In most markets, we appear to be a low cost producer. Although important, this is a sustaining strategy. Superstar Specialties, Inc. has not weeded out non-growth markets. What are the competitive dynamics and drivers, including prospects for growth and pricing? What is competition doing?

SALES VICE PRESIDENT'S PERSPECTIVE

Phillip, Vice President for sales said, "Our product development process needs work. Too many projects have been around for years with no resolution. We tend to focus on individual opportunities, rather than looking strategically at building a product line that would most benefit all businesses. We need better selection of products and projects to emphasize. We have a lack of product line management. What products should we be selling? What products should be discontinued? Applying the resources appropriately where they are needed, when they are needed and getting value out of the resource is critical. We have to know where and when to get the best bang for our buck. If it is worth the resource it is worth doing right and worth doing now.

MANUFACTURING VICE PRESIDENT'S PERSPECTIVE

Frank, Vice President for Manufacturing said, "As the VP for Manufacturing I want to know how to obtain high quality and low cost supply of raw material. I want to look at possibilities on how we can integrate control of the raw materials, quality and

performance and also at the same time develop strong relationship with the suppliers. What does Superstar Specialties, Inc. truly want to be when we grow up? What is our vision with regard to our customers, our markets, our employees, our communities? What are our mission objectives to achieve this vision? Are there any successful companies/organizations we see as a model of what we would like to achieve? What is our timeframe to achieve this? What support is required to achieve our objectives (such as communication, IT)? How profitable are the markets we participate in? How will competitors react to our strategies? What future capabilities are required by our customers (existing and potential)?"

After carefully listening to the comments by the executive council and noting down all the points that the members discussed, Dr. Wagener added, "I have tabulated all the comments and issues in table 2. We will have further discussion on which issues should be chosen as the critical success factors for the company.

LIST OF ISSUES

After nearly two hours of discussion, it was agreed that the issues listed in table 2 were the most significant:

	Issues	**Submitted By**
1	Grow Superstar Specialties, Inc.'s gross profit by 25% over the next two years	CEO
2	What should Superstar's strategy be by product market? Grow, maintain, harvest, divest, etc.	CEO

3	Industry perception: Viewed as somewhat unstable either financially and/or management wise. There is truth in both of these perceptions. How do we grow our profits to counter?	CEO
4	PROFIT growth is more important than sales growth	CEO
5	Superstar Specialties, Inc. is in a few commodity (vs. specialty value added) business where we are weak, not cost competitive both manufacturing & raw material cost basis; lack critical mass, What businesses should we really be in?	CEO
6	Developing effective lines of communications between all functional groups, business, locations and levels of employees. a. Communication is critical in developing an environment. b. How is everyone (different business groups, locations) doing?	CEO
7	We need a better screening process for in-coming projects, both at a Corporate R&D level and at the Business Unit level.	CEO
8	What model do we develop and modify going forward that accounts for changes in strategic/market direction?	CEO
9	How do we disseminate/instill common values and metrics across all functional departments?	CEO
10	Our existing products are an untapped goldmine. There is "informational friction" when it comes to facilitating internal searches for off-the-shelf solutions. This should be the fastest and cheapest method of growth. How do we decide which products to	VP Marketing

	emphasize for quick results?	
11	Too many product variations to manage; need to rationalize products within a given technology.	VP Marketing
12	Create a Central File to Follow Development – Some new products get something "lost" along the way in development whether it's some specific performance characteristic, cost constraint, or the results of samples sent for evaluation. I suggest a standardized "project page" accessible to sales/technical/etc. with fields each group can fill with data or anyone can via "interviewing" the other groups.	VP Marketing
13	Are there key technologies for which we are weak?	VP Marketing
14	Total company capital constraint is $40 mm annually including sustaining and maintenance.	CFO
15	The method for allocating technical resources is unclear.	VP R&D
16	Understanding what brings value to the end use application	VP R&D
17	Our product development process needs work. Too many projects have been around for years with no resolution. We tend to shoot at individual opportunities, rather than looking strategically at building a product line that would most benefit all businesses	VP Sales
18	Applying the resources appropriately where they are needed, when they are needed and getting your value out of the resource. a. Know where to get the best bang for your buck. b. Doing more with less is	VP Sales

	in vogue, but realize you can't do everything. Pick your best chances and realize trying to do everything may not work like you would hope. If it is worth the resource it is worth doing right and worth doing now.	
19	Obtaining high quality, low cost raw material supply. a. Backward integration, allows for control of the raw materials cost, quality and performance. b. Obtaining the lowest possible cost for raw materials through leverage of company resources or better negotiation. c. Getting new or better raw materials first for development of products. Suppliers should be bringing new raw materials to us because we are valued. d. Develop strong relationships with the suppliers.	VP Manufacturing
20	How do we get accurate information for new market opportunities that are embryonic in stage but show promise because of a customer need and encouraging market reaction?	VP Manufacturing
21	Defining the acceptance of new development. For developing a new product we must have the proper justification and this has never been clear, at what volume do we add a new formula in the plants?	VP Manufacturing
22	What does Superstar Specialties, Inc. truly want to be when we grow up? What is our Vision with regard to our customers, our markets, our employees, our communities? What are our mission objectives to achieve this Vision? Are there any successful	VP Manufacturing

	companies/organizations we see as a model of what we would like to achieve? What is our timeframe to achieve this? What support is required to achieve our objectives (such as communication, IT)?	
23	What trends, drivers and discontinuities will be impacting our business?	VP Manufacturing

Table 2: Table showing concerning issues at Superstar Specialties Inc.

IDENTIFYING CRITICAL SUCCESS FACTORS

After looking at the list of issues in table 2, the executive council members decided on 16 critical success factors that can affect their company's progress. Dr. Wagener created a critical success factors list that addressed the issues raised in the previous discussion.

1. CUMULATIVE PROJECTED 3 YEAR GROWTH (IN DOLLARS) OF PROFIT FROM 2003- 2005

   This is a critical measure of vitality and market acceptance. We like to choose a previous year of actual results to ground the data and next year's projected results.

2. VALUE TO YOUR CUSTOMER

   Superstar Specialties prides itself in delivering good technical service and designing products for customers. This critical success factor is always filled out from the customer's perspective. The questions for this factor, as shown in the spread sheet in Appendix A of the CDROM, show how this factor is measured

3. COMPETITIVE ADVANTAGE

   The questions for this factor, as shown in the spread sheet in Appendix A of the CDROM, show how this factor is measured.

4. PERCENT PROFIT FOR THE LAST FULL YEAR (OR THE CURRENT YEAR PROJECTED)

   Measures the quality of profit

5. TECHNICAL/COMMERCIAL FEASIBILITY

   Measures how well market penetration is achieved. The questions for this factor, as shown in the spread sheet in Appendix A of the CDROM, shows how this factor is measured

6. TOTAL SALES FOR THE LAST FULL YEAR
7. MARKET ATTRACTIVENESS

   Measures the attractiveness of the market to Superstar Specialties. The questions for this factor, as shown in the spread sheet in Appendix A of the CDROM, shows how this factor is measured.

8. TOTAL PROFIT FOR LAST FULL YEAR
9. CURRENT DEVELOPMENT COSTS FOR THE BUSINESS SEGMENT
10. STRATEGIC FIT FOR SUPERSTAR SPECIALITIES
11. PERCENT SALES FROM NEW PRODUCTS
12. SALES GROWTH FROM NEW PRODUCTS OVER THE PAST 3 YEARS
13. PERCENT SALES OVERSEAS
14. MANUFACTURING QUALITY (e.g. Six sigma or some similar measure)
15. CUSTOMER SERVICE QUALITY

16. PERCENT SALES GOALS MET

Passing on copies of the list to the executive members Dr. Wagener said, “This is a list of critical success factors which, when evaluated in depth, will address many of the issues shown in Table 2. You may have more to add to the list, but understand that the final list should have fewer items: 10 are ideal, 8 is the minimum, and 12 is the maximum.”

DECIDING CRITICAL SUCCESS FACTORS

Looking at the list of sixteen items Sanjeev understood that it was time for the executive council to decide on the critical success factors. After an hour of discussion and rigorous thinking, Earl said, “Gentleman, we should be able to finalize the critical success factor decision using discussion and agreement. So let us start with the discussion once we finish our lunch.”

After lunch, when the whole committee came back, it was time for discussions again. Earl started the discussion, “Colleagues, if you want to talk about a particular critical success factor, or have any new factors that you came up with, now is the time to decide on it. You could start off with the critical success factors I showed you, and how you would like to weigh them.” After many hours of discussion, Sanjeev and his team came up with the critical success factors list shown in Table 3 and their respective weights:

	Critical success factor	Weight	Issues Addressed
1	**% Profit Growth ($ to $) 2002 - 2004**	**20%**	1, 15, 3, 4, 23
2	**Value to Customer (End User)**	**15%**	15, 11, 5, 19, 16, 20, 22, 23
3	**Competitive Advantage**	**10%**	10, 15, 3, 20, 7, 22, 13, 23
4	**% Profit last full year**	**10%**	1, 17, 3, 4, 7, 23
5	**Technical / Commercial Feasibility**	**10%**	11, 5, 19, 16, 18, 20, 21, 22
6	**Total sales last full year**	**10%**	15, 5, 18, 7, 23
7	**Market Attractiveness**	**10%**	2, 10, 11, 5, 20, 8, 13
8	**Total Profit last full year**	**5%**	15, 5, 7, 23
9	**Current Development Costs**	**5%**	15, 17, 14, 11, 19, 21, 13, 22, 23
10	**Strategic Fit**	**5%**	2, 15, 17, 14, 10, 19, 22, 8, 9
	TOTALS	**100%**	

Table 3: Critical success factors with Weights specified

DAY THREE

The agenda for day three was set as follows:

- Opening remarks – Earl Wagener
- Need to perform "What If" analysis – Sanjeev Kumar
- Assignment to management teams (Vice Presidents) to come up with final list of R&D projects to be prioritized – Executive Committee

BUSINESS UNIT ANALYSIS

Addressing the committee Dr. Wagener said, “Ladies and Gentleman, Welcome back to the third day of the retreat. Today I will give you a brief introduction and an idea of how to work with the critical success factors. The next step is to analyze the projects using the analysis tool. There are five business units that Superstar Specialties is dealing with: Energy, Food, Construction, Personal Care, and Transportation. For better understanding of this tool, I will deal with the analysis and details of only one of the business unit, personal care. Once you understand the concept of how prioritization of projects in personal care is done, you can follow like wise and work on the other business units.”

Let us start with the business unit, Personal Care. Figure 7 shows the top down model of the three proposed projects in the Personal Care segment.

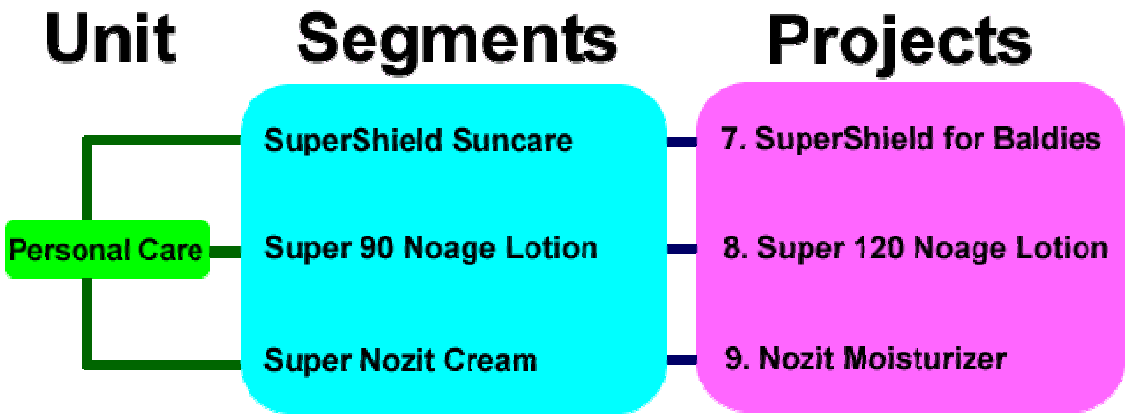

Figure 14: Top down model of the business unit, PERSONAL CARE

You rate your business segments as well as the projects funded by each business segment. Also you can see the projected profit and loss (if any) for the company using this tool. Before looking into the business analysis of this Personal Care unit, we have to look into two different issues:

1. The business segments and
2. The business projects

The business units are composed of the business segments and the projects relate to each segment. We will first analyze the business segments, to obtain a prioritized list of the value of each segment to the company.

The second step is to analyze the projects within each segment to determine if the projects can improve the business. Here we want to find out the impact of the projects on the segments. If the projects scores higher than the segments then that is a good project, but if they score low and do not add any value to the segment then that project may have to be dropped.

Segments and projects must be analyzed separately since the ranges for the individual critical success factors are different."

BUSINESS SEGMENT ANALYSIS

Dr. Wagener continued, "Please refer to the MS-Excel Spreadsheet in Appendix A of the CDROM as you follow through this discussion. The ten critical factors and weights from day 2 (Table 3) are entered in table 4. Then values are computed for each factor for the business segment "Super 90 Noage". (Figure 4)

Personal Care Segment 'Super 90 Noage Lotion'				
	Critical Factor	Raw Data	Weight	Score
1	% Gross Profit Growth ($ to $)		20	
	2003 - 2005			
2	Value to Customer (End User)		15	
3	Competitive Advantage		10	
4	% Gross Profit last full year		10	
5	Technical / Commercial Feasibility		10	
6	Total sales last full year		10	
7	Market Attractiveness		10	
8	Total Gross Profit last full year		5	
9	Current Development Costs		5	
10	Strategic Fit		5	
	TOTAL		100%	

Table 4: Business Segment Analysis for Super 90 Noage Segment

In table 4 you can see that some of the values are highlighted and the others are not. I will give you a detailed explanation of what it means.

The highlighted values are those that are entered manually into the data sheet. The values in the:

a. "Raw Data" column are taken from earlier records or the records from the previous years. If there is no data about the previous year, then a value is estimated based on other company's records.

b. Values in “Score” column are calculated based on “Ranked Ranges” and “Weight” columns. Comparing the “Raw Data” column and the “Ranked Ranges” column, a value ranging from five to zero will be multiplied to the value in the “Weight” column. Once the value is determined it is automatically multiplied by the excel spread sheet with the value in the “Weight” column and will show up in the “Score” column.

We will now illustrate how the values are computed for each row in Table 4 for the business segment, “Super 90 Noage”.

DETERMINING SCORE

1. % Gross Profit Growth ($ to $) 2003 - 2005:

- This is a critical measure of vitality and market acceptance. Actual results of the previous year and next year’s projected results are taken into consideration.
- The value for % gross profit growth in table 4 for raw data is taken from the previous year’s records and is shown to be 11.9%
- This value is compared with the ranked ranges which are shown as:
  i. If the raw data is > 15% use a value of 5, or
  ii. If the raw data is > 12% use a value of 4, or
  iii. If the raw data is > 9% use a value of 3, or
  iv. If the raw data is > 6% use a value of 2, or
  v. If the raw data is > 3% use a value of 1, or
  vi. If the raw data is < 3% use a value of 0

- Since the raw data is > 9%, we will use a value of 3 from the ranked ranges and multiply that with the weight of this critical success factor which is 20% and will use the score of: $3 * 20 = 60$ as shown in table 5.

	Critical Factor	Raw Data	Weight	Score
1	% Gross Profit Growth ($ to $)	11.90%	20	60
	2003 - 2005			

Table 5: Percentage gross profit growth for Super 90 Noage Segment

2. Value to the customer (End User):

- This critical success factor can be based on delivering good technical service, interaction with customers (like feedback, stock meetings, etc...) and designing good products for customers. This critical success factor is always analyzed from the customer's perspective.
- If the value to the customer is equal to the market competition, then the score is Zero. Equal doesn't give any score at all.

The raw data for this critical success factor is computed in table 6. The project managers for this segment have to work together to compute the values for each sub-factor. The values for the sub-items, who rated them and the reasons for the rating are shown in this table 6.

	Value to the Customer				
	Critical Components	**Score**	**Range**	**Rated By**	**Documentation**
1	Offers benefits in the form of:				
	- Lower cost product	10	0-25		For lower temp uses, costas are lower
	- Increased performance	15	0-20		Fuel savings are great
	- Protectable value pricing	8	0-15		Value Pricing good for home use
	- Market share protection / enhancement	7	0-15		Has Provided Market Share Increases
	- Allows compliance with HSE regulations	0	0-15		Lower NOX emissions
	- Provides product solutions	8	0-10		Much better operations
	- Offers production benefits(unit op/utility/etc savings	6	0-10		Lower cost Equipment
2	Time required to implement				
	< 6 months	5	10		Usual time to market
	< 18 months		5		
	> 18 months		0		
3	Cumulative customer cost (non-capital) required to implement this technology				
	No cost	8	10		Very little extra people developmental costs
	Reasonable cost		5		
	High cost		0		
4	Direct customer capital cost to implement this technology				
	No capital required	4	10		More expensive metallurgy
	Reasonable capital		5		
	High capital		0		
	Total Score	71	140		

Table 6: Calculation of Raw data for Value to the Customer

- From table 6 we can see that the value of the raw data for the value to the customer is 71. This value is automatically added to the segment analysis table 4 by the excel spread sheet.
- Also remember that the highlighted values are those that are entered manually
- This value is compared with the ranked ranges which are shown as:
    - If the raw data is > 120 use a value of 5, or
    - If the raw data is > 100 use a value of 4, or
    - If the raw data is > 80 use a value of 3, or
    - If the raw data is > 60 use a value of 2, or
    - If the raw data is > 40 use a value of 1, or

- If the raw data is < 40 use a value of 0

- Since the raw data is > 60, we will use a value of 2 from the ranked ranges and multiply that with the weight of this critical success factor which is 15% and will use the score of: $2 * 15 = 30$ to create Table 7.

	Critical Factor	Raw Data	Weight	Score
2	Value to Customer (End User)	71	15	30

Table 7: Value to the Customer for Super 90 Noage Segment

3. Competitive advantage:

This critical value is completed by answering

- Questions such as, do we have the low cost position over our competitors? Do we have a customer recognized performance advantage over our competitors? These are general questions that are being asked by most companies.
- If the Competitive advantage is equal to the competition, then the score is Zero. Equal doesn't give any score at all.
- The raw data for this critical success factor is computed in table 8. The project managers have to work together to compute the values for each sub-factor. The value for the sub-items, who rated them and the reason for the rating are shown in table 8.

Competitive Advantage				
			Rated By	
Critical Components	Score	Range	(Initials)	Documentation
Do we have the low cost position over our competitors?	5	0-30		For half our products
Do we have a customer recognized performance advantage over our competitors?	20	0-30		Almost always
Is our product technology protected with patents, trade secrets,know how, or contracts?	15	0-20		Patents about to run out
Do we have a customer recognized performance technical capability, sales, marketing, or technical service?	14	0-20		We are good in this market
Are there gaps in our product offerings? (no gaps - high score)	8	0-15		Need high temperature membrane
Percent of Current Products That Are "Me Too" <60% =15; 75%= 10; 90%=5; 100%= 0	12	0-15		Unique products
Total Score	74	130		

Table 8: Calculation of Raw data for Competitive Advantage

- From table 8 we can see that the value of the raw data for the competitive advantage is 74. This value is added to the segment analysis in table 4
- This value is compared with the ranked ranges which are shown as:
    - If the raw data is > 110 use a value of 5, or
    - If the raw data is > 90 use a value of 4, or
    - If the raw data is > 70 use a value of 3, or
    - If the raw data is > 50 use a value of 2, or
    - If the raw data is > 30 use a value of 1, or
    - If the raw data is < 30 use a value of 0
- Since the raw data is > 70, we will use a value of 3 from the ranked ranges and multiply that with the weight of this critical success factor which is 10% and will use the score of: $3 * 10 = 30$ as shown in table 9

	Critical Factor	Raw Data	Weight	Score
3	Competitive Advantage	74	10	30

Table 9: Competitive Advantage for Super 90 Noage Segment

4. **Percent Gross Profit for the last full year (or the current year projected):**

- This factor measures the quality of the profit and determines the lifetime of a new product starting from when the product is released in the market.
- The highlighted value in table 10 for raw data is taken from the previous year's records and is shown to be 70.0%
- This value is compared with the ranked ranges which are shown as:
  i. If the raw data is > 50% use a value of 5, or
  ii. If the raw data is > 42% use a value of 4, or
  iii. If the raw data is > 34% use a value of 3, or
  iv. If the raw data is > 26% use a value of 2, or
  v. If the raw data is > 18% use a value of 1, or
  vi. If the raw data is < 18% use a value of 0
- Since the raw data is > 50%, so we will use a value of 5 from the ranked ranges and multiply that with the weight of this critical success factor which is 10% and will use the score of: $5 * 10 = 50$ as shown in Table 10.

	Critical Factor	Raw Data	Weight	Score
4	% Gross Profit last full year	70.00%	10	50

Table 10: Percentage gross profit last full for Super 90 Noage Segment

5. Technical / Commercial Feasibility:

- This critical success factor measures how well market penetration is achieved.
- This critical success factor will give information about whether the price or performance is confirmed by the customers, whether competitors can take strong action to block or decrease their price, whether there are any raw materials available, and whether there are any capital requirements for this product.
- The raw data for this critical success factor is computed in table 11. The project managers have to work together to compute the values for each sub-factor. The value for the sub-items, who rated them and the reason for the rating are shown in table 11.

	Technical / Commercial Feasibility				
		Score	**Range**	**Initials**	**Documentation**
	Critical Component				
1	Time to commercialization <6 mo.=30; <1 yr.=15; <18mo.=10; >18mo.=5; .2yrs.=0	12	0-30		15 month average so far
2	Has the price/performance been confirmed by customers?	15	0-30		We have 50% advantage
3	Are any patents/ know-how/competitor products/ geography blocking normal product development?	10	0-20		Competition is fairly intense
4	Are all resources available (Technical Service, Marketing, Manufacturing, etc.) ?	15	0-20		One of our best resource businesses
5	Will our strategic customers actively help in development?	7	0-10		No problem
6	Cost in Time or $$ to comply with Health / Safety / Environmental Low=10; Med=5; High=0	0	0-10		Losts of safety costs
7	Can competitors take strong action to block? Yes= 0 No= 10 Maybe=5	5	0-10		Clear may be
8	Is this a new product / technology for our customers? Score measures ability of customer to commercialize	8	0-10		They are very familiar with this technology
9	Are all raw materials readily available?	10	0-10		Not a problem
10	What are the needed capital requirements? Low=10; Medium=5 High=0	9	0-10		We have spend the big bucks
11	Is this a new product or technology for us?	10	0-10		We are the leaders
12	Customers are profitable, growing, and development oriented? Are customers favorably positioned to afford higher value?	10	0-10		Energy Companies are needed
	Total =	111	180		

Table 11: Calculation of Raw data for Technical or Commercial Feasibility

- From table 11 we can see that the value of the raw data for technical or commercial feasibility is 111. This value is added to the segment analysis in Table 4
- This value is compared with the ranked ranges which are shown as:
    - If the raw data is > 150 use a value of 5, or
    - If the raw data is > 120 use a value of 4, or
    - If the raw data is > 90 use a value of 3, or
    - If the raw data is > 60 use a value of 2, or
    - If the raw data is > 30 use a value of 1, or
    - If the raw data is < 30 use a value of 0
- Since the raw data is > 90, so we will use a value of 3 from the ranked ranges and multiply that with the weight of this critical success factor which is 10% and will use the score of: $3 * 10 = 30$ as shown in table 12.

	Critical Factor	Raw Data	Weight	Score
5	Technical / Commercial Feasibility	111	10	30

Table 12: Technical or Commercial Feasibility for Super 90 Noage Segment

6. Total sales last full year:

- Last full year sales are critical in the analysis of the business segments. If we don't have last full year sales, then the sales for the first half or the previous half of the year are used.
- The highlighted value in table 13 for raw data is taken from the previous year's records and is shown to be $18.6 Million dollars

- This value is compared with the ranked ranges which are shown as:
  i. If the raw data is > $30 Million use a value of 5, or
  ii. If the raw data is > $24 Million use a value of 4, or
  iii. If the raw data is > $18 Million use a value of 3, or
  iv. If the raw data is > $12 Million use a value of 2, or
  v. If the raw data is > $6 Million use a value of 1, or
  vi. If the raw data is < $6 Million use a value of 0
- Since the raw data is > $18 Million, so we will use a value of 3 from the ranked ranges and multiply that with the weight of this critical success factor which is 10% and will use the score of: $3 * 10 = 30$ as shown in Table 13.

	Critical Factor	Raw Data	Weight	Score
6	Total sales last full year	$18.60	10	30

Table 13: Total Sales Last Full Year for Super 90 Noage Segment

7. **Market attractiveness:**
   - This critical success factor measures the attractiveness of the market to the company. The main factors that affect this critical success factor are the market size, market growth rate, market share, and is the porter analysis favorable?
   - The raw data for this critical success factor is computed in table 14. The project managers have to work together to compute the values for each sub-factor. The values for the sub-items, who rated them and the reasoning for the rating, are shown in table 14.

	Market Attractiveness				
	Critical Component	**Score**	**Range**	**Completed By**	**Documentation**
1	Market size >$300MM=25, >$100MM=15, <$50MM=5	17	0-25		< $165 MM
2	Porter Analysis Favorable? >50=25, >35=15, <20=5	15	0-25		
3	Market growth rate >7%=20, GNP=10, <1%=5	20	0-20		Growth rate >10
4	Number/strength of competitors <4=20, 4-10=10, >10=5	10	0-20		5 competitors
5	Sovereign Market Share >40= 20;>25=15;>15=10;>5=5	12	0-20		26% market share
6	Regulatory (Safety / health / Environ) Advantages?	8	0-10		Less emissions
7	External Drivers / Trends Favorable?	8	0-10		Energy savings
8	Available niche markets	8	0-10		Lot of niche markets
	Total	98	140		

Table 14: Calculation of Raw data for Market Attractiveness

- From this table 14 we can see that the value of the raw data for technical or commercial feasibility is 98. This value is added to the segment analysis table 4
- This value is compared with the ranked ranges which are shown as:
    - If the raw data is > 120 use a value of 5, or
    - If the raw data is > 100 use a value of 4, or
    - If the raw data is > 80 use a value of 3, or
    - If the raw data is > 60 use a value of 2, or
    - If the raw data is > 40 use a value of 1, or
    - If the raw data is < 40 use a value of 0
- Since the raw data is > 80, we will use a value of 3 from the ranked ranges and multiply that with the weight of this critical success factor which is 10% and will use the score of: $3 * 10 = 30$ as shown in table 15.

	Critical Factor	Raw Data	Weight	Score
7	Market Attractiveness	98	10	30

Table 15: Market Attractiveness for Super 90 Noage Segment

8. Total profit last full year:

- This critical success factors for segment analysis measures the impact of total profits during last year. If you don't have profit for the last year, you can take values from half-yearly sales.
- The highlighted value in table 16 for raw data is taken from the previous year's records and is shown to be $13.0 Million dollars
- This value is compared with the ranked ranges which are shown as:
  i. If the raw data is > $15 Million use a value of 5, or
  ii. If the raw data is > $12 Million use a value of 4, or
  iii. If the raw data is > $9 Million use a value of 3, or
  iv. If the raw data is > $6 Million use a value of 2, or
  v. If the raw data is > $3 Million use a value of 1, or
  vi. If the raw data is < $3 Million use a value of 0
- Since the raw data is > $12 Million, we will use a value of 4 from the ranked ranges and multiply that with the weight of this critical success factor which is 5% and will use the score of: $4 * 5 = 20$ as shown in table 16

	Critical Factor	Raw Data	Weight	Score
8	Total Gross Profit last full year	$13.00	5	20

Table 16: Total Gross Profit Last Full Year for Super 90 Noage Segment

9. Current Development Costs:

- This critical success factor is computed based on current developmental costs.
- The highlighted value in table 17 for raw data is taken from the previous year's records and is shown to be $2.0 Million dollars
- This value is compared with the ranked ranges which are shown as:
  i. If the raw data is < $0.15 Million use a value of 5, or
  ii. If the raw data is < $0.3 Million use a value of 4, or
  iii. If the raw data is < $0.5 Million use a value of 3, or
  iv. If the raw data is < $1.0 Million use a value of 2, or
  v. If the raw data is < $1.5 Million use a value of 1, or
  vi. If the raw data is > $1.5 Million use a value of 0
- The other point that is worth noting is that the lesser the developmental costs the higher the segment rating.
- Since the raw data is > $1.5 Million, we will use a value of 0 from the ranked ranges and multiply that with the weight of this critical success factor which is 5% and will use the score of: $0 * 5 = 0$ as shown in table 17.

	Critical Factor	Raw Data	Weight	Score
9	Current Development Costs	$2.00	5	0

Table 17: Current Developmental Costs for Super 90 Noage Segment

10. Strategic Fit:

- This critical success factor shows how the segment will strategically fit the company. Some of the main aspects of this critical success factor are to see the

uses for current customer base, see if it fits the current R & D, see the sales infrastructure, see how it fits current distribution, and see how it fits the current business model

- The raw data for this critical success factor is computed in the table 18. The project managers have to work together to compute the values for each sub-factor. The values for the sub-items, who rated them and the reasoning for the rating are shown in table 18.

	Strategic Fit				
	Critical Component	**Score**	**Range**	**Completed By**	**Documentation**
1	Strong Growth Candidate >10%=20, >5%=15, >2%=10, >1%=5, <1%=0	20	0-20		>10%
2	Strong Profit Candidate >60%=20, >46%=15, >33%=10, >20%=5, <20%=0	20	0-20		58%
3	Uses Current Customer Base	10	0-20		All current customers
4	Fits Current R&D / Tech. Serv / Sales Infrastructure	10	0-20		Key segment
5	Synergistic With Core Technologies	12	0-20		Fits our core competencies
6	Fits Current Business Model	5	0-10		
7	Fits Current Distribution	5	0-10		
8	Fits Current Mfg.Capabilities	5	0-10		
	Total	87	130		

Table 18: Calculation of Raw data for Strategic Fit

- From table 18 we can see that the value of the raw data for technical or commercial feasibility is 87. This value is added to the segment analysis table 4
- This value is compared with the ranked ranges which are shown as:
    - If the raw data is > 110 use a value of 5, or
    - If the raw data is > 90 use a value of 4, or
    - If the raw data is > 70 use a value of 3, or

- If the raw data is > 50 use a value of 2, or
- If the raw data is > 30 use a value of 1, or
- If the raw data is < 30 use a value of 0

- Since the raw data is > 70, we will use a value of 3 from the ranked ranges and multiply that with the weight of this critical success factor which is 5% and will use the score of: $3 * 5 = 15$ as shown in table 19.

	Critical Factor	Raw Data	Weight	Score
10	Strategic Fit	87	5	15

Table 19: Strategic Fit for Super 90 Noage Segment

By combining the values shown in the tables 5, 7, 9, 10, 12, 13, 15, 16, 17, 19, the full analysis for the segment, “Super 90 Noage” could be performed and is shown as table 20.

Personal Care Segment 'Super 90 Noage Lotion'				
	Critical Factor	Raw Data	Weight	Score
1	% Gross Profit Growth ($ to $)	11.90%	20	60
	2003 - 2005			
2	Value to Customer (End User)	71	15	30
3	Competitive Advantage	74	10	30
4	% Gross Profit last full year	70.00%	10	50
5	Technical / Commercial Feasibility	111	10	30
6	Total sales last full year	$18.60	10	30
7	Market Attractiveness	98	10	30
8	Total Gross Profit last full year	$13.00	5	20
9	Current Development Costs	$2.00	5	0
10	Strategic Fit	87	5	15
	TOTAL		100%	295

Table 20: Business Segment Analysis for Super 90 Noage Segment with scores

PROJECT ANALYSIS

A similar analysis could be performed for the project SUPER 120 NOAGE in this business segment. The details are shown in the excel spreadsheet in Appendix A of the CDROM. The final values are shown in the table 21.

	Critical Factor	Raw Data	Weight	Score
1	% Gross Profit Growth ($ to $)	18.80%	20	100
	2003 - 2005			
2	Value to Customer (End User)	92	15	45
3	Competitive Advantage	117	10	50
4	% Gross Profit last full year	70.00%	10	50
5	Technical / Commercial Feasibility	85	10	20
6	Total sales last full year	$7.00	10	20
7	Market Attractiveness	91	10	30
8	Total Gross Profit last full year	$4.90	5	20
9	Current Development Costs	$0.90	5	0
10	Strategic Fit	95	5	20
	TOTAL		100%	355

Table 21: Research Project analysis for Super 120 Noage project with values

RELATION BETWEEN UNITS, SEGMENTS AND PROJECTS

How are business units, segments and projects related? Some of the rules that will guide you in determining the values in business unit tables are:

1. Percentage Profit Growth, Value to the Customer, Competitive Advantage, Technical / Commercial Feasibility, Market Attractiveness, Strategic Fit:
    a. Current values for the above critical success factors can be found by interpolating the segment values in that business unit.

b. Projected values for these critical success factors are estimated using general knowledge or by interpolation, but they are proportional to the values already existing. So you cannot assign astronomical values for these critical success factors.

2. Percentage Gross Profit:
    a. Current and projected values for this critical success factor are a percentage of the ratio of Total profit / Total sales of the last full year.

$$\text{Gross Profit} = \frac{Total\ \text{Pr}ofit - LastFullYear}{TotalSales - LastFullYear}$$

3. Total Sales last full year, Total Profit last full year and Current Developmental Costs:
    a. Current values for the above critical success factors can be found by interpolating the segment values in that business unit.
    b. Projected values can also be obtained by using the formula: Sales/Profit for last year + ((Sales/Profit due to Project 1 + Sales/Profit due to Project 2 + Sales/Profit due to Project 3) * Number of years)
    c. Once the sales/profit values are determined we can determine the values for percent gross profit.
    d. Values for Developmental Costs are also estimated in the same way as the Total Sales / Total Profit.

By following the guidelines alone, the business unit personal care was analyzed using the excel spreadsheet in Appendix A of the CDROM and the total score computation is shown in Table 22.

Personal Care Business Analysis Worksheet											(Raw Data - Personal Care segments)
Business Segment	%Profit Growth ($ to $) 2003 - 2005	Value to Customer	Competitive Advantage	% Gross Profit - Last full Year	Technical / Commercial Feasibility	Total Sales - Last Ful year	Market Attractiveness	Total Profit - Last Ful Year	Current Developmen Costs	Strategic Fit	Total Score
Business Unit											
Personal Care	8.07%	68.67	77.33	58.00%	110.33	$50.00	99.00	$29.00	$4.55	85.33	300
Projected Personal Care	12.90%	86.33	97.33	58.51%	103.00	$74.18	$92.33	$43.40	$9.15	$91.67	355
Segments											
Super Nozit Cream	4.50%	53	54	38.70%	108	$8.00	92	$3.10	$0.95	84	185
Super 90 Noage Lotion	11.90%	71	74	70.00%	111	$18.60	98	$13.00	$2.00	87	295
Supershield Suncare	7.80%	82	104	48.00%	112	$23.40	107	$12.90	$1.60	85	300
Projects											
Nozit Moisturizer	14.50%	85	95	43.00%	101	$2.09	100	$0.90	$0.60	92	290
Super 120 Noage	18.80%	92	117	70.00%	85	$7.00	91	$4.90	$0.90	95	355
Supershield for Baldies	5.40%	82	80	48.00%	123	$3.00	86	$1.40	$0.80	88	225

Table 22: Summary of the Business Unit Personal Care

A similar analysis was performed for the other business units Energy, Food, Transportation, and Construction. Please refer to the excel spreadsheets in Appendix A of the CDROM for more details.

DAY FOUR

The agenda for day four was set as follows:

- Discussion on Units – Executive Team
- Working session among the Vice Presidents to come up with a final list of R&D projects to be prioritized and funds allocated. Discuss with the CEO and come up with the final list.

DISCUSSION ON BUSINESS UNITS

Once the values for all the segments and the projects are collected and the analysis done, a business unit is analyzed. The most intense part of analysis is on the business units. In this analysis, you will see that the three personal care segments are compared and the three personal care research projects are also compared in a single sheet as shown in the table 22. Heated arguments and discussions resulted when the VP's interpreted the results. Every person in the committee defended his/her project.

Looking at the Personal Care business analysis (Table 22), Sanjeev said, "Looks like the business segment Super Nozit cream is not doing well. We are almost spending $0.95 million on developmental costs and the total profits that we are getting are only $3.1 million. Can we take this money and spend it on some other segment where we can have more profits? Again to reiterate, the objective of this retreat session is to redistribute our resources where they are most profitable."

Lloyd, CFO interrupted and said, "I totally agree with Sanjeev, if there is a business which has $0.95 million development costs and has a very low overall score (185), I would rather remove that business segment and invest that money that would require less developmental costs and we can get more profits."

Paul, VP R & D interrupted and said, "The people that are on the Super Nozit Cream know that they are on a dull project, they probably are not very happy, they probably do not enjoy coming to work everyday, and if they now look at how project scored, they may want to work on a different project or different segment, if they can fit in any other program."

Laura, VP Personal Care said, “I know that Super Nozit cream is the least scored at 185, but that segment does not need as much revenue for the developmental costs as the other segments. This segment has been in the Superstar Energy business for a long time now. The market attractiveness has a value of 92 which is not low and our prices never lost ground. This is not a new technology for us and all the raw materials are readily available. Looking from the customers’ point of view, they are favorably positioned.”

SUPERSTAR SPECIALITIES, INC					All Segments Analysis							
Business Segment	% Profit Growth ($ to $) 2003 - 2005	Value to Customer	Competitive Advantage	% Gross Profit - Last full Year	Technical / Commercial Feasibility	Total Sales last full year	Market Attractiveness	Total Profit 2003	Current Development Costs	Strategic Fit	Total Score	Business Unit
Maximum Value	>15%	140	130	>50%	180	>$30MM	140	>$15MM	>$1.5MM	130	500	
Enriched Oxygen Members	16.00%	81.00	98.00	58.00%	118.00	$41.00	93.00	$23.80	$1.82	108.00	390.00	Energy
Super Preservative	12.80%	81.00	98.00	51.00%	120.00	$39.90	110.00	$19.90	$2.90	124.00	385.00	Food
Superlight Panels	11.20%	103.00	103.00	56.00%	132.00	$10.00	110.00	$5.60	$0.40	99.00	340.00	Construction
Supershield Suncare	7.80%	82.00	104.00	48.00%	112.00	$23.40	107.00	$12.90	$1.60	85.00	300.00	Personal Care
Super 90 Noage Lotion	11.90%	71.00	74.00	70.00%	111.00	$18.60	98.00	$13.00	$2.00	87.00	295.00	Personal Care
Photovoltaic Components	10.00%	58.00	79.00	43.00%	115.00	$30.00	80.00	$10.00	$1.32	85.00	270.00	Energy
Superceramic Engines	8.60%	82.00	95.00	22.00%	113.00	$24.00	101.00	$5.28	$1.10	92.00	265.00	Transportation
Superlast Roads	5.90%	61.00	56.00	25.00%	105.00	$64.00	127.00	$16.00	$6.20	92.00	255.00	Construction
Superburnall Gas Additive	4.50%	43.00	81.00	45.00%	86.00	$26.00	101.00	$11.70	$1.13	104.00	245.00	Transportation
Supersmart glue	7.20%	71.00	63.00	20.00%	110.00	$45.00	81.00	$9.00	$3.00	80.00	235.00	Construction
Piezo Polymers	6.50%	43.00	73.00	47.00%	117.00	$17.00	74.00	$8.00	$0.56	85.00	230.00	Energy
Superfataway Peptides	5.60%	56.00	64.00	38.00%	114.00	$21.00	127.00	$8.00	$1.80	104.00	225.00	Food
Super Nozit Cream	4.50%	53.00	54.00	38.70%	108.00	$8.00	92.00	$3.10	$0.95	84.00	185.00	Personal Care
MCT Energy Bars	1.50%	35.00	73.00	25.00%	105.00	$20.00	81.00	$5.00	$0.99	98.00	165.00	Food
Superclean DirtRepel	-0.50%	54.00	48.00	30.00%	87.00	$13.00	72.00	$3.90	$1.60	77.00	125.00	Transportation

Table 23: Table showing scores of all the Segments

Laura continued, “Also if we look at the table with all the segments for the company analyzed, as shown in table 23, Super Nozit Cream is not the least ranked segment and there are two other segments, MCT Energy Bars and Superclean DirtRepel that are ranked lower than this segment at 165 and 125 respectively.”

Even before Laura can finish, Jason, VP Transportation interrupted her, “Superclean DirtRepel may be ranked as the least of all the segments but it has better

sales and better profit than Super Nozit Cream. Superclean Dirtrepel is one of the best known products that are valued by the customer.

Seeing that Laura was pointing about MCT Energy bars, Roy, VP Food said, "MCT Energy Bars has better sales at $20 million than half of the segments in Superstar and its profits are better than Super Nozit Cream or Superclean Dirtrepel. The percent profit growth is at least a positive value unlike the Superclean Dirtrepel. This segment has better sales than the segments that are ranked higher. So, I believe that if you consider only sales, then this project will be ranked above half of the segments in Superstar is currently having. We have competitive advantage over other companies and strategically we are better fit. If 'Value to the customer' and 'Percentage gross profit' were not considered, then you would see that this project will be somewhere in the top 40 percentage of all segments."

Laura added, "I did not want to point out about all the segments, but all I wanted to show was that there were projects that are ranked lower than what one of the segments in Personal Care is ranked at. But if you look at the other two segments in Personal Care: Supershield Suncare and Super 90 Noage Lotion they are ranked fourth and fifth of all the fifteen segments. Also the new project Nozit Moisturizer as shown in table 24 will be actually bringing in profits and is ranked better than six other projects. So we will have more profits which will in turn give advantage over other units."

SUPERSTAR SPECIALITIES, INC					All Projects Analysis							
All Projects	% Profit Growth ($ to $) 2003 - 2005	Value to Customer	Competitive Advantage	% Gross Profit - Last full Year	Technical / Commercial Feasibility	Total Sales last full year	Market Attractiveness	Total Profit 2003	Current Development Costs	Strategic Fit	Total Score	Business Unit
Maximum Value	>15%	140	130	>50%	180	>$30MM	140	>$15MM	>$1.5MM	130	500	
High Temp Gas Membranes	20.80%	81.00	95.00	60.00%	123.00	$17.34	101.00	$10.40	$0.55	117.00	415.00	Energy
Superburnall Jetfuel	12.60%	86.00	113.00	48.00%	129.00	$6.53	101.00	$3.13	$0.40	117.00	360.00	Transportation
Paper Panels	41.00%	88.00	95.00	58.00%	111.00	$7.00	96.00	$4.06	$0.45	111.00	360.00	Construction
Super 120 Noage	18.80%	92.00	117.00	70.00%	85.00	$7.00	91.00	$4.90	$0.90	95.00	355.00	Personal Care
Supercreamic Vehicle Parts	16.70%	83.00	105.00	45.00%	116.00	$3.90	103.00	$1.76	$0.35	97.00	345.00	Transportation
High Temperature Preservative	10.60%	90.00	100.00	52.00%	101.00	$8.00	87.00	$5.60	$0.79	111.00	320.00	Food
Improved Photo Catalyst	10.50%	81.00	117.00	31.00%	92.00	$6.50	86.00	$2.10	$0.30	95.00	295.00	Energy
Nanotube Piezo Polymers	11.80%	71.00	95.00	45.00%	101.00	$4.23	87.00	$1.90	$0.16	111.00	290.00	Energy
Nozit Moisturizer	14.50%	85.00	95.00	43.00%	101.00	$2.09	100.00	$0.90	$0.60	92.00	290.00	Personal Care
Improved Fataway for Kids	9.30%	92.00	117.00	45.00%	85.00	$3.50	76.00	$1.51	$0.38	95.00	285.00	Food
Teflon Glueall	10.50%	92.00	102.00	42.10%	85.00	$4.50	86.00	$1.90	$0.45	85.00	275.00	Construction
New asphalt additives	7.00%	72.00	71.00	37.00%	123.00	$6.10	101.00	$2.22	$0.49	92.00	265.00	Construction
MCT Energy Cereal	7.30%	81.00	72.00	35.00%	123.00	$2.10	101.00	$0.73	$0.45	117.00	260.00	Food
Improved Dirtrepel	4.80%	91.00	92.00	45.00%	113.00	$0.85	93.00	$0.38	$0.30	102.00	235.00	Transportation
Supershield for Baldies	5.40%	82.00	80.00	48.00%	123.00	$3.00	86.00	$1.40	$0.80	88.00	225.00	Personal Care

Table 24: Table showing scores of all the proposed Projects

Laura continued, "If you analyze table 25 that ranks the units, you will see that Personal Care is the business unit that is ranked No. 1 for the projected year 2005. Personal Care unit will bring in more sales and profit and percent gross profit than any of the other units that we have now. So we need to pursue the existing segments and fund new projects in personal care."

SUPERSTAR SPECIALITIES, INC					Business Analysis						
Business Unit	%Profit Growth ($ to $) 2003 - 2005	Value to Customer	Competitive Advantage	% Gross Profit -Last full Year	Technical / Commercial Feasibility	Total Sales last full year	Market Attractiveness	Total Profit 2003	Current Development Costs	Strategic Fit	Total Score
Maximum Value	>15%	140	130	>50%	180	>$90MM	140	>$45MM	>$4.5MM	130	500
Energy	10.83%	60.67	83.33	47.50%	116.67	$88.00	82.33	$41.80	$3.70	92.67	315.00
Personal Care	8.07%	68.67	77.33	58.00%	110.33	$50.00	99.00	$29.00	$4.55	85.33	300.00
Food	6.63%	57.33	78.33	40.67%	113.00	$80.90	106.00	$32.90	$5.69	108.67	280.00
Construction	8.10%	78.33	74.00	25.71%	115.67	$119.00	106.00	$30.60	$9.60	90.33	275.00
Transportation	4.20%	59.67	74.67	33.14%	95.33	$63.00	91.33	$20.88	$3.83	91.00	240.00
			Projected 2005								
Projected Personal Care	12.90%	86.33	97.33	58.51%	103.00	$74.18	92.33	$43.40	$9.15	91.67	355.00
Projected Energy	14.37%	77.67	102.33	48.98%	105.33	$144.14	91.33	$70.60	$5.72	107.67	345.00
Projected Construction	19.50%	84.00	89.33	30.45%	106.33	$154.20	94.33	$46.96	$12.38	96.00	340.00
Projected Food	9.07%	87.67	96.33	44.94%	103.00	$108.10	88.00	$48.58	$8.93	107.67	340.00
Projected Transportation	11.37%	86.67	103.33	36.72%	119.33	$85.56	99.00	$31.42	$5.93	105.33	310.00

Table 25: Table showing scores of existing and projected business units

Phillip, VP Sales said, “Personal Care does not have as good sales as some other units such as Construction which will have projected sales of $154 million and better profits such as energy projected to be at $44 million, so why should Superstar be interested in a small project like Supershield for Baldies?”

Lloyd, CFO said, “The good thing I like about Personal Care unit is that it is not only projected to be the best unit, but also that it gives us the best percentage profit growth of almost 60% which no other unit gives. But at the same time, I am wanting to take money for current developmental costs for the project Supershield for Baldies and invest those moneys into any of Nanotube Piezo Polymers ($0.16MM), Improved photo catalyst ($0.3MM), or Superceramic Vehicle Parts ($0.35MM).”

Laura added, “Yes, the one thing that I am proud about Personal Care is that we are projected to be the best of all the business units in 2005. Sales and profit might be low in our business but as CFO pointed out the percentage profit growth that our business will

give you will be the maximum of any of the other business units in Superstar (Table 25). So even if we have a project that has low profits and sales we will be leading with profits."

Dr. Wagener tried to bring order in the room and said, "Gentleman, let us not discuss on what project that you want to stop or what segments you want to remove out of Superstar, instead let us focus on what can be done to and achieve the company's objectives. Superstar Specialties is one of growing companies trying to compete with the industry giants and also with global competition. With other companies maturing and growing very fast, their technologies are improving rapidly and it is stunning how some of the companies are coming up with innovations. So we have to be creative and introduce and take chances on good projects, and at the same time have high standards in order to compete with other companies. So, I suggest that in our discussions let us debate on all the possible scenarios and leave the final decision to Sanjeev."

After listening to the discussion Sanjeev said, "Looking at all your comments and suggestions, I think that we will drop the Supershield for Baldies project. As CFO and VP Sales have suggested we can use the revenue and developmental costs in some other projects that can give us more percentage gross profits than what project for Baldies is giving us. Also that money can go into one or all of the projects in Personal care. If we do that Personal Care as a business can give more percentage gross profit than 60% (may be 70% or something) and be better than other business units. Also, I am suggesting that Laura should not drop the project completely instead you should keep a close watch on the market for demand on the project Supershield for Baldies. We can re-evaluate it next

year. Let us continue with the evaluation of other segments and projects in the other units."

The discussion for the rest of the projects, segments, and units continued for Superstar Specialties. The spreadsheet (Appendix A of the CDROM) provides the details of the analysis for the other projects and segments.

DAY FIVE

The agenda for day five was set as follows:

- Session One – Project Managers
- Session Two – Vice Presidents
- Session Three – Executive Team

STUDENT'S ROLE

You have just been hired as a new assistant to one of the Vice President of Superstar Specialties, Inc. In your role, you are expected to provide input for that vice president's task of prioritizing the business unit's. The vice presidents must meet with the other business unit directors in one week for the final session of the retreat. Your task will be to provide the requested information in a timely manner and within the deadlines established by that vice president to better enable him/her to share accurate information in the final session.

Your vice president has requested a meeting with you to discuss the executive retreat and the goals of the retreat. In order for you to make contribution to his/her analysis, you must understand the implications of your work and its impact on the decisions that are to be made. In the meeting with your vice president, he/she recaps the first four days of the

retreat and provides you with background information about the issues that led to the need for an executive retreat.

SESSION ONE

The Vice Presidents invited the project managers who were involved in developing the 15 projects to attend the fifth-day of retreat. The managers were asked to provide scenarios and values based on changing business opportunities and threats. The managers provided changed scores for each project as shown below. They were used to re-compute the score for each project using the spreadsheet in Appendix A of the CDROM.

Project 1: Assume the role of project manager for the energy project 'NANOTUBE PIEZO POLYMERS'.

1. The percentage profit growth has changed from 11.8% to 7.3%.
2. Manufacturing capabilities in strategic fit have been improved from 7 to 10.
3. Allows compliance with HSE regulations in value to the customer has changed from 0 to 10.
4. Product technology under competitive advantage is now protected with patents and has changed its value from 5 to 15.
5. Needed capital requirements in technical / commercial feasibility now changed from 5 to 9.

Prioritize the unit (present and future), the segments and projects. Create a presentation showing the values for the unit, segment, and projects. Has there been any improvement in the rank of 'NANOTUBE PIEZO POLYMERS' energy project?

Project 2: Assume the role of project manager for the energy project 'IMPROVED PHOTO CATALYST'.

1. The percentage profit growth has changed from 10.5% to 4.2 %.
2. Estimated percentage gross profit has changed from 31% to 35%.

Prioritize the unit (present and future), the segments and projects. Create a presentation showing the values for the unit, segment, and project and how 'IMPROVED PHOTO CATALYST' is ranked and is it worth pursuing?

Project 3: Assume the role of project manager for the energy project 'HIGH TEMPERATURE GAS MEMBRANES'.

1. The percentage profit growth has changed from 20.8% to 10.46%
2. Time required to implement under value to the customer is now >18 months.
3. Product technology under competitive advantage is now protected with patents and has changed its value from 5 to 15.
4. Know-how and competitor products under technical and commercial feasibility have been changed to 4 from 12.

Prioritize the unit (present and future), segments and projects. Create a presentation showing the values for the unit, segments, and projects and how 'HIGH TEMPERATURE GAS MEMBRANES' is ranked and is it worth pursuing?

Project 4: Assume the role of project manager for the food project 'IMPROVED FATAWAY FOR KIDS'

1. Percentage profit growth has changed from9.3% to 14.4 %.
2. Estimated percentage gross profit has decreased from 45% to 35%.
3. Estimated sales increased from $3.5 million to $6.7 million.

Prioritize the unit (present and future), the segments and projects. Create a presentation showing the values for the unit, segment, and project. Has there been any improvement in the rank of ‘IMPROVED FATAWAY FOR KIDS’ food project?

Project 5: Assume the role of project manager for the food project ‘MCT ENERGY CEREAL’

1. Percentage profit growth has changed from 7.3% to 12.8%.
2. Protectable value pricing in value to the customer changed from 8 to 14.
3. Time to commercialization in technical and commercial feasibility has changed from 10 to 19.

Prioritize the unit (present and future), the segments and projects. Create a presentation showing the values for the unit, segment, and project. Has there been any improvement in the rank of ‘MCT ENERGY CEREAL’ food project?

Project 6: Assume the role of project manager for the food project ‘HIGH TEMPERATURE PRESERVATIVE’

1. Percentage profit growth has changed from 10.6% to 13.6 %.
2. Estimated gross profit changed from $5.60 million to $6.70 million.
3. In value to the customer lower cost product changed from 15 to 23, increased performance has changed form 15 to 18, and our market share increased from 8 to 13.

Prioritize the unit (present and future), the segments and projects. Create a presentation showing the values for the unit, segment, and project and how ‘HIGH TEMPERATURE PRESERVATIVE’ is ranked and is it worth pursuing?

Project 7: Assume the role of project manager for the personal care project 'SUPERSHIELD FOR BALDIES'

1. The percentage profit growth has changed from 5.4% to 10.46%
2. Time required to implement under value to the customer is now 8 months.
3. Product technology under competitive advantage is now protected with patents and has changed its value from 5 to 15.
4. Know-how and competitor products under technical and commercial feasibility have been changed to 18 from 12.

Prioritize the unit (present and future), the segments and projects. Create a presentation showing the values for the unit, segment, and project and how 'SUPERSHIELD FOR BALDIES' is ranked and is it worth pursuing?

Project 8: Assume the role of project managers for the personal care project 'SUPER 120 NOAGE LOTION'

1. The percentage profit growth has changed from 18.8% to 7.3%.
2. Manufacturing capabilities in strategic fit have been improved from 5 to 10.
3. Allows compliance with HSE regulations in value to the customer has changed from 15 to 10.
4. Product technology under competitive advantage is now protected with patents and has changed its value from 20 to 15.
5. Needed capital requirements in technical / commercial feasibility now changed from 2 to 9.

Prioritize the unit (present and future), the segments and projects. Create a presentation showing the values for the unit, segment, and projects. Has there been any improvement in the rank of ‘SUPER 120 NOAGE LOTION’ personal care project?

Project 9: Assume the role of project manager for the personal care project ‘NOZIT MOISTURIZER’

1. The percentage profit growth has changed from 14.5% to 6.2 %.
2. Estimated percentage gross profit has changed from 43% to 35%.

Prioritize the unit (present and future), segments and projects. Create a presentation showing the values for the unit, segments, and projects and how ‘NOZIT MOISTURIZER’ is ranked and is it worth pursuing?

Project 10: Assume the role of project manager for the transportation project ‘SUPERBURNALL JET FUEL’.

1. Percentage profit growth has been changed from 12.6% to 15.3 %.
2. Estimated gross profit changed from $3.15 million to $4.70 million.
3. In value to the customer lower cost product changed from 15 to 23, increased performance has changed form 15 to 18, and our market share increased from 5 to 13.

Prioritize the unit (present and future), the segments and projects. Create a presentation showing the values for the unit, segment, and project and how ‘SUPERBURNALL JET FUEL’ is ranked and is it worth pursuing?

Project 11: Assume the role of project manager for the transportation project ‘SUPERCERAMIC VEHICLE PARTS’.

1. The %Profit Growth has changed from 16.7% to 8.4 %.

2. Estimated percentage gross profit has decreased from 45% to 22.5%.
3. Estimated sales decreased from $3.9 million to $2.7 million.

Prioritize the unit (present and future), the segments and projects. Create a presentation showing the values for the unit, segment, and project. Has there been any improvement in the rank of ‘SUPERCERAMIC VEHICLE PARTS’ transportation project?

Project 12: Assume the role of project manager for the transportation project ‘IMPROVED DIRTREPEL’.

1. Percentage profit growth has changed from 4.8% to 5.7%.
2. Protectable value pricing in value to the customer changed from 2 to 8.
3. Resources available value in technical and commercial feasibility has changed from 10 to 18.

Prioritize the unit (present and future), the segments and projects. Create a presentation showing the values for the unit, segment, and project. Has there been any improvement in the rank of ‘IMPROVED DIRTREPEL’ transportation project?

Project 13: Assume the role of project manager for the construction project ‘NEW ASPHALT ADDITIVES’

1. Percentage profit growth has changed from 7.0% to 11.7%.
2. Estimated percentage gross profit has increased from 37% to 46%.
3. Estimated sales decreased from $6.1 million to $7.9 million.

Prioritize the unit (present and future), the segments and projects. Create a presentation showing the values for the unit, segment, and project. Has there been any improvement in the rank of ‘NEW ASPHALT ADDITIVES’ construction project?

Project 14: Assume the role of project manager for the construction project 'TEFLON GLUEALL'

1. Percentage profit growth has changed from 10.5% to 12.7 %.
2. Estimated gross profit changed from $1.9 million to $3.27 million.
3. In value to the customer lower cost product changed from 25 to 20, increased performance has changed form 15 to 18, and our market share increased from 5 to 13.

Prioritize the unit (present and future), the segments and projects. Create a presentation showing the values for the unit, segment, and project and how 'TEFLON GLUEALL' is ranked and is it worth pursuing?

Project 15: Assume the role of project manager for the construction project 'PAPER PANELS'

1. Percentage profit growth has changed from 41% to 32%.
2. Protectable value pricing in value to the customer changed from 10 to 1.
3. Resources available value in technical and commercial feasibility has changed from 10 to 5.

Prioritize the unit (present and future), the segments and projects. Create a presentation showing the values for the unit, segment, and project. Has there been any improvement in the rank of 'PAPER PANELS' construction project?

SESSION TWO

The VP'S for each unit worked with the project managers to prioritize the projects and segments in each unit. The questions considered while working on the units were:

What projects needed to be funded? What projects and segments had good percentage gross profit? Do we want to pursue a project that will not make good profits? Which segments had better sales and do we want to dissolve a segment that has poor performance and allocate those personnel to other segments?

Unit I, Energy: Project 1, Project 2, and Project 3 members joined together to form as energy unit team. In the business unit energy, discuss which project is doing better and which project should be improved. Change values in the spreadsheet (Appendix A of the CDROM) based on discussions among the group members so that the projects you choose have high scores. Also, discuss whether the projects are worth pursuing. Try to pick the best projects.

Unit II, Food: Project 4, Project 5, and Project 6 members joined together to form as a food unit team. In the business unit food, discuss which project is doing better and which project should be improved. Change values in the spreadsheet (Appendix A of the CDROM) based on discussions among the group members so that the projects you choose have high scores. Also, discuss whether the projects are worth pursuing. Try to pick the best projects.

Unit III, Personal Care: Project 7, Project 8, and Project 9 members joined together to form as a personal care unit team. In the business unit personal care, discuss which project is doing better and which project should be improved. Change values in the spreadsheet (Appendix A of the CDROM) based on discussions among the group members so that the projects you choose have high scores. Also, discuss whether the projects are worth pursuing. Try to pick the best projects.

Unit IV, Transportation: Project 10, Project 11, and Project 12 members joined together to form as a transportation unit team. In the business unit transportation, discuss which project is doing better and which project should be improved. Change values in the spreadsheet (Appendix A of the CDROM) based on discussions among the group members so that the projects you choose have high scores. Also, discuss whether the projects are worth pursuing. Try to pick the best projects.

Unit V, Construction: Project 13, Project 14, and Project 15 members joined together to form as a construction unit team. In the business unit construction, discuss which project is doing better and which project should be improved. Change values in the spreadsheet (Appendix A of the CDROM) based on discussions among the group members so that the projects you choose have high scores. Also, discuss whether the projects are worth pursuing. Try to pick the best projects.

SESSION THREE

Sanjeev, CEO and Executive management worked together to discuss all the projects and their scores in the spreadsheet 'All Projects Analysis' (Appendix A of the CDROM). Decide on the rankings and argue which projects the executive committee needs to pick given the $4.91 million developmental budget.

Other questions that need to be answered during this session are:

1. What projects need to be funded?
2. What to do with a great project in a poor segment or unit?
3. What segments should be sold or disassembled or reorganized?
4. What should you do with a project that does not fit your company?

5. Should a project be funded under each unit?
6. What should you do if a unit has two strong projects? Should one unit be funded and another unit loses funding in order to support two strong projects?

CONCLUSION ON THE CASE

Sanjeev thanked the executive management team and Dr. Earl Wagener for working with him in selecting the R & D projects that will be funded that year. He started to prepare a statement that will be shared with all employees of Superstar Specialties so that they feel motivated to work on the new projects with renewed energy and dedication.

IMPLEMENTATION OF THE CASE

This case study was implemented in two Auburn University classes, BUSI/ENGR 3520 and STAT 2610. This chapter gives a brief description of how this case was implemented in the classes.

IMPLEMENTATION IN BUSI / ENGR 3520

Auburn University's Business-Engineering-Technology (BET) program prepares Auburn undergraduates from two colleges to work in competitive technology-intensive business environments. Students are trained to function effectively in cross-functional teams of engineering and business professionals. Students in this program learn why engineers and business professionals are different and learn to understand the thinking, motivation, communication and culture of students from both colleges. The BET program's goal is to produce successful engineers and business professionals who can work effectively in both cultures. Students take seven specially-designed classes together, of which “3520 Integrating Business and Engineering Theories in Practice” is one.

In implementing this case study, the case study was given as is to the students and a one hour lecture was devoted to introducing the problem. After this introduction, the students were asked to go through the case study. They were also given the MS-Excel tool that is needed to understand the prioritization process. At this point the class was divided into fifteen project teams, each representing one proposed project in the

Superstar case. Once the students had been given several days to read through the material, they were asked to participate in ‘Session I’ of ‘Day 5’ in the case study. One observation during this first session of the assignment was that the students really enjoyed working on the spreadsheet and really understood what they were looking for in their respective assignments. This assignment gave them a sense of how they need to know everything about any project that they are working on.

After the students finished working on the first assignment, three project teams were grouped to form a unit team, so there were a total of only five teams for the next assignment. These five unit teams were asked to work on ‘Session II’ of the case study. At this point, they were encouraged to discuss amongst themselves on which of their three projects should be ranked as the best project. There was a lively discussion among the students as each tried to defend the projects that they had worked on. This assignment taught the students that they may sometimes have to prove to others that the project that they had worked on was worth pursuing further.

Once the students had finished working on the second assignments, the whole class was assembled to play the role of the executive committee. Dr. Earl Wagener attended this session and gave some insights to the students as to why they had gone through the assignments in ‘Session I’ and ‘Session II’. At this point, students with projects that have been ranked lowest in the prioritized chart were arguing that they could improve their ranking by manipulating a couple of points to bring them to the top, or at least to the middle, of the chart. Students were participating enthusiastically and giving substantial input as to how the funds should be allocated in Superstar Specialties Inc.

Table 26 shows the final list of projects that would receive funding after the discussion in the BUSI/ENGR 3520 class.

SUPERSTAR SPECIALITIES, INC					All Projects Analysis							
All Projects	% Profit Growth ($) 2003 - 2005	Value to Customer	Competitive Advanta	% Gross Profit - L full Year	Technical / Commercial Feasibil	Total Sales last full year	Market Attractiveness	Total Profit 2003	Current Developmen Costs	Strategic Fit	Total Score	Business Unit
Maximum Value	>15%	140	130	>50%	180	>$30MM	140	>$15MM	>$1.5MM	130	500	
Superburnall Jetfuel	15.30%	105.00	113.00	48.00%	129.00	$6.53	101.00	$4.70	$0.40	117.00	400.00	Transportation
Paper Panels	32.00%	88.00	95.00	58.00%	106.00	$7.00	96.00	$4.06	$0.45	111.00	360.00	Construction
High Temperature Preservative	13.60%	106.00	100.00	52.00%	101.00	$8.00	87.00	$6.70	$0.79	111.00	360.00	Food
Super 120 Noage	18.80%	92.00	117.00	70.00%	85.00	$7.00	91.00	$4.90	$0.90	95.00	355.00	Personal Care
High Temp Gas Membranes	10.46%	74.00	105.00	60.00%	115.00	$17.34	101.00	$10.40	$0.55	117.00	350.00	Energy
MCT Energy Cereal	12.80%	101.00	92.00	35.00%	141.00	$2.10	106.00	$0.73	$0.45	117.00	325.00	Food
New asphalt additives	11.70%	91.00	95.00	46.00%	123.00	$7.90	101.00	$2.22	$0.49	92.00	320.00	Construction
Teflon Glueall	12.70%	98.00	102.00	42.10%	92.00	$4.50	88.00	$3.27	$0.45	93.00	315.00	Construction
Nanotube Piezo Polymers	7.30%	101.00	98.00	45.00%	124.00	$4.23	87.00	$1.90	$0.16	114.00	310.00	Energy
Improved Fataway for Kids	14.40%	92.00	117.00	35.00%	85.00	$6.70	76.00	$1.51	$0.38	95.00	305.00	Food
						$71.30		$40.39	$5.02			
Nozit Moisturizer	14.50%	85.00	95.00	43.00%	101.00	$2.09	100.00	$0.90	$0.60	92.00	290.00	Personal Care
Supershield for Baldies	10.46%	86.00	93.00	48.00%	129.00	$3.00	86.00	$1.40	$0.80	88.00	275.00	Personal Care
Improved Dirtrepel	5.70%	102.00	102.00	45.00%	121.00	$0.85	106.00	$0.38	$0.30	102.00	270.00	Transportation
Improved Photo Catalyst	4.20%	94.00	117.00	35.00%	92.00	$6.50	91.00	$2.10	$0.30	100.00	265.00	Energy
Supercreamic Vehicle Parts	8.40%	98.00	105.00	22.50%	121.00	$2.70	110.00	$1.76	$0.35	97.00	255.00	Transportation
						$86.44		$46.93	$7.37			

Table 26: Projects that received funding after prioritization in BUSI / ENGR 3520

After the prioritization of the projects was complete, the students discussed the company's likely financial position and decided that they would fund the first ten projects. Although the funds required for the first ten projects added up to $5.02 million, students were willing to go slightly over budget to fund these projects. It was interesting to note that the students defending Superceramic Vehicle parts, the lowest ranked project, were still arguing that their project had the best market attractiveness of all the projects and should be fully funded.

IMPLEMENTATION IN STAT 2610[2]

Carrying out useful statistical analyses requires several types of skills. The consensus of a group of executives from a broad range of companies is that improving the statistical literacy of business students should be an important goal for universities. These executives agree that students should know how to use statistical techniques to plan and evaluate business situations and how to assess data and data collection techniques. STAT 2610 is intended to be a 'Introduction to Statistical Analysis'.

This class consisted of two sections, and these sections were used as an experimental class and a control class in order to measure any differences in understanding and retaining information achieved by the students with the help of Superstar Specialties case study. Students signed up for the class without prior knowledge of the format of the lectures and the same professor conducted both classes. The experimental class incorporated the Superstar Specialties case study and included extensive hands-on participation in computer labs, while the control class participated in a traditional lecture class with lecture slides and limited computer instruction through demonstration.

One important step taken to adapt the case for the statistics class was that the Superstar case was shortened. Statistical data was developed for one product line (Super 120 Noage Lotion) for use in the hands-on statistical analysis. Also, case analysis guidelines were developed for the final report.

[2] This section includes material from a presentation at a LITEE Workshop by Ms. Evelyn Trasher

After an initial analysis, there was no indication of any significant differences in class performance on exams, homework or projects. However, it was observed that the students in the experimental class were more comfortable using business tools for statistical analysis, while the control class was noticeably less comfortable with the same tools. The experimental class also seemed to have a better grasp of statistical terminology and were generally more open and eager to participate in the follow up survey and interview, expressing a greater appreciation of the real world applications of statistics.

CONCLUSIONS

This methodology can be used to help a wide variety of organizations or projects to select from multiple R & D proposals those projects that are best suited to their needs due to its high degree of transparency and flexibility. This methodology can not only serve the needs of big organizations but also the needs of an individual in his/her daily needs. The only criteria that this tool requires are the constraints that must be applied to the tool so that it can be used for a particular situation.

This methodology can be used to show the relationship between critical success factors and the issues that are important for an organization or project by measuring them on the same scale. In doing so, the relative importance of each critical success factor is weighted on a percentage scale to sum to 100%. The company executives leading the various business units and the company's top management are all closely involved in this process.

The need for prioritization occurs when different units of the company pursuing significant research must compete for funding for new projects. Among the fifteen projects proposed, Superstar Specialties Inc. had to make the choice to fund only some of the projects, due to the constraints imposed by the limited research budget.

The main aspect that a student learns to appreciate after participating in this case study is how prioritization can be an important step in any decision involving a

company's future prospects. The undergraduate students who participated in the two classes were excited and learned about how the prioritization process in a company works in the real world. Some of the students even went one step further and manipulated values in the projects that they were interested in to bring them to the top of the list, and thus improve their chances of obtaining funding for the project. There was a lively discussion and a great deal of enthusiasm among the students when this case study was presented. Since the students have to write/sign their names under the "Completed by" column, this tool also gives students a feel for the type of responsibility they will assume when they take a job in the real world of engineering and business, and a sense of commitment to their projects.

In conclusion, this uniform, logical, and comprehensive prioritizing tool is very transparent and can be easily manipulated and customized by any organization for prioritizing projects, potentially saving millions of dollars. Also, this tool helps projects identify any impediments, thus reducing the amount of money spent on Research and Development.

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APPENDIX A: INSTRUCTOR'S MANUAL

OVERVIEW

The Superstar Specialties Inc. case is a case study dealing with the prioritization of Research and Development (R&D) projects. Superstar Specialties Inc. teaches students not only an innovative method that can be used in the prioritization of R&D cases, but also allows students to investigate a wide range of issues surrounding R&D prioritization. The case allows students to observe and participate in the decision making process at various levels, from the CEO to the managers of individual R&D projects.

With the help of Dr. Earl Wagener, Sanjeev Kumar has scheduled a retreat with Superstar Specialties' top executives and project managers in order to prioritize their R&D projects to best meet the goals of the company. Superstar Inc. will go through the prioritization method created by Dr. Earl Wagener that allows them to create specific criteria geared towards their company goals and then weighs these criteria to best align them to the company's overall business strategy. At the retreat, the Superstar Inc. staff discuss each of the projects and then work to identify the projects most suited for the company's goals. The retreat sheds light on the type of issues that companies commonly deal with, such as pet projects and internal struggles among employees. At the end of the retreat, decisions about which R&D project should be funded are made based on the innovative methods developed by Dr. Earl Wagener.

COURSES AND LEVELS

This case study is suitable for undergraduate and graduate students in both engineering & business courses. The case study is designed to show the importance of prioritizing R&D projects, as well as to allow students to gain hands on experience with an excellent method to use for the purpose.

INSTRUCTION PLAN

The class can be divided based on how the instructor wishes to use the case study. An example of how the class can be divided follows, but the professor teaching the course is free to make his or her own choice. If there are thirty students in the class, the class can be divided into two students per project and there will be fifteen groups for session one. For the second session, three projects in each area of energy, personal care, etc. can be grouped together to form five groups of six students. For session three, the whole class is assembled in a single group for the discussion. By this time, each group (energy, personal care, etc.) has a very good understanding of which projects are doing well and which projects are vulnerable. Thus, when they start discussing the projects from the point of view of the company's senior management, the liveliness of the project comes into play and the students argue to save their own projects.

SOLUTION TO SESSION ONE OF THE CASE

Project 1: Assume the role of project manager for the energy project 'Nanotube Piezo Polymers'.

1. The percentage profit growth has changed from 11.8% to 7.3%.

SUPERSTAR SPECIALITIES, INC					Energy Project 'Nanotube Piezo Polymers'
	Critical Factor	Raw Data	Weight	Score	Comments
1	% Gross Profit Growth ($ to $)	7.30%	20	40	>15%=5, >12%=4, >9%=3, >6%=2, >3%=1, <3%=0
	2003 - 2005				
2	Value to Customer (End User)	71	15	30	>120=5, >100=4, >80=3, >60=2, >40=1, <40=0
3	Competitive Advantage	95	10	40	>110=5, >90=4, >70=3, >50=2, >30=1, <30=0
4	% Gross Profit last full year	45.00%	10	40	>50%=5, >42%=4, >34%=3, >26%=2, >18%=1, <18%=0
5	Technical / Commercial Feasibility	101	10	30	>150=5, >120=4, >90=3, >60=2, >30=1, <30=0
6	Total sales last full year	$4.23	10	10	>$15=5, >$12=4, >$9=3, >$6=2, >$3=1, <$3=0 (In Million)
7	Market Attractiveness	87	10	30	>120=5, >100=4, >80=3, >60=2, >40=1, <40=0
8	Total Gross Profit last full year	$1.90	5	10	>$6=5, >$4.5=4, >$3=3, >$1.5=2, >$0.5=1, <$0.5=0 (In Million)
9	Current Development Costs	$0.16	5	15	<$0.1=5, <$0.15=2, <$0.25=3, <$0.4=2, <$0.5=1, >$0.5=0 (In Million)
10	Strategic Fit	111	5	25	>110=4, >90=4, >70=3, >50=2, >30=1, <30=0
	TOTAL		100%	270	

Table 27: Solution to Part 1 Project 1

2. Manufacturing capabilities in the strategic fit have been improved from 7 to 10.

Strategic Fit					Nanotube Piezo Polymers
	Critical Component	Score	Range	Completed By	Documentation
1	Strong Growth Candidate >10%=20, >5%=15, >2%=10, >1%=5, <1%=0	20	0-20		Growth rate 30%
2	Strong Profit Candidate >60%=20, >46%=15, >33%=10, >20%=5, <20%=0	14	0-20		
3	Uses Current Customer Base	16	0-20		Some new customers, but majority existing
4	Fits Current R&D / Tech. Serv / Sales Infrastructure	16	0-20		research strong need more engineering
5	Synergistic With Core Technologies	18	0-20		Polymer base strong
6	Fits Current Business Model	10	0-10		
7	Fits Current Distribution	10	0-10		
8	Fits Current Mfg.Capabilities	10	0-10		Need to expand scaleup
	Total	114	130		

Table 28: Solution to Part 2 Project 1

3. Allows compliance with HSE regulations in value to the customer has changed from 0 to 10.

	Value to the Customer				Nanotube Piezo Polymers
	Critical Components	**Score**	**Range**	**Rated By**	**Documentation**
	Offers benefits in the form of:				
1	- Lower cost product	15	0-25		Nanotubes more expensive, but performance much better
	- Increased performance	15	0-20		Performance 3x over other peizo polymers, but temperature limited
	- Protectable value pricing	5	0-15		Low end IR cameras new to market, pricing uncertain
	- Market share protection / enhancement	8	0-15		Potential very good, need to see market development
	- Allows compliance with HSE regulations	10	0-15		No HSE advantage, no problems
	- Provides product solutions	3	0-10		Lower cost, but IR performance slightly less
	- Offers production benefits(unit op/utility/etc savings	8	0-10		Piezopolymers easier to assemble
	Time required to implement				
2	< 6 months	7	10		Superstar will do most of the prototyping
	< 18 months		5		
	> 18 months		0		
	Cumulative customer cost (non-capital) required to implement this technology				
3	No cost	7	10		Reasonable
	Reasonable cost		5		
	High cost		0		
	Direct customer capital cost to implement this technology				
4	No capital required	3	10		Above average capital required, but not prohibitive
	Reasonable capital		5		
	High capital		0		
	Total Score	81	140		

Table 29: Solution to Part 3 Project 1

4. Product technology under competitive advantage is now protected with fewer patents and has changed its value from 20 to 15.

	Competitive Advantage				Nanotube Piezo Polymers
	Critical Components	**Score**	**Range**	**Rated By (Initials)**	**Documentation**
1	Do we have the low cost position over our competitors?	25	0-30		Nanotubes expensive, but performance allows thinner films
2	Do we have a customer recognized performance advantage over our competitors?	20	0-30		IR performance equal, but polymer allows new configurations
3	Is our product technology protected with patents, trade secrets,know how, or contracts?	15	0-20		4 Issued International Patents
4	Do we have a customer recognized performance technical capability, sales, marketing, or technical service?	10	0-20		Superstar new to market, but great technical development reputation
5	Are there gaps in our product offerings? (no gaps - high score)	5	0-15		Will expand SKU's in future years
6	Percent of Current Products That Are "Me Too" <60% =15; 75%= 10; 90%=5; 100%= 0	15	0-15		All new technology
	Total Score	90	130		

Table 30: Solution to Part 4 Project 1

5. Needed capital requirements in technical/commercial feasibility now changed from 2 to 9.

Technical / Commercial Feasibility					Nanotube Piezo Polymers
		Score	Range	Initials	Documentation
	Critical Component				
1	Time to commercialization <6 mo.=30; <1 yr.=15; <18mo.=10; >18mo.=5; .2yrs.=0	5	0-30		Nanotube reproducibility problematic
2	Has the price/performance been confirmed by customers?	25	0-30		Customers love the performance /cost ratio
3	Are any patents/ know-how/competitor products/ geography blocking normal product development?	19	0-20		Our patents look good
4	Are all resources available (Technical Service, Marketing, Manufacturing, etc.) ?	10	0-20		Need more scale up people
5	Will our strategic customers actively help in development?	10	0-10		Customers on board
6	Cost in Time or $$ to comply with Health / Safety / Environmental Low=10; Med=5; High=0	9	0-10		
7	Can competitors take strong action to block? Yes= 0 No= 10 Maybe=5	2	0-10		We will have strong competition
8	Is this a new product / technology for our customers? Score measures ability of customer to commmercialize	3	0-10		Yes, they will have to develop some new equipment
9	Are all raw materials readily available?	2	0-10		Nanotube purity a problem
10	What are the needed capital requirements? Low=10; Medium=5 High=0	9	0-10		We will need new equipment
11	Is this a new product or technology for us?	5	0-10		New , but we are the leaders
12	Customers are profitable, growing, and development oriented? Are customers favorably positioned to afford higher value?	9	0-10		Customers are in the security business which is hot
	Total =	108	180		

Table 31: Solution to Part 5 Project 1

Project 2: Assume the role of project manager for the energy project 'Improved Photo Catalyst'.

1. The percentage profit growth has changed from 10.5% to 4.2 %.
2. Estimated percentage gross profit has changed from 31% to 35%.

SUPERSTAR SPECIALITIES, INC			Energy Project 'Improved Photo Catalyst'		
	Critical Factor	Raw Data	Weight	Score	Comments
1	% Gross Profit Growth ($ to $) 2003 - 2005	4.20%	20	20	>15%=5, >12%=4, >9%=3, >6%=2, >3%=1, <3%=0
2	Value to Customer (End User)	81	15	45	>120=5, >100=4, >80=3, >60=2, >40=1, <40=0
3	Competitive Advantage	117	10	50	>110=5, >90=4, >70=3, >50=2, >30=1, <30=0
4	% Gross Profit last full year	35.00%	10	30	>50%=5, >42%=4, >34%=3, >26%=2, >18%=1, <18%=0
5	Technical / Commercial Feasibility	92	10	30	>150=5, >120=4, >90=3, >60=2, >30=1, <30=0
6	Total sales last full year	$6.50	10	20	>$15=5, >$12=4, >$9=3, >$6=2, >$3=1, <$3=0 (In Million)
7	Market Attractiveness	86	10	30	>120=5, >100=4, >80=3, >60=2, >40=1, <40=0
8	Total Gross Profit last full year	$2.10	5	10	>$6=5, >$4.5=4, >$3=3, >$1.5=2, >$0.5=1, <$0.5=0 (In Million)
9	Current Development Costs	$0.30	5	10	<$0.1=5, <$0.15=2, <$0.25=3, <$0.4=2, <$0.5=1, >$0.5=0 (In Million)
10	Strategic Fit	95	5	20	>110=4, >90=4, >70=3, >50=2, >30=1, <30=0
	TOTAL		100%	265	

Table 32: Solution to Part 1 & 2 Project 2

Project 3: Assume the role of project manager for the energy project 'High Temperature Gas Membranes'.

1. The percentage profit growth has changed from 20.8% to 10.46%

SUPERSTAR SPECIALITIES, INC			Energy Project 'High Temperature Gas Membranes'		
	Critical Factor	Raw Data	Weight	Score	Comments
1	% Gross Profit Growth ($ to $) 2003 - 2005	10.46%	20	60	>15%=5, >12%=4, >9%=3, >6%=2, >3%=1, <3%=0
2	Value to Customer (End User)	81	15	45	>120=5, >100=4, >80=3, >60=2, >40=1, <40=0
3	Competitive Advantage	95	10	40	>110=5, >90=4, >70=3, >50=2, >30=1, <30=0
4	% Gross Profit last full year	60.00%	10	50	>50%=5, >42%=4, >34%=3, >26%=2, >18%=1, <18%=0
5	Technical / Commercial Feasibility	123	10	40	>150=5, >120=4, >90=3, >60=2, >30=1, <30=0
6	Total sales last full year	$17.34	10	50	>$15=5, >$12=4, >$9=3, >$6=2, >$3=1, <$3=0 (In Million)
7	Market Attractiveness	101	10	40	>120=5, >100=4, >80=3, >60=2, >40=1, <40=0
8	Total Gross Profit last full year	$10.40	5	25	>$6=5, >$4.5=4, >$3=3, >$1.5=2, >$0.5=1, <$0.5=0 (In Million)
9	Current Development Costs	$0.55	5	0	<$0.1=5, <$0.15=2, <$0.25=3, <$0.4=2, <$0.5=1, >$0.5=0 (In Million)
10	Strategic Fit	117	5	25	>110=4, >90=4, >70=3, >50=2, >30=1, <30=0
	TOTAL		100%	375	

Table 33: Solution to Part 1 Project 3

2. Time required to implement under value to the customer is now >18 months.

	Value to the Customer				High Temperature Gas Membranes
	Critical Components	**Score**	**Range**	**Rated By**	**Documentation**
	Offers benefits in the form of:				
1	- Lower cost product	20	0-25		High Temp Membranes Lower Fuel Consumption
	- Increased performance	15	0-20		High Temperature Operation Clearly Superior
	- Protectable value pricing	8	0-15		Membrane Costs High, but Performance Gives Edge
	- Market share protection / enhancement	10	0-15		Potential Outstanding
	- Allows compliance with HSE regulations	0	0-15		No HSE advantage, no problems
	- Provides product solutions	3	0-10		Product Solutions Very Viable In many Markets
	- Offers production benefits(unit op/utility/etc savings	8	0-10		Lower cost of fuel and pollutants
	Time required to implement				
2	< 6 months	0	10		Superstar will do most of the prototyping
	< 18 months		5		
	> 18 months		0		
	Cumulative customer cost (non-capital) required to implement this technology				
3	No cost	7	10		Reasonable
	Reasonable cost		5		
	High cost		0		
	Direct customer capital cost to implement this technology				
4	No capital required	3	10		Capital Could be higher due to higher temp operation
	Reasonable capital		5		
	High capital		0		
	Total Score	74	140		

Table 34: Solution to Part 2 Project 3

3. Product technology under competitive advantage is now protected with patents and has changed its value from 5 to 15.

	Competitive Advantage				High Temperature Gas Membranes
	Critical Components	**Score**	**Range**	**Rated By (Initials)**	**Documentation**
1	Do we have the low cost position over our competitors?	30	0-30		Higer Temperature Operation provides lowest lowest cost btu's
2	Do we have a customer recognized performance advantage over our competitors?	25	0-30		Testing Prototypes have Shown 30% Advantage- Still need long term data
3	Is our product technology protected with patents, trade secrets,know how, or contracts?	15	0-20		Patents applied for, but not issued
4	Do we have a customer recognized performance technical capability, sales, marketing, or technical service?	10	0-20		Superstar new to market, but great technical development reputation
5	Are there gaps in our product offerings? (no gaps - high score)	10	0-15		Have covered major markets
6	Percent of Current Products That Are "Me Too" <60% =15; 75%= 10; 90%=5; 100%= 0	15	0-15		All new technology
	Total Score	105	130		

Table 35: Solution to Part 3 Project 3

4. Know-how and competitor products under technical and commercial feasibility have been changed to 4 from 12.

	Technical / Commercial Feasibility				High Temperature Gas Membranes
		Score	Range	Initials	Documentation
	Critical Component				
1	Time to commercialization <6 mo.=30; <1 yr.=15; <18mo.=10; >18mo.=5; .2yrs.=0	10	0-30		Membranes Require long term operation, but savings are there now for some applications
2	Has the price/performance been confirmed by customers?	25	0-30		Customers love the performance /cost ratio
3	Are any patents/ know-how/competitor products/ geography blocking normal product development?	4	0-20		2 competing patent applications are of concern
4	Are all resources available (Technical Service, Marketing, Manufacturing, etc.) ?	15	0-20		Project well funded in US-Need help overseas
5	Will our strategic customers actively help in development?	10	0-10		Customers on board
6	Cost in Time or $$ to comply with Health / Safety / Environmental Low=10; Med=5; High=0	9	0-10		
7	Can competitors take strong action to block? Yes= 0 No= 10 Maybe=5	7	0-10		We will have competition, but they aren't ready yet
8	Is this a new product / technology for our customers? Score measures ability of customer to commmercialize	5	0-10		Yes, they will have to develop some new equipment
9	Are all raw materials readily available?	8	0-10		No apparent lack of raws
10	What are the needed capital requirements? Low=10; Medium=5 High=0	5	0-10		Nothing ridiculous
11	Is this a new product or technology for us?	8	0-10		Innovation on our base
12	Customers are profitable, growing, and development oriented? Are customers favorably positioned to afford higher value?	9	0-10		Energy Business loves these products
	Total	115	180		

Table 36 Solution to Part 4 Project 3

Project 4: Assume the role of project manager for the food project 'Improved Fataway for Kids'

1. Percentage profit growth has changed from 9.3% to 14.4 %.
2. Estimated percentage gross profit has decreased from 45% to 35%.
3. Estimated sales increased from $3.5 million to $6.7 million.

SUPERSTAR SPECIALITIES, INC			Food Project 'Improved Fataway for Kids'		
	Critical Factor	Raw Data	Weight	Score	Comments
1	% Gross Profit Growth ($ to $)	14.40%	20	80	>15%=5, >12%=4, >9%=3, >6%=2, >3%=1, <3%=0
	2003 - 2005				
2	Value to Customer (End User)	92	15	45	>120=5, >100=4, >80=3, >60=2, >40=1, <40=0
3	Competitive Advantage	117	10	50	>110=5, >90=4, >70=3, >50=2, >30=1, <30=0
4	% Gross Profit last full year	35.00%	10	30	>50%=5, >42%=4, >34%=3, >26%=2, >18%=1, <18%=0
5	Technical / Commercial Feasibility	85	10	20	>150=5, >120=4, >90=3, >60=2, >30=1, <30=0
6	Total sales last full year	$6.70	10	20	>$15=5, >$12=4, >$9=3, >$6=2, >$3=1, <$3=0 (In Million)
7	Market Attractiveness	76	10	20	>120=5, >100=4, >80=3, >60=2, >40=1, <40=0
8	Total Gross Profit last full year	$1.51	5	10	>$6=5, >$4.5=4, >$3=3, >$1.5=2, >$0.5=1, <$0.5=0 (In Million)
9	Current Development Costs	$0.38	5	10	<$0.1=5, <$0.15=2, <$0.25=3, <$0.4=2, <$0.5=1, >$0.5=0 (In Million)
10	Strategic Fit	95	5	20	>110=4, >90=4, >70=3, >50=2, >30=1, <30=0
	TOTAL		100%	305	

Table 37 Solution to Parts 1, 2, and 3 Project 4

Project 5: Assume the role of project manager for the food project 'MCT Energy Cereal'

1. Percentage profit growth has changed from 7.3% to 12.8%.

SUPERSTAR SPECIALITIES, INC			Food Project 'MCT Energy Cereal'		
	Critical Factor	Raw Data	Weight	Score	Comments
1	% Gross Profit Growth ($ to $)	12.80%	20	80	>15%=5, >12%=4, >9%=3, >6%=2, >3%=1, <3%=0
	2003 - 2005				
2	Value to Customer (End User)	81	15	45	>120=5, >100=4, >80=3, >60=2, >40=1, <40=0
3	Competitive Advantage	72	10	30	>110=5, >90=4, >70=3, >50=2, >30=1, <30=0
4	% Gross Profit last full year	35.00%	10	30	>50%=5, >42%=4, >34%=3, >26%=2, >18%=1, <18%=0
5	Technical / Commercial Feasibility	123	10	40	>150=5, >120=4, >90=3, >60=2, >30=1, <30=0
6	Total sales last full year	$2.10	10	0	>$15=5, >$12=4, >$9=3, >$6=2, >$3=1, <$3=0 (In Million)
7	Market Attractiveness	101	10	40	>120=5, >100=4, >80=3, >60=2, >40=1, <40=0
8	Total Gross Profit last full year	$0.73	5	5	>$6=5, >$4.5=4, >$3=3, >$1.5=2, >$0.5=1, <$0.5=0 (In Million)
9	Current Development Costs	$0.45	5	5	<$0.1=5, <$0.15=2, <$0.25=3, <$0.4=2, <$0.5=1, >$0.5=0 (In Million)
10	Strategic Fit	117	5	25	>110=4, >90=4, >70=3, >50=2, >30=1, <30=0
	TOTAL		100%	300	

Table 38: Solution to Part 1 Project 5

2. Protectable value pricing in value to the customer changed from 8 to 14.

	Value to the Customer				MCT Energy Cereal
	Critical Components	**Score**	**Range**	**Rated By**	**Documentation**
1	Offers benefits in the form of:				
	- Lower cost product	8	0-25		High temperature membranes, lower fuel consumption
	- Increased performance	15	0-20		High temperature operation clearly superior
	- Protectable value pricing	14	0-15		Membrane costs high, but performance gives edge
	- Market share protection / enhancement	10	0-15		Potential outstanding
	- Allows compliance with HSE regulations	0	0-15		No HSE advantage, no problem
	- Provides product solutions	4	0-10		Product solutions very viable in many markets
	- Offers production benefits(unit op/utility/etc savings	6	0-10		Lower cost of fuel and pollutants
2	Time required to implement				
	< 6 months	10	10		Superstar will do most of the prototyping
	< 18 months		5		
	> 18 months		0		
3	Cumulative customer cost (non-capital) required to implement this technology				
	No cost	10	10		Reasonable
	Reasonable cost		5		
	High cost		0		
4	Direct customer capital cost to implement this technology				
	No capital required	10	10		Capital could be higher due to higher temperature operation
	Reasonable capital		5		
	High capital		0		
	Total Score	87	140		

Table 39: Solution to Part 2 Project 5

3. Time to commercialization in technical and commercial feasibility has changed from 10 to 19.

Technical / Commercial Feasibility					MCT Energy Cereal
		Score	Range	Initials	Documentation
	Critical Component				
1	Time to commercialization <6 mo.=30; <1 yr.=15; <18mo.=10; >18mo.=5; .2yrs.=0	19	0-30		Membranes require long term operation, but savings are there now for some applications
2	Has the price/performance been confirmed by customers?	25	0-30		Customers love the performance /cost ratio
3	Are any patents/ know-how/competitor products/ geography blocking normal product development?	12	0-20		2 competent patent applications are are of concern
4	Are all resources available (Technical Service, Marketing, Manufacturing, etc.) ?	15	0-20		Project well funded in US-Need help overseas
5	Will our strategic customers actively help in development?	10	0-10		Customers on board
6	Cost in Time or $$ to comply with Health / Safety / Environmental Low=10; Med=5; High=0	9	0-10		
7	Can competitors take strong action to block? Yes= 0 No= 10 Maybe=5	7	0-10		We will have competition, but they aren't ready yet
8	Is this a new product / technology for our customers? Score measures ability of customer to commmercialize	5	0-10		Yes, they will have to develop some new equipment
9	Are all raw materials readily available?	8	0-10		No apparent lack of raws
10	What are the needed capital requirements? Low=10; Medium=5 High=0	5	0-10		Nothing ridiculous
11	Is this a new product or technology for us?	8	0-10		Innovation on our base
12	Customers are profitable, growing, and development oriented? Are customers favorably positioned to afford higher value?	9	0-10		Energy Business loves these products
	Total	132	180		

Table 40: Solution to Part 3 Project 5

Project 6: Assume the role of project manager for the food project 'High Temperature Preservative'

1. Percentage profit growth has changed from 10.6% to 13.6 %.
2. Estimated gross profit changed from $5.60 million to $6.70 million.

SUPERSTAR SPECIALITIES, INC					Food Project 'High Temperature Preservative'
	Critical Factor	Raw Data	Weight	Score	Comments
1	% Gross Profit Growth ($ to $)	13.60%	20	80	>15%=5, >12%=4, >9%=3, >6%=2, >3%=1, <3%=0
	2003 - 2005				
2	Value to Customer (End User)	90	15	45	>120=5, >100=4, >80=3, >60=2, >40=1, <40=0
3	Competitive Advantage	100	10	40	>110=5, >90=4, >70=3, >50=2, >30=1, <30=0
4	% Gross Profit last full year	52.00%	10	50	>50%=5, >42%=4, >34%=3, >26%=2, >18%=1, <18%=0
5	Technical / Commercial Feasibility	101	10	30	>150=5, >120=4, >90=3, >60=2, >30=1, <30=0
6	Total sales last full year	$8.00	10	20	>$15=5, >$12=4, >$9=3, >$6=2, >$3=1, <$3=0 (In Million)
7	Market Attractiveness	87	10	30	>120=5, >100=4, >80=3, >60=2, >40=1, <40=0
8	Total Gross Profit last full year	$6.70	5	25	>$6=5, >$4.5=4, >$3=3, >$1.5=2, >$0.5=1, <$0.5=0 (In Million)
9	Current Development Costs	$0.79	5	0	<$0.1=5, <$0.15=2, <$0.25=3, <$0.4=2, <$0.5=1, >$0.5=0 (In Million)
10	Strategic Fit	111	5	25	>110=4, >90=4, >70=3, >50=2, >30=1, <30=0
	TOTAL		100%	345	

Table 41: Solution to Part 1 and 2 Project 6

3. In value to the customer lower cost product changed from 15 to 23, increased performance has changed form 15 to 18, and our market share increased from 8 to 13.

	Value to the Customer				High Temperature Preservative
	Critical Components	**Score**	**Range**	**Rated By**	**Documentation**
1	Offers benefits in the form of:				
	- Lower cost product	23	0-25		Nanotubes more expensive, but performance much better
	- Increased performance	18	0-20		Performance 3x over other peizo polymers, but temperature limited
	- Protectable value pricing	5	0-15		Low end IR cameras new to market, pricing uncertain
	- Market share protection / enhancement	13	0-15		Potential very good, need to see market development
	- Allows compliance with HSE regulations	12	0-15		No HSE advantage, no problems
	- Provides product solutions	10	0-10		Lower cost, but IR performance slightly less
	- Offers production benefits(unit op/utility/etc savings	8	0-10		Piezopolymers easier to assemble
2	Time required to implement				
	< 6 months	7	10		Superstar will do most of the prototyping
	< 18 months		5		
	> 18 months		0		
3	Cumulative customer cost (non-capital) required to implement this technology				
	No cost	7	10		Reasonable
	Reasonable cost		5		
	High cost		0		
4	Direct customer capital cost to implement this technology				
	No capital required	3	10		Above average capital required, but not prohibitive
	Reasonable capital		5		
	High capital		0		
	Total Score	106	140		

Table 42: Solution to Part 3 Project 6

Project 7: Assume the role of project manager for the personal care project 'Supershield for Baldies'

1. The percentage profit growth has changed from 5.4% to 10.46%

SUPERSTAR SPECIALITIES, INC					Personal Care Project 'Supershield for Baldies'
	Critical Factor	Raw Data	Weight	Score	Comments
1	% Gross Profit Growth ($ to $)	10.46%	20	60	>15%=5, >12%=4, >9%=3, >6%=2, >3%=1, <3%=0
	2003 - 2005				
2	Value to Customer (End User)	82	15	45	>120=5, >100=4, >80=3, >60=2, >40=1, <40=0
3	Competitive Advantage	80	10	30	>110=5, >90=4, >70=3, >50=2, >30=1, <30=0
4	% Gross Profit last full year	48.00%	10	40	>50%=5, >42%=4, >34%=3, >26%=2, >18%=1, <18%=0
5	Technical / Commercial Feasibility	123	10	40	>150=5, >120=4, >90=3, >60=2, >30=1, <30=0
6	Total sales last full year	$3.00	10	0	>$15=5, >$12=4, >$9=3, >$6=2, >$3=1, <$3=0 (In Million)
7	Market Attractiveness	86	10	30	>120=5, >100=4, >80=3, >60=2, >40=1, <40=0
8	Total Gross Profit last full year	$1.40	5	5	>$6=5, >$4.5=4, >$3=3, >$1.5=2, >$0.5=1, <$0.5=0 (In Million)
9	Current Development Costs	$0.80	5	0	<$0.1=5, <$0.15=2, <$0.25=3, <$0.4=2, <$0.5=1, >$0.5=0 (In Million)
10	Strategic Fit	88	5	15	>110=4, >90=4, >70=3, >50=2, >30=1, <30=0
	TOTAL		100%	265	

Table 43: Solution to Part 1 Project 7

2. Time required to implement under value to the customer is now 8 months.

Value to the Customer					Supershield for Baldies
	Critical Components	Score	Range	Rated By	Documentation
1	Offers benefits in the form of:				
	- Lower cost product	15	0-25		High Temp Membranes Lower Fuel Consumption
	- Increased performance	18	0-20		High Temperature Operation Clearly Superior
	- Protectable value pricing	10	0-15		Membrane Costs High, but Performance Gives Edge
	- Market share protection / enhancement	3	0-15		Potential Outstanding
	- Allows compliance with HSE regulations	0	0-15		No HSE advantage, no problems
	- Provides product solutions	3	0-10		Product Solutions Very Viable In many Markets
	- Offers production benefits(unit op/utility/etc savings	8	0-10		Lower cost of fuel and pollutants
2	Time required to implement				
	< 6 months	9	10		Superstar will do most of the prototyping
	< 18 months		5		
	> 18 months		0		
3	Cumulative customer cost (non-capital) required to implement this technology				
	No cost	7	10		Reasonable
	Reasonable cost		5		
	High cost		0		
4	Direct customer capital cost to implement this technology				
	No capital required	10	10		Capital could be higher due to higher temperature operation
	Reasonable capital		5		
	High capital		0		
	Total Score	83	140		

Table 44: Solution to Part 2 Project 7

3. Product technology under competitive advantage is now protected with patents and has changed its value from 5 to 15.

	Competitive Advantage				Supershield for Baldies
	Critical Components	Score	Range	Rated By (Initials)	Documentation
1	Do we have the low cost position over our competitors?	15	0-30		High temperature operation provides lowest cost BTU's
2	Do we have a customer recognized performance advantage over our competitors?	25	0-30		Testing prototype have shown 30% advantage, Still need long term data
3	Is our product technology protected with patents, trade secrets,know how, or contracts?	15	0-20		Patents applied for, but not issued
4	Do we have a customer recognized performance technical capability, sales, marketing, or technical service?	10	0-20		Superstar new to market, but great technical development reputation
5	Are there gaps in our product offerings? (no gaps - high score)	10	0-15		Have covered major markets
6	Percent of Current Products That Are "Me Too" <60% =15; 75%= 10; 90%=5; 100%= 0	15	0-15		All new technology
	Total Score	90	130		

Table 45: Solution to Part 3 Project 7

4. Know-how and competitor products under technical and commercial feasibility have been changed to 18 from 12.

	Technical / Commercial Feasibility				Supershield for Baldies
	Critical Component	Score	Range	Rated by (Initials)	Documentation
1	Time to commercialization <6 mo.=30; <1 yr.=15; <18mo.=10; >18mo.=5; .2yrs.=0	10	0-30		Membranes require long term operation, but saiving are there now for some applications
2	Has the price/performance been confirmed by customers?	25	0-30		Customers love the performance / cost ratio
3	Are any patents/ know-how/competitor products/ geography blocking normal product development?	18	0-20		2 competing patent applications are of concern
4	Are all resources available (Technical Service, Marketing, Manufacturing, etc.) ?	15	0-20		Project well funded in US, need help overseas
5	Will our strategic customers actively help in development?	10	0-10		Customers on board
6	Cost in Time or $$ to comply with Health / Safety / Environmental Low=10; Med=5; High=0	9	0-10		
7	Can competitors take strong action to block? Yes= 0 No= 10 Maybe=5	7	0-10		We will have competition, but they aren't ready yet
8	Is this a new product / technology for our customers? Score measures ability of customer to commmercialize	5	0-10		Yes, they will have to develop some new equipment
9	Are all raw materials readily available?	8	0-10		No apparent lack of raws
10	What are the needed capital requirements? Low=10; Medium=5 High=0	5	0-10		Nothing ridiculous
11	Is this a new product or technology for us?	8	0-10		Innovation on our base
12	Customers are profitable, growing, and development oriented? Are customers favorably positioned to afford higher value?	9	0-10		Energy Business loves these products
	Total =	129	180		

Table 46: Solution to Part 4 Project 7

Project 8: Assume the role of project managers for the personal care project 'Super 120 Noage LOTION'

1. The percentage profit growth has changed from 18.8% to 7.3%.

SUPERSTAR SPECIALITIES, INC					Personal Care Project 'Super 120 Noage'
	Critical Factor	Raw Data	Weight	Score	Comments
1	% Gross Profit Growth ($ to $)	7.30%	20	40	>15%=5, >12%=4, >9%=3, >6%=2, >3%=1, <3%=0
	2003 - 2005				
2	Value to Customer (End User)	92	15	45	>120=5, >100=4, >80=3, >60=2, >40=1, <40=0
3	Competitive Advantage	117	10	50	>110=5, >90=4, >70=3, >50=2, >30=1, <30=0
4	% Gross Profit last full year	70.00%	10	50	>50%=5, >42%=4, >34%=3, >26%=2, >18%=1, <18%=0
5	Technical / Commercial Feasibility	85	10	20	>150=5, >120=4, >90=3, >60=2, >30=1, <30=0
6	Total sales last full year	$7.00	10	20	>$15=5, >$12=4, >$9=3, >$6=2, >$3=1, <$3=0 (In Million)
7	Market Attractiveness	91	10	30	>120=5, >100=4, >80=3, >60=2, >40=1, <40=0
8	Total Gross Profit last full year	$4.90	5	20	>$6=5, >$4.5=4, >$3=3, >$1.5=2, >$0.5=1, <$0.5=0 (In Million)
9	Current Development Costs	$0.90	5	0	<$0.1=5, <$0.15=2, <$0.25=3, <$0.4=2, <$0.5=1, >$0.5=0 (In Million)
10	Strategic Fit	95	5	20	>110=4, >90=4, >70=3, >50=2, >30=1, <30=0
	TOTAL		100%	295	

Table 47: Solution to Part 1 Project 8

2. Manufacturing capabilities in strategic fit have been improved from 5 to 10.

Strategic Fit					Super 120 Noage
	Critical Component	Score	Range	Completed By	Documentation
1	Strong Growth Candidate >10%=20, >5%=15, >2%=10, >1%=5, <1%=0	15	0-20		Growth rate 5%
2	Strong Profit Candidate >60%=20, >46%=15, >33%=10, >20%=5, <20%=0	5	0-20		
3	Uses Current Customer Base	16	0-20		Some new customers, but majority existing
4	Fits Current R&D / Tech. Serv / Sales Infrastructure	16	0-20		research strong need more engineering
5	Synergistic With Core Technologies	18	0-20		Very much withing core
6	Fits Current Business Model	10	0-10		
7	Fits Current Distribution	10	0-10		
8	Fits Current Mfg.Capabilities	10	0-10		Need to impove batch process
	Total	100	130		

Table 48: Solution to Part 2 Project 8

3. Allows compliance with HSE regulations in value to the customer has changed from 15 to 10.

	Value to the Customer				Super 120 Noage
	Critical Components	**Score**	**Range**	**Rated By**	**Documentation**
1	Offers benefits in the form of:				
	- Lower cost product	25	0-25		Catalyst offers slightly lower cost
	- Increased performance	15	0-20		Performance improves 6%
	- Protectable value pricing	2	0-15		Value Pricing Marginal At First
	- Market share protection / enhancement	5	0-15		Need Performance to Improve
	- Allows compliance with HSE regulations	10	0-15		No HSE advantage, no problems
	- Provides product solutions	3	0-10		Product Solutions Very Early Stage
	- Offers production benefits(unit op/utility/etc savings	10	0-10		No Fuel Cell Construction Benefits
2	Time required to implement				
	< 6 months	7	10		Superstar will do most of the prototyping
	< 18 months		5		
	> 18 months		0		
3	Cumulative customer cost (non-capital) required to implement this technology				
	No cost	7	10		Reasonable
	Reasonable cost		5		
	High cost		0		
4	Direct customer capital cost to implement this technology				
	No capital required	3	10		Need retooling capital
	Reasonable capital		5		
	High capital		0		
	Total Score	87	140		

Table 49: Solution to Part 3 Project 8

4. Product technology under competitive advantage is now protected with patents and has changed its value from 20 to 15.

	Competitive Advantage				Super 120 Noage
	Critical Components	**Score**	**Range**	**Rated By (Initials)**	**Documentation**
1	Do we have the low cost position over our competitors?	30	0-30		Slight cost advantage, lowest cost BTU's
2	Do we have a customer recognized performance advantage over our competitors?	20	0-30		Performance advantage improvement real - Need longer term data
3	Is our product technology protected with patents, trade secrets,know how, or contracts?	15	0-20		One patent issued, 3 pending
4	Do we have a customer recognized performance technical capability, sales, marketing, or technical service?	20	0-20		Superstar new to market, but great technical development reputation
5	Are there gaps in our product offerings? (no gaps - high score)	12	0-15		This fills a major gap
6	Percent of Current Products That Are "Me Too" <60% =15; 75%= 10; 90%=5; 100%= 0	15	0-15		All new technology
	Total Score	112	130		

Table 50: Solution to Part 4 Project 8

5. Needed capital requirements in technical / commercial feasibility now changed from 2 to 9.

Technical / Commercial Feasibility					Super 120 Noage
		Score	Range	Initials	Documentation
	Critical Component				
1	Time to commercialization <6 mo.=30; <1 yr.=15; <18mo.=10; >18mo.=5; .2yrs.=0	0	0-30		Project is already 18 months old
2	Has the price/performance been confirmed by customers?	20	0-30		Early stage confirmation
3	Are any patents/ know-how/competitor products/ geography blocking normal product development?	8	0-20		Comepetitors are working hard to patent
4	Are all resources available (Technical Service, Marketing, Manufacturing, etc.) ?	10	0-20		Project long in the tooth - Will have to do in cuts
5	Will our strategic customers actively help in development?	5	0-10		Several customers helping, most are wait and see
6	Cost in Time or $$ to comply with Health / Safety / Environmental Low=10; Med=5; High=0	9	0-10		
7	Can competitors take strong action to block? Yes= 0 No= 10 Maybe=5	5	0-10		We will have competition, but they haven't development show stopper yet
8	Is this a new product / technology for our customers? Score measures ability of customer to commmercialize	5	0-10		Yes, they will have to develop some new equipment
9	Are all raw materials readily available?	3	0-10		More rare earths are single sourced
10	What are the needed capital requirements? Low=10; Medium=5 High=0	9	0-10		Already spend a lot more needed
11	Is this a new product or technology for us?	8	0-10		Innovation on our base
12	Customers are profitable, growing, and development oriented? Are customers favorably positioned to afford higher value?	10	0-10		Energy businesses loves these products

Table 51: Solution to Part 5 Project 8

Project 9: Assume the role of project manager for the personal care project 'Nozit Moisturizer'

1. The percentage profit growth has changed from 14.5% to 6.2 %.
2. Estimated percentage gross profit has changed from 43% to 35%.

SUPERSTAR SPECIALITIES, INC					Personal Care Project 'Nozit Moisturizer'
	Critical Factor	Raw Data	Weight	Score	Comments
1	% Gross Profit Growth ($ to $)	6.20%	20	40	>15%=5, >12%=4, >9%=3, >6%=2, >3%=1, <3%=0
	2003 - 2005				
2	Value to Customer (End User)	85	15	45	>120=5, >100=4, >80=3, >60=2, >40=1, <40=0
3	Competitive Advantage	95	10	40	>110=5, >90=4, >70=3, >50=2, >30=1, <30=0
4	% Gross Profit last full year	35.00%	10	30	>50%=5, >42%=4, >34%=3, >26%=2, >18%=1, <18%=0
5	Technical / Commercial Feasibility	101	10	30	>150=5, >120=4, >90=3, >60=2, >30=1, <30=0
6	Total sales last full year	$2.09	10	0	>$15=5, >$12=4, >$9=3, >$6=2, >$3=1, <$3=0 (In Million)
7	Market Attractiveness	100	10	30	>120=5, >100=4, >80=3, >60=2, >40=1, <40=0
8	Total Gross Profit last full year	$0.90	5	5	>$6=5, >$4.5=4, >$3=3, >$1.5=2, >$0.5=1, <$0.5=0 (In Million)
9	Current Development Costs	$0.60	5	0	<$0.1=5, <$0.15=2, <$0.25=3, <$0.4=2, <$0.5=1, >$0.5=0 (In Million)
10	Strategic Fit	92	5	20	>110=4, >90=4, >70=3, >50=2, >30=1, <30=0
	TOTAL		100%	240	

Table 52: Solution to Parts 1 and 2 Project 9

Project 10: Assume the role of project manager for the transportation project 'Superburnall Jet Fuel'.

1. Percentage profit growth has been changed from 12.6% to 15.3 %.
2. Estimated gross profit changed from $3.13 million to $4.70 million.

SUPERSTAR SPECIALITIES, INC			Transportation Project 'Superburnall Jet Fuel'		
	Critical Factor	Raw Data	Weight	Score	Comments
1	% Gross Profit Growth ($ to $)	15.30%	20	100	>15%=5, >12%=4, >9%=3, >6%=2, >3%=1, <3%=0
	2003 - 2005				
2	Value to Customer (End User)	86	15	45	>120=5, >100=4, >80=3, >60=2, >40=1, <40=0
3	Competitive Advantage	113	10	50	>110=5, >90=4, >70=3, >50=2, >30=1, <30=0
4	% Gross Profit last full year	48.00%	10	40	>50%=5, >42%=4, >34%=3, >26%=2, >18%=1, <18%=0
5	Technical / Commercial Feasibility	129	10	40	>150=5, >120=4, >90=3, >60=2, >30=1, <30=0
6	Total sales last full year	$6.53	10	20	>$15=5, >$12=4, >$9=3, >$6=2, >$3=1, <$3=0 (In Million)
7	Market Attractiveness	101	10	40	>120=5, >100=4, >80=3, >60=2, >40=1, <40=0
8	Total Gross Profit last full year	$4.70	5	20	>$6=5, >$4.5=4, >$3=3, >$1.5=2, >$0.5=1, <$0.5=0 (In Million)
9	Current Development Costs	$0.40	5	5	<$0.1=5, <$0.15=2, <$0.25=3, <$0.4=2, <$0.5=1, >$0.5=0 (In Million)
10	Strategic Fit	117	5	25	>110=4, >90=4, >70=3, >50=2, >30=1, <30=0
	TOTAL		100%	385	

Table 53: Solution to Parts 1 and 2 Project 10

3. In value to the customer lower cost product changed from 15 to 23, increased performance has changed form 15 to 18, and our market share increased from 5 to 13.

	Value to the Customer				Superburnall Jet Fuel
	Critical Components	**Score**	**Range**	**Rated By**	**Documentation**
1	Offers benefits in the form of:				
	- Lower cost product	23	0-25		Fuel Burn Efficiency 10% better=lower cost
	- Increased performance	18	0-20		Better burn efficiency
	- Protectable value pricing	5	0-15		Can get the difference in value to airlines
	- Market share protection / enhancement	13	0-15		Possible for larger customers
	- Allows compliance with HSE regulations	8	0-15		Fewer emmmissions
	- Provides product solutions	8	0-10		Blends with current jet fuel
	- Offers production benefits(unit op/utility/etc savings	8	0-10		Lower cost of fuel and pollutants
2	Time required to implement				
	< 6 months	7	10		Long term perfromance still not complete
	< 18 months		5		
	> 18 months		0		
3	Cumulative customer cost (non-capital) required to implement this technology				
	No cost	7	10		Reasonable
	Reasonable cost		5		
	High cost		0		
4	Direct customer capital cost to implement this technology				
	No capital required	8	10		Essentilally same equipment
	Reasonable capital		5		
	High capital		0		
	Total Score	105	140		

Table 54: Solution to Part 3 Project 10

Project 11: Assume the role of project manager for the transportation project 'Superceramic Vehicle Parts'.

1. The % Profit Growth has changed from 16.7% to 8.4%.
2. Estimated percentage gross profit has decreased from 45% to 22.5%.
3. Estimated sales decreased from $3.9 million to $2.7 million.

SUPERSTAR SPECIALITIES, INC					Transportation Project 'Superceramic Vehicle Parts'
	Critical Factor	Raw Data	Weight	Score	Comments
1	% Gross Profit Growth ($ to $)	8.40%	20	40	>15%=5, >12%=4, >9%=3, >6%=2, >3%=1, <3%=0
	2003 - 2005				
2	Value to Customer (End User)	83	15	45	>120=5, >100=4, >80=3, >60=2, >40=1, <40=0
3	Competitive Advantage	105	10	40	>110=5, >90=4, >70=3, >50=2, >30=1, <30=0
4	% Gross Profit last full year	22.50%	10	10	>50%=5, >42%=4, >34%=3, >26%=2, >18%=1, <18%=0
5	Technical / Commercial Feasibility	116	10	30	>150=5, >120=4, >90=3, >60=2, >30=1, <30=0
6	Total sales last full year	$2.70	10	0	>$15=5, >$12=4, >$9=3, >$6=2, >$3=1, <$3=0 (In Million)
7	Market Attractiveness	103	10	40	>120=5, >100=4, >80=3, >60=2, >40=1, <40=0
8	Total Gross Profit last full year	$1.76	5	10	>$6=5, >$4.5=4, >$3=3, >$1.5=2, >$0.5=1, <$0.5=0 (In Million)
9	Current Development Costs	$0.35	5	10	<$0.1=5, <$0.15=2, <$0.25=3, <$0.4=2, <$0.5=1, >$0.5=0 (In Million)
10	Strategic Fit	97	5	20	>110=4, >90=4, >70=3, >50=2, >30=1, <30=0
	TOTAL		100%	245	

Table 55: Solution to Parts 1, 2 and 3 Project 11

Project 12: Assume the role of project manager for the transportation project 'Improved Dirtrepel'.

1. Percentage profit growth has changed from 4.8% to 5.7%.

SUPERSTAR SPECIALITIES, INC					Transportation Project 'Improved Dirtrepel'
	Critical Factor	Raw Data	Weight	Score	Comments
1	% Gross Profit Growth ($ to $)	5.70%	20	20	>15%=5, >12%=4, >9%=3, >6%=2, >3%=1, <3%=0
	2003 - 2005				
2	Value to Customer (End User)	91	15	45	>120=5, >100=4, >80=3, >60=2, >40=1, <40=0
3	Competitive Advantage	92	10	40	>110=5, >90=4, >70=3, >50=2, >30=1, <30=0
4	% Gross Profit last full year	45.00%	10	40	>50%=5, >42%=4, >34%=3, >26%=2, >18%=1, <18%=0
5	Technical / Commercial Feasibility	113	10	30	>150=5, >120=4, >90=3, >60=2, >30=1, <30=0
6	Total sales last full year	$0.85	10	0	>$15=5, >$12=4, >$9=3, >$6=2, >$3=1, <$3=0 (In Million)
7	Market Attractiveness	93	10	30	>120=5, >100=4, >80=3, >60=2, >40=1, <40=0
8	Total Gross Profit last full year	$0.38	5	0	>$6=5, >$4.5=4, >$3=3, >$1.5=2, >$0.5=1, <$0.5=0 (In Million)
9	Current Development Costs	$0.30	5	10	<$0.1=5, <$0.15=2, <$0.25=3, <$0.4=2, <$0.5=1, >$0.5=0 (In Million)
10	Strategic Fit	102	5	20	>110=4, >90=4, >70=3, >50=2, >30=1, <30=0
	TOTAL		100%	235	

Table 56: Solution to Part 1 Project 12

2. Protectable value pricing in value to the customer changed from 2 to 8.

Value to the Customer					Improved Dirtrepel
	Critical Components	Score	Range	Rated By	Documentation
1	Offers benefits in the form of:				
	- Lower cost product	10	0-25		Cost improvements possible
	- Increased performance	15	0-20		Long term performance Much better
	- Protectable value pricing	8	0-15		Value Pricing Marginal At First
	- Market share protection / enhancement	5	0-15		Need Performance to Improve
	- Allows compliance with HSE regulations	15	0-15		No HSE advantage, no problems
	- Provides product solutions	8	0-10		Product Solutions Very Early Stage, but Very likely
	- Offers production benefits(unit op/utility/etc savings	8	0-10		Thinner coatings possible
2	Time required to implement				
	< 6 months	10	10		Drop in repalcement
	< 18 months		5		
	> 18 months		0		
3	Cumulative customer cost (non-capital) required to implement this technology				
	No cost	8	10		Very Little needed
	Reasonable cost		5		
	High cost		0		
4	Direct customer capital cost to implement this technology				
	No capital required	10	10		Drop in replacement
	Reasonable capital		5		
	High capital		0		
	Total Score	97	140		

Table 57: Solution to Part 2 Project 12

3. Resources available value in technical and commercial feasibility has changed from 10 to 18.

Technical / Commercial Feasibility					Improved Dirtrepel
		Score	Range	Initials	Documentation
	Critical Component				
1	Time to commercialization <6 mo.=30; <1 yr.=15; <18mo.=10; >18mo.=5; .2yrs.=0	20	0-30		Should go quickly due to drop in nature
2	Has the price/performance been confirmed by customers?	20	0-30		Early stage confirmation looks good
3	Are any patents/ know-how/competitor products/ geography blocking normal product development?	15	0-20		Global Protection not there yet for our technology
4	Are all resources available (Technical Service, Marketing, Manufacturing, etc.) ?	18	0-20		Cautious Biz Manager still not convinced, short on resources
5	Will our strategic customers actively help in development?	5	0-10		Several customres helping- Most are wait and see
6	Cost in Time or $$ to comply with Health / Safety / Environmental Low=10; Med=5; High=0	9	0-10		
7	Can competitors take strong action to block? Yes= 0 No= 10 Maybe=5	5	0-10		We will have competition, but they haven't developed a show stopper yet
8	Is this a new product / technology for our customers? Score measures ability of customer to commmercialize	8	0-10		They have been here before
9	Are all raw materials readily available?	9	0-10		No problems apparent
10	What are the needed capital requirements? Low=10; Medium=5 High=0	2	0-10		Already spent a lot-more needed
11	Is this a new product or technology for us?	5	0-10		We are cautiously confident
12	Customers are profitable, growing, and development oriented? Are customers favorably positioned to afford higher value?	5	0-10		Some Transportation companies are profitable and growing
	Total	121	180		

Table 58: Solution to Part 3 Project 12

Project 13: Assume the role of project manager for the construction project 'New Asphalt Additives'

1. Percentage profit growth has changed from 7.0% to 11.7%.
2. Estimated percentage gross profit has increased from 37% to 46%.
3. Estimated sales decreased from $6.1 million to $7.9 million.

SUPERSTAR SPECIALITIES, INC					Construction Project 'New Asphalt Additive'
	Critical Factor	Raw Data	Weight	Score	Comments
1	% Gross Profit Growth ($ to $)	11.70%	20	60	>15%=5, >12%=4, >9%=3, >6%=2, >3%=1, <3%=0
	2003 - 2005				
2	Value to Customer (End User)	72	15	30	>120=5, >100=4, >80=3, >60=2, >40=1, <40=0
3	Competitive Advantage	71	10	30	>110=5, >90=4, >70=3, >50=2, >30=1, <30=0
4	% Gross Profit last full year	46.00%	10	40	>50%=5, >42%=4, >34%=3, >26%=2, >18%=1, <18%=0
5	Technical / Commercial Feasibility	123	10	40	>150=5, >120=4, >90=3, >60=2, >30=1, <30=0
6	Total sales last full year	$7.90	10	20	>$15=5, >$12=4, >$9=3, >$6=2, >$3=1, <$3=0 (In Million)
7	Market Attractiveness	101	10	40	>120=5, >100=4, >80=3, >60=2, >40=1, <40=0
8	Total Gross Profit last full year	$2.22	5	10	>$6=5, >$4.5=4, >$3=3, >$1.5=2, >$0.5=1, <$0.5=0 (In Million)
9	Current Development Costs	$0.49	5	5	<$0.1=5, <$0.15=2, <$0.25=3, <$0.4=2, <$0.5=1, >$0.5=0 (In Million)
10	Strategic Fit	92	5	20	>110=4, >90=4, >70=3, >50=2, >30=1, <30=0
	TOTAL		100%	295	

Table 59: Solution to Parts 1, 2, and 3 Project 13

Project 14: Assume the role of project manager for the construction project 'Teflon Glueall'

1. Percentage profit growth has changed from 10.5% to 12.7 %.
2. Estimated gross profit changed from $1.9 million to $3.27 million.

SUPERSTAR SPECIALITIES, INC					Construction Project 'Teflon Glueall'
	Critical Factor	Raw Data	Weight	Score	Comments
1	% Gross Profit Growth ($ to $)	12.70%	20	80	>15%=5, >12%=4, >9%=3, >6%=2, >3%=1, <3%=0
	2003 - 2005				
2	Value to Customer (End User)	92	15	45	>120=5, >100=4, >80=3, >60=2, >40=1, <40=0
3	Competitive Advantage	102	10	40	>110=5, >90=4, >70=3, >50=2, >30=1, <30=0
4	% Gross Profit last full year	42.10%	10	40	>50%=5, >42%=4, >34%=3, >26%=2, >18%=1, <18%=0
5	Technical / Commercial Feasibility	85	10	20	>150=5, >120=4, >90=3, >60=2, >30=1, <30=0
6	Total sales last full year	$4.50	10	10	>$15=5, >$12=4, >$9=3, >$6=2, >$3=1, <$3=0 (In Million)
7	Market Attractiveness	86	10	30	>120=5, >100=4, >80=3, >60=2, >40=1, <40=0
8	Total Gross Profit last full year	$3.27	5	15	>$6=5, >$4.5=4, >$3=3, >$1.5=2, >$0.5=1, <$0.5=0 (In Million)
9	Current Development Costs	$0.45	5	5	<$0.1=5, <$0.15=2, <$0.25=3, <$0.4=2, <$0.5=1, >$0.5=0 (In Million)
10	Strategic Fit	85	5	15	>110=4, >90=4, >70=3, >50=2, >30=1, <30=0
	TOTAL		100%	300	

Table 60: Solution to Parts 1, and 2 Project 14

3. In value to the customer lower cost product changed from 25 to 20, increased performance has changed form 15 to 18, and our market share increased from 5 to 13.

	Value to the Customer				Teflon Glueall
	Critical Components	**Score**	**Range**	**Rated By**	**Documentation**
1	Offers benefits in the form of:				
	- Lower cost product	20	0-25		Catalyst offers slightly lower cost
	- Increased performance	18	0-20		Performance improves 6%
	- Protectable value pricing	2	0-15		Value Pricing Marginal At First
	- Market share protection / enhancement	13	0-15		Need Performance to Improve
	- Allows compliance with HSE regulations	15	0-15		No HSE advantage, no problems
	- Provides product solutions	3	0-10		Product Solutions Very Early Stage
	- Offers production benefits(unit op/utility/etc savings	10	0-10		No Fuel Cell Construction Benefits
2	Time required to implement				
	< 6 months	7	10		Superstar will do most of the prototyping
	< 18 months		5		
	> 18 months		0		
3	Cumulative customer cost (non-capital) required to implement this technology				
	No cost	7	10		Reasonable
	Reasonable cost		5		
	High cost		0		
4	Direct customer capital cost to implement this technology				
	No capital required	3	10		Need retooling capital
	Reasonable capital		5		
	High capital		0		
	Total Score	98	140		

Table 61: Solution to Part 3 Project 14

Project 15: Assume the role of project manager for the construction project 'Paper Panels'

1. Percentage profit growth has changed from 41% to 32%.

SUPERSTAR SPECIALITIES, INC			Construction Project 'Paper Panels'		
	Critical Factor	Raw Data	Weight	Score	Comments
1	% Gross Profit Growth ($ to $)	32.00%	20	100	>15%=5, >12%=4, >9%=3, >6%=2, >3%=1, <3%=0
	2003 - 2005				
2	Value to Customer (End User)	88	15	45	>120=5, >100=4, >80=3, >60=2, >40=1, <40=0
3	Competitive Advantage	95	10	40	>110=5, >90=4, >70=3, >50=2, >30=1, <30=0
4	% Gross Profit last full year	58.00%	10	50	>50%=5, >42%=4, >34%=3, >26%=2, >18%=1, <18%=0
5	Technical / Commercial Feasibility	111	10	30	>150=5, >120=4, >90=3, >60=2, >30=1, <30=0
6	Total sales last full year	$7.00	10	20	>$15=5, >$12=4, >$9=3, >$6=2, >$3=1, <$3=0 (In Million)
7	Market Attractiveness	96	10	30	>120=5, >100=4, >80=3, >60=2, >40=1, <40=0
8	Total Gross Profit last full year	$4.06	5	15	>$6=5, >$4.5=4, >$3=3, >$1.5=2, >$0.5=1, <$0.5=0 (In Million)
9	Current Development Costs	$0.45	5	5	<$0.1=5, <$0.15=2, <$0.25=3, <$0.4=2, <$0.5=1, >$0.5=0 (In Million)
10	Strategic Fit	111	5	25	>110=4, >90=4, >70=3, >50=2, >30=1, <30=0
	TOTAL		100%	360	

Table 62: Solution to Part 1 Project 15

2. Protectable value pricing in value to the customer changed from 10 to 1.

	Value to the Customer				Paper Panels
	Critical Components	Score	Range	Rated By	Documentation
1	Offers benefits in the form of:				
	- Lower cost product	20	0-25		Nanotubes more expensive, but performance much better
	- Increased performance	15	0-20		Performance 3x over other peizo polymers, but temperature limited
	- Protectable value pricing	1	0-15		Low end IR cameras new to market, pricing uncertain
	- Market share protection / enhancement	8	0-15		Potential very good, need to see market development
	- Allows compliance with HSE regulations	0	0-15		No HSE advantage, no problems
	- Provides product solutions	10	0-10		Lower cost, but IR performance slightly less
	- Offers production benefits(unit op/utility/etc savings	8	0-10		Piezopolymers easier to assemble
2	Time required to implement				
	< 6 months	7	10		Superstar will do most of the prototyping
	< 18 months		5		
	> 18 months		0		
3	Cumulative customer cost (non-capital) required to implement this technology				
	No cost	7	10		Reasonable
	Reasonable cost		5		
	High cost		0		
4	Direct customer capital cost to implement this technology				
	No capital required	3	10		Above average capital required, but not prohibitive
	Reasonable capital		5		
	High capital		0		

Table 63: Solution to Part 2 Project 15

3. Resources available value in technical and commercial feasibility has changed from 10 to 5.

	Technical / Commercial Feasibility				Paper Panels
		Score	Range	Initials	Documentation
	Critical Component				
1	Time to commercialization <6 mo.=30; <1 yr.=15; <18mo.=10; >18mo.=5; .2yrs.=0	15	0-30		Nanotube reproducibility problematic
2	Has the price/performance been confirmed by customers?	25	0-30		Customers love the performance /cost ratio
3	Are any patents/ know-how/competitor products/ geography blocking normal product development?	19	0-20		Our patents look good
4	Are all resources available (Technical Service, Marketing, Manufacturing, etc.) ?	5	0-20		Need more scale up people
5	Will our strategic customers actively help in development?	10	0-10		Customers on board
6	Cost in Time or $$ to comply with Health / Safety / Environmental Low=10; Med=5; High=0	9	0-10		
7	Can competitors take strong action to block? Yes= 0 No= 10 Maybe=5	2	0-10		We will have strong competition
8	Is this a new product / technology for our customers? Score measures ability of customer to commmercialize	3	0-10		Yes, they will have to develop new processes
9	Are all raw materials readily available?	2	0-10		Nanotube purity is a problem
10	What are the needed capital requirements? Low=10; Medium=5 High=0	2	0-10		We will need new equipment
11	Is this a new product or technology for us?	5	0-10		New, but we are the leaders
12	Customers are profitable, growing, and development oriented? Are customers favorably positioned to afford higher value?	9	0-10		Customers are in the security business which is hot
	Total =	106	180		

Table 64: Solution to Part 3 Project 15

SOLUTION TO SESSION TWO

Unit I, Energy: Project 1, Project 2, and Project 3 members joined together to form an Energy unit team. In the business unit Energy, discuss which project is doing best and which project needs most improvement. Change values in the spreadsheet (Appendix A of the CD-ROM) based on discussions among the group members so that the projects you choose have high scores. Also, discuss whether the projects are worth pursuing. Try to pick the best projects.

SUPERSTAR SPECIALITIES, INC				Energy Business Analysis Worksheet							
Business Segment	%Profit Growth ($ to $ 2003 - 2005	Value to Customer	Competitive Advantag	% Gross Profit - Last f Year	Technical / Commerci Feasibility	Total Sales - Last Full year	Market Attractiveness	Total Profit - Last Full Year	Current Development Costs	Strategic Fit	Total Score
Business Unit											
Energy	10.83%	61	83	47.50%	117	$88	82	$42	$4	93	315
Projected Energy	7.32%	78.67	104.00	48.98%	105.00	$144.14	$91.33	$70.60	$5.72	108.67	305
Segments											
Enriched Oxygen Members	16.00%	81	98	58.00%	118	$41.00	93	$23.80	$1.82	108	390
Piezo Polymers	6.50%	43	73	47.00%	117	$17.00	74	$8.00	$0.56	85	230
Photovoltaic Components	10.00%	58	79	43.00%	115	$30.00	80	$10.00	$1.32	85	270
Projects											
High Temp Gas Membranes	10.46%	74	105	60.00%	115	$17.34	101	$10.40	$0.55	117	350
Nanotube Piezo Polymers	7.30%	81	90	45.00%	108	$4.23	87	$1.90	$0.16	114	275
Improved Photo Catalyst	4.20%	81	117	35.00%	92	$6.50	86	$2.10	$0.30	95	265

Table 65: Solution to Unit I, Energy

Unit II, Food: Project 4, Project 5, and Project 6 members joined together to form a Food unit team. In the business unit Food, discuss which project is doing best and which project needs most improvement. Change values in the spreadsheet (Appendix A of the CDROM) based on discussions among the group members so that the projects you choose have high scores. Also, discuss whether the projects are worth pursuing. Try to pick the best projects.

SUPERSTAR SPECIALITIES, INC				Food Business Analysis Worksheet							
Business Segment	%Profit Growth ($ to $ 2003 - 2005	Value to Customer	Competitive Advantag	% Gross Profit - Last Year	Technical / Commerci Feasibility	Total Sales - Last Full year	Market Attractiveness	Total Profit - Last Full Year	Current Development Costs	Strategic Fit	Total Score
Business Unit											
Food	6.63%	57.33	78.33	40.67%	113.00	$80.90	106.00	$32.90	$5.69	108.67	280
Projected Food	13.60%	95.00	96.33	44.35%	106.00	$114.50	$88.00	$50.78	$8.93	107.67	360
Segments											
MCT Energy Bars	1.50%	35	73	25.00%	105	$20.00	81	$5.00	$0.99	98	165
Super Preservative	12.80%	81	98	51.00%	120	$39.90	110	$19.90	$2.90	124	385
Superfataway Peptides	5.60%	56	64	38.00%	114	$21.00	127	$8.00	$1.80	104	225
Projects											
Improved Fataway for Kids	14.40%	92	117	35.00%	85	$6.70	76	$1.51	$0.38	95	305
MCT Energy Cereal	12.80%	87	72	35.00%	132	$2.10	101	$0.73	$0.45	117	300
High Temperature Preservative	13.60%	106	100	52.00%	101	$8.00	87	$6.70	$0.79	111	360

Table 66: Solution to Unit II, Food

Unit III, Personal Care: Project 7, Project 8, and Project 9 members joined together to form as a Personal Care unit team. In the business unit Personal Care, discuss which project is doing best and which project needs most improvement. Change values in the spreadsheet (Appendix A of the CDROM) based on discussions among the group members so that the projects you choose have high scores. Also, discuss whether the projects are worth pursuing. Try to pick the best projects.

SUPERSTAR SPECIALITIES, INC				Personal Care Business Analysis Worksheet							
Business Segment	%Profit Growth ($ to $ 2003 - 2005	Value to Customer	Competitive Advantag	% Gross Profit - Last Year	Technical / Commerci Feasibility	Total Sales - Last Full year	Market Attractiveness	Total Profit - Last Full Year	Current Development Costs	Strategic Fit	Total Score
Business Unit											
Personal Care	8.07%	70.00	79.00	58.00%	110.33	$50.00	104.67	$29.00	$4.55	85.33	310
Projected Personal Care	7.99%	85.00	99.00	58.51%	107.33	$74.18	92.33	$43.40	$9.15	$93.33	315
Segments											
Super Nozit Cream	4.50%	57	59	38.70%	108	$8.00	109	$3.10	$0.95	84	195
Super 90 Noage Lotion	11.90%	71	74	70.00%	111	$18.60	98	$13.00	$2.00	87	295
Supershield Suncare	7.80%	82	104	48.00%	112	$23.40	107	$12.90	$1.60	85	300
Projects											
Nozit Moisturizer	6.20%	85	95	35.00%	101	$2.09	100	$0.90	$0.60	92	240
Super 120 Noage	7.30%	87	112	70.00%	92	$7.00	91	$4.90	$0.90	100	305
Supershield for Baldies	10.46%	83	90	48.00%	129	$3.00	86	$1.40	$0.80	88	265

Table 67: Solution to Unit III, Personal Care

Unit IV, Transportation: Project 10, Project 11, and Project 12 members joined together to form a Transportation unit team. In the business unit Transportation, discuss which project is doing best and which project needs most improvement. Change values in the spreadsheet (Appendix A of the CD-ROM) based on discussions among the group members so that the projects you choose have high scores. Also, discuss whether the projects are worth pursuing. Try to pick the best projects.

SUPERSTAR SPECIALITIES, INC				Transportation Business Analysis Worksheet							
Business Segment	%Profit Growth ($ to $ 2003 - 2005	Value to Customer	Competitive Advantag	% Gross Profit - Last f Year	Technical / Commerci Feasibility	Total Sales - Last Full year	Market Attractiveness	Total Profit - Last Full Year	Current Development Costs	Strategic Fit	Total Score
Business Unit											
Tranportation	4.20%	59.67	74.67	33.14%	95.33	$63.00	91.33	$20.88	$3.83	91.00	240
Projected Transportation	9.80%	95.00	103.33	41.56%	122.00	$83.16	$99.00	$34.56	$5.93	105.33	320
Segments											
Superburnall Gas Additive	4.50%	43	81	45.00%	86	$26.00	101	$11.70	$1.13	104	245
Superceramic Engines	8.60%	82	95	22.00%	113	$24.00	101	$5.28	$1.10	92	265
Superclean DirtRepel	-0.50%	54	48	30.00%	87	$13.00	72	$3.90	$1.60	77	125
Projects											
Improved Dirtrepel	5.70%	97	92	45.00%	121	$0.85	93	$0.38	$0.30	102	245
Superburnall Jetfuel	15.30%	105	113	48.00%	129	$6.53	101	$4.70	$0.40	117	400
Supercreamic Vehicle Parts	8.40%	83	105	22.50%	116	$2.70	103	$1.76	$0.35	97	245

Table 68: Solution to Unit IV, Transportation

Unit V, Construction: Project 13, Project 14, and Project 15 members joined together to form a Construction unit team. In the business unit Construction, discuss which project is doing best and which project needs most improvement. Change values in the spreadsheet (Appendix A of the CD-ROM) based on discussions among the group members so that the projects you choose have high scores. Also, discuss whether the projects are worth pursuing. Try to pick the best projects.

SUPERSTAR SPECIALITIES, INC				Construction Business Analysis Worksheet							
Business Segment	%Profit Growth ($ to $ 2003 - 2005	Value to Customer	Competitive Advantag	% Gross Profit - Last Year	Technical / Commerci Feasibility	Total Sales - Last Full year	Market Attractiveness	Total Profit - Last Full Year	Current Development Costs	Strategic Fit	Total Score
Business Unit											
Construction	8.10%	78.33	74.00	25.71%	115.67	$119.00	106.00	$30.60	$9.60	90.33	275
Projected Construction	18.80%	83.00	89.33	31.50%	104.67	$157.80	$94.33	$49.70	$12.38	96.00	340
Segments											
Superlight Panels	11.20%	103	103	56.00%	132	$10.00	110	$5.60	$0.40	99	340
Supersmart glue	7.20%	71	63	20.00%	110	$45.00	81	$9.00	$3.00	80	235
Superlast Roads	5.90%	61	56	25.00%	105	$64.00	127	$16.00	$6.20	92	255
Projects											
Paper Panels	32.00%	79	95	58.00%	106	$7.00	96	$4.06	$0.45	111	345
Teflon Glueall	12.70%	98	102	42.10%	85	$4.50	86	$3.27	$0.45	85	300
New asphalt additives	11.70%	72	71	46.00%	123	$7.90	101	$2.22	$0.49	92	295

Table 69: Solution to Unit V, Construction

SOLUTION TO SESSION THREE:

In the final session, the whole class can be assembled and asked which projects should be chosen for funding with the given budget. Even when it is not evident whether a project is doing better or worse in the previous session, it will be very clear in this session. Here, students can argue about particular projects. They can either agree to keep individual projects or cancel them entirely. Whatever their position, the students must argue logically and provide evidence or a very good explanation supporting their arguments.

SUPERSTAR SPECIALITIES, INC					All Projects Analysis							
All Projects	% Profit Growth ($) 2003 - 2005	Value to Customer	Competitive Advanta	% Gross Profit - L full Year	Technical / Commercial Feasibil	Total Sales last full year	Market Attractivenes	Total Profit 2003	Current Developmen Costs	Strategic Fit	Total Score	Business Unit
Maximum Value	>15%	140	130	>50%	180	>$30MM	140	>$15MM	>$1.5MM	130	500	
Superburnall Jetfuel	15.30%	105.00	113.00	48.00%	129.00	$6.53	101.00	$4.70	$0.40	117.00	400.00	Transportation
Paper Panels	32.00%	88.00	95.00	58.00%	106.00	$7.00	96.00	$4.06	$0.45	111.00	360.00	Construction
High Temperature Preservative	13.60%	106.00	100.00	52.00%	101.00	$8.00	87.00	$6.70	$0.79	111.00	360.00	Food
Super 120 Noage	18.80%	92.00	117.00	70.00%	85.00	$7.00	91.00	$4.90	$0.90	95.00	355.00	Personal Care
High Temp Gas Membranes	10.46%	74.00	105.00	60.00%	115.00	$17.34	101.00	$10.40	$0.55	117.00	350.00	Energy
MCT Energy Cereal	12.80%	101.00	92.00	35.00%	141.00	$2.10	106.00	$0.73	$0.45	117.00	325.00	Food
New asphalt additives	11.70%	91.00	95.00	46.00%	123.00	$7.90	101.00	$2.22	$0.49	92.00	320.00	Construction
Teflon Glueall	12.70%	98.00	102.00	42.10%	92.00	$4.50	88.00	$3.27	$0.45	93.00	315.00	Construction
Nanotube Piezo Polymers	7.30%	101.00	98.00	45.00%	124.00	$4.23	87.00	$1.90	$0.16	114.00	310.00	Energy
Improved Fataway for Kids	14.40%	92.00	117.00	35.00%	85.00	$6.70	76.00	$1.51	$0.38	95.00	305.00	Food
						$71.30		$40.39	$5.02			
Nozit Moisturizer	14.50%	85.00	95.00	43.00%	101.00	$2.09	100.00	$0.90	$0.60	92.00	290.00	Personal Care
Supershield for Baldies	10.46%	86.00	93.00	48.00%	129.00	$3.00	86.00	$1.40	$0.80	88.00	275.00	Personal Care
Improved Dirtrepel	5.70%	102.00	102.00	45.00%	121.00	$0.85	106.00	$0.38	$0.30	102.00	270.00	Transportation
Improved Photo Catalyst	4.20%	94.00	117.00	35.00%	92.00	$6.50	91.00	$2.10	$0.30	100.00	265.00	Energy
Supercreamic Vehicle Parts	8.40%	98.00	105.00	22.50%	121.00	$2.70	110.00	$1.76	$0.35	97.00	255.00	Transportation
						$86.44		$46.93	$7.37			

Table 70: Solution to the Problem

In the above screenshot of the projects, all the projects are rearranged, taking up new positions in the sorted order. Superburnall Jetfuel has now become the top-ranked project and Nozit Moisturizer the least interesting project. Looking at the older values, Nozit moisturizer was ranked ninth before the values were changed. However, this changed to the lowest-ranked position when the values assigned to various aspects of the project were changed. The students can be asked to discuss among themselves what needs to be done with each of these projects.