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Abstract

The objective of this paper is to present the teaching note of a case study. The case study outlines the strategic issues facing Excel Cooperative as a result of the rapid expansion of biofuel production capacity in the Midwestern U.S. Excel Cooperative is a mid-sized, 'local', farmer-owned cooperative serving farmers in north central Indiana. Excel is composed of four divisions: agronomy, energy, grain, and feed/livestock. With the Excel case, the reader must think strategically about the broad impacts of the biofuel "boom", apply strategic management tools and decision-making under uncertainty concepts to better understand the impacts, and frame a response.

The methodology proposed in the teaching note is composed of a SWOT analysis, scorecarding and heat mapping, scenario analysis, payoff matrix, and decision tree. A SWOT analysis is a useful way to identify the uncertainties. Scorecarding and heat mapping assessment tools can then be used to assess and map the uncertainties, and decide which uncertainties the company should capitalize on and which projects could be pursued to exploit those uncertainties. Scenario analysis can then help develop further how the uncertainties could unfold and affect the projects. Payoff matrix and decision tree (using real option valuation) analysis tools can then help make a decision on which project to pursue. Finally, these projects cannot be evaluated in a vacuum. Mapping the portfolio of projects is necessary to make sure the company diversifies the risk. This paper includes an illustration of the methodology by applying the tools to a real life example that has been tested in several executive agribusiness educational workshops. A list of psychological traps to avoid and be mindful of when making decisions in an uncertain environment is also proposed.

Keywords: uncertainty, risk, heat mapping, scorecarding, scenario analysis, payoff matrix, decision tree, real option, traps

JEL Codes: D81

Excel Cooperative: Strategic Response to the Boom in Biofuels. Teaching Note

Maud Roucan-Kane, Michael Boehlje, Allan Gray, and Jay Akridge

TEACHING NOTE

This teaching note accompanies the case study titled "Excel Cooperative: Strategic Response to the Boom in Biofuels" available upon request to the authors and published under the reference Akridge, J., M. Roucan-Kane, A. Gray, M. Boehlje, C. Bitsanis. International Agribusiness Strategy Cases: A Book in Honor of Professor Ray Goldberg. M.A. Boland and E. Gallo. "Excel Cooperative: Strategic Response to the Boom in Ethanol." K-State Printing Services, Manhattan, Kansas, 2009.

Statement of Relevance

This case study outlines the strategic issues facing Excel Cooperative as a result of the rapid expansion of biofuels production capacity in the Midwestern U.S. Excel Cooperative is a mid-sized, 'local', farmer-owned cooperative serving farmers in north central Indiana. Excel is composed of four divisions: agronomy, energy, grain, and feed/livestock. With the Excel case, the reader must think strategically about the broad impacts of the biofuels "boom", apply strategic management tools and decision-making under uncertainty concepts to better understand the impacts, and frame a response.

Perspectives Presented by the Case

This case gives the reader the opportunity to think about strategy in an uncertain environment. The case illustrates structural and strategic challenges facing the Excel cooperative given the uncertainty about the growth in the biofuels industry. The case highlights the importance of an analysis of the strengths and weaknesses of the firm as a first assessment

towards developing a strategy. It also explores the complexity of an organization with several distinct divisions by challenging readers to think about the strengths and weaknesses of each division. Analysis of the issues and uncertainties facing each division based on this uncertain biofuels environment is required. This means the case will work well as a learning tool for strategy implementation where uncertainty is inherent.

Important discussion points and lessons emphasized by the case include:

1. It's important to start an analysis by focusing on the strengths and weaknesses of a firm.
2. It's hard to make decisions under uncertainty, but tools such as scorecards and decision trees can help frame the analysis. However, it's worth noting that a good decision does not mean the outcome is favorable, but means that the decision making process was right.
3. Making decisions under uncertainty sometimes suggests using a real options approach: making incremental steps and not huge investments in one area.

Target Market

The case has been tested and is effective as part of executive education courses. Students/participants are challenged to assess the strengths and weaknesses of Excel by division; and conduct an analysis of the strategic issues and key uncertainties. The case will be particularly useful for those who already understand the basics of the biodiesel/ethanol trend, but who may not understand the uncertainties associated with this trend.

Teaching Strategy

Teaching this case begins by asking students/participants to individually read and think about the case prior to class. In an undergraduate class, a 15-minute introduction to the case by the instructor may be useful before beginning discussion. The introduction should explain the uncertainties facing Excel in a market where ethanol is booming. Part of the discussion should focus on the biodiesel/ethanol context and the associated uncertainty. Students should realize that

all companies are faced with some uncertainties. The goal of the case is not to see who can identify the most uncertainties, but rather to understand what are the main uncertainties facing Excel and how Excel can best be prepared to respond to those uncertainties.

In a graduate or executive education class, the instructor may not need to provide an introduction, but can elicit the same information from the class by asking questions such as:

1. Describe the Excel organization – what are some of the important characteristics of the firm and the markets it serves?
2. What are the key elements of the ethanol situation in Excel's market area?

These questions will provide enough background to move into the discussion.

Once the introduction is complete, breaking the class into teams of three to five students may be useful. The teams should discuss and summarize their answers to each question presented below, and choose one representative to present a summary of the team's answers to the class. The facilitator should work to move the discussion past a listing of uncertainties to an identification of the most likely events, stressing how Excel should prepare to make the most of those events.

Analytical Framework/Tools

Issue Identification

The first step using the case is to complete a SWOT analysis and identify some of the key issues and uncertainties (See Exhibit A). This analysis is best done by division and should obtain answers to the following questions:

1. Assess the strengths and weaknesses for each of the four main Excel divisions.
2. Conduct a market scan of the issues/opportunities for each of the four main Excel divisions.

3. Conduct a market scan of the key threats/uncertainties for each of the four main Excel divisions.

The suggested responses to those questions are as follows.

a. The agronomy division

i. Strengths

As indicated in the case, Excel has three locations: Bringhurst, Idaville, and Reynolds which makes it convenient for its customers to not have to travel long distance to get their products. Furthermore, Excel "offers a complete line of crop production inputs" which adds to the convenience by creating a one stop shop. As highlighted in the section "Management and Organizational Structure" of the case description, Excel also has highly experienced and capable people. Finally, Excel "is the market leader in White County" with a market share of 50%.

ii. Weaknesses

As highlighted by Figure 8 of the case study (map of Excel's agronomy locations), Excel serves a small geography. The market space is very competitive which has resulted in declining margins. Human Resources are mentioned as a strength, but can also be seen as a weakness in the sense that those highly capable and experienced employees are aging and George is not sure he has the right employees to replace them. Finally, sales have declined because of biotechnology advances and seed varieties with 'input traits', which is a trend that is likely to continue in years to come. All this makes it really hard for Excel to expand without major investments.

iii. Issues/Opportunities

The two main issues affecting the agronomy division are related to expansion. First, Excel has recently started offering precision or site specific services. This does not represent a complete service offering right now and is not highly developed. Developing this new service requires important investments that may or may not be justified. More generally, the question is whether or not to expand the agronomy division. The future profitability and the potential size of the precision department and the agronomy division depend on demand growth which is highly uncertain as noted below.

iv. Threats/Uncertainties

Demand is uncertain depending on how long the current biofuels/ethanol trend will last and how big of an influence it will have on number of corn versus soybean acres. The ethanol trend will be heavily influenced by the biofuels policy: will the policy and the subsidies be favorable to ethanol or not? Demand for agronomy division products and services will depend first on how competitors respond to the potential change in demand: will they expand as well, will they quit the business, or will they maintain their size? Finally, it also depends on how well seed traits will perform in the long-term -- will resistance develop faster than new traits, obliging farmers to switch back to conventional protection methods? Another uncertainty for Excel agronomy division lies in the adoption of precision service: is the market ready for precision service? How big of a market does it represent?

b. The energy division

i. Strengths

Excel has a really strong market share in petroleum - 80% of the farm market and a strong presence in bulk retail. Furthermore, by having several locations, Excel captures more customers and makes it convenient for them to obtain fuel. Finally, as highlighted in the section

"Management and Organizational Structure" of the case discussion, Excel also has highly experienced and capable people.

ii. Weaknesses

First, because Excel has a large market share in the farm market, it is difficult to grow market share further. Second, gas at the pump is a really competitive market, making it hard for suppliers to make money or sometimes even breakeven. Third, Human Resources are mentioned as a strength but can also be seen as a weakness in the sense that those highly capable and experienced employees are aging and George is not sure he has the right employees as replacements.

iii. Issues/Opportunities

How aggressive the retail market (gas at the pump) is may make competition an issue. If Excel decides to offer such products as E85, separate storage capacity, pumps, and other equipment will be required.

iv. Uncertainty/Threats

Forecasting the retail demand for biofuels is difficult and uncertain. Many consumers may not have cars able to use E85. Furthermore, with the volatile nature of oil prices and commodity prices, it's uncertain whether biofuels prices will be competitive long-term. Whether the subsidies on biofuels will remain also make the biofuels industry vulnerable. In addition, ethanol has about 70% of the energy of gasoline; longer-term, there might be cheaper and more efficient energy sources. Finally, it's unsure how the competition will react both in the retail and commercial fuel markets.

c. The grain division

i. Strengths

Excel has several facilities which offer convenience for farmers to deliver their grain. All these facilities also have significant storage capacity and have land available to expand. Excel also has the capacity to ship rail car loads. This shipment option is highly efficient and cheaper than trucks. Excel is not dependent on one market but instead has several markets: North and South Carolina, Georgia, Lafayette in Indiana (Tate & Lyle), and retail in Indiana (Reynolds-South and Flora). George also has excellent relationships with farmers which helps in grain procurement. Finally, as highlighted in the section "Management and Organizational Structure" of the case, Excel has also highly experienced and capable people.

ii. Weaknesses

Excel has many competitors which puts pressure on grain procurement and storage margins. While human resources are mentioned as a strength, they can also be weakness because those highly capable and experienced employees are aging and George is not sure he has the right employees as replacement.

iii. Issues/Opportunities

The rail shipment option is a great option to ship grain to distant markets; but if additional ethanol plants are built in the local community, shipping to a distant market becomes less profitable. Competition in originating grain will also increase which will pressure George's procurement and storage margins.

iv. Uncertainty/Threats

The long-term future for biofuels is a key uncertainty. This will affect how and if origination opportunities develop and the attractiveness of rail shipment to the southeast markets. Closer markets may develop if neighboring states need grain for biofuels plants. Current storage capacity may not adequate for expanded corn acreage. If biofuels continues to expand and

livestock production decreases, Excel's role may change from grain origination for livestock growers and feed merchandisers to grain procurement for ethanol plants.

d. The feed/livestock division

i. Strengths

The feed/livestock division offers an opportunity to market the grain from the grain division and create a value-added product. Because Excel is a pork integrator, the firm has a better understanding of the pork industry and hog producers' needs. Being an integrator, Excel also has some feed sales it can count on. Excel is close to a pork processing plant which makes it less costly to market and deliver its hogs. Finally, as highlighted in the "Management and Organizational Structure" section of the case description, Excel also has highly experienced and capable people.

ii. Weaknesses

Since Excel is a pork producer/integrator, the firm is in direct competition with its customers of hog feed. High corn prices because of ethanol demand result in higher feed costs for the pork division. And again the highly capable and experienced employees are aging and George is not sure he has the right replacements.

iii. Issues/Opportunities

The key issues are the high volatility of both pork prices and feed costs. The future of Excel as a feed merchandiser and pork integrator may also be impacted by the opportunity to use Distiller's Dried Grains with Solubles (DDGS), a by-product from ethanol production, as a feed ingredient.

iv. Uncertainty/Threats

If biofuels continue to grow, higher feed costs may limit growth in livestock production, and feed costs of producing hogs for this division will also increase.

Assessing the Uncertainties

The second and most important use of the case is to illustrate the use of various tools and techniques to evaluate uncertainties. The tools that are useful in assessing the uncertainties in this case are:

- Risk scorecarding/heat mapping
- Scenario analysis
- Payoff matrices
- Decision trees
- Real options valuation (time delay)
- Options portfolio mapping
- Psychological or decision traps

1. Risk Scorecarding/Heat Mapping[1]

The approach is to present a mental model that frames assessment of uncertainty from both a potential and an exposure perspective. Scorecarding, a process for taking qualitative discussions about strategic uncertainty and turning these discussions into quantitative rankings, and heat mapping, a process of taking the rankings from scorecarding utilizing both colors/symbols and generic strategies to communicate the impact of the uncertainty on the business, are assessment tools which operationalize the mental model. In essence, the mental model is designed to

[1] The following reference is useful to help in the teaching and the discussion on risk scorecarding/heat mapping: Detre, J., B. Briggeman, M. Boehlje, A. Gray. "Scrorecarding and Heat Mapping: Tools and Concepts for Assessing Strategic Uncertainty". International Food and Agribusiness Management Review, 9 (1), 2006.

promote and generate discussion around key areas of uncertainty through a systematic framework that directs the firm in selecting an appropriate uncertainty management strategy. The first step in assessing uncertainty requires an understanding of the sources of strategic uncertainty (see Table 1).

Table 1. Dimensions of Uncertainty

Categories of Strategic Uncertainty		**Sources of Strategic Uncertainty**
Business/Operational	Operations and Business Practices	Contractual uncertainty, internal processes and controls, management transitions
	People and Human Resources	Recruiting, training, retention, organizational culture
	Strategic Positioning and Flexibility	Mergers and acquisitions, joint ventures, resource allocation and planning organizational agility, information access
Financial	Financing and Financial Structure	Debt structure, non-equity financing
	Financial Markets	Portfolio misalignment
Market Conditions	Market Prices and Terms of Trade	Contract terms, market outlets, market access
	Competitors and Competition	Antitrust, industrial espionage
	Customer Relationships	Poor market timing, inadequate customer support
	Reputation and Image	Corporate image, brand image, reputation of key employees, community relationships
Technology	Technological	Complexity, obsolescence, workforce skill sets, adoption rate, diffusion rate
Business Relationships	Business Partners and Partnerships	Interdependency, confidentiality, cultural conflict, information sharing
	Distribution Systems and Channels	Access, dependence on distributors
Policy and Regulation	Political	Enforcement of intellectual property rights, change in leadership, revised economic policies, budget shortfalls
	Regulatory and Legislative	Government trade negotiations, government farm subsidies

Risk and uncertainties can be assessed on three dimensions: potential, exposure, and the likelihood of each. “Potential” is the opportunity that the firm can capture if it takes the risk. If the outcomes of the risk are favorable, the benefits may be a new market, more loyal customers, etc. “Exposure” represents the downside loss if the outcomes of the risk are unfavorable. This may be represented by losses in sales because of lost customers, a tarnished image, as well as financial losses. “Likelihood” is the probability of seeing the potential of the exposure event happening.

Examples of potentials and exposures for strategic uncertainties are presented in Table 2.

Table 2. Examples of potentials and exposures for strategic uncertainties

Categories of Strategic Uncertainty	Examples of	
	Potentials	**Exposures**
Business /Operational	Superior cost control/operational efficiency, Superior workforce, Creating synergies through scope	Business interruption, Loss of key employees
Financial	Strong financial position, Access to equity funds/investors, Attractive financing terms (amounts and terms), Financial reserves (pursue unanticipated opportunities, weather financial shocks, etc.)	Rising interest rates, Loss of lender, Highly leveraged
Market Conditions	Strong brand, Strong complementary products and bundling potential, First mover advantages, Create high switching costs (create loyalty)	Pricing pressure/discounting by competitors, Loss of market share, Consolidation of customer industry, Hyper-competition
Technology	Speed of innovation and commercialization, Niches not attractive to others, Enhanced learning capacity	Limited acceptance of biotechnology, Slow to commercialize new products, Competitor has preferred standards/platform
Business Relationships	Strong market position of distributors, Strong relationship with processors, Enhanced learning, Access to future opportunities	Dependence on distributors, Not a preferred supplier to processor, Not a key account to suppliers
Policy & Regulation	Increasing market from more open trade, Patent protection, Speed of approval	Changes in intellectual property law, Changes in farm income support, Local limits on technology adoption

The potential, the likelihood of the potential, the exposure, and the likelihood of the exposure can be scored on a scale of 1 to 5 (See Tables 3 and 4). A 1 indicates that the risk is low, unimportant, has minimal impact, or is highly unlikely. A 5 implies that the risk is high, important, has large impact, or is highly likely.

Table 3. Strategic Uncertainty Assessment Scorecard for Potential

Categories of Strategic Uncertainty	Potential					Likelihood				
	Low				*High*	*Low*				*High*
Business/Operational	1	2	3	4	5	1	2	3	4	5
Financial	1	2	3	4	5	1	2	3	4	5
Market Conditions	1	2	3	4	5	1	2	3	4	5
Technology	1	2	3	4	5	1	2	3	4	5
Business Relationships	1	2	3	4	5	1	2	3	4	5
Policy & Regulation	1	2	3	4	5	1	2	3	4	5

Table 4. Strategic Uncertainty Assessment Scorecard for Exposure

Categories of Strategic Uncertainty	Exposure					Likelihood				
	Low				*High*	*Low*				*High*
Business/Operational	1	2	3	4	5	1	2	3	4	5
Financial	1	2	3	4	5	1	2	3	4	5
Market Conditions	1	2	3	4	5	1	2	3	4	5
Technology	1	2	3	4	5	1	2	3	4	5
Business Relationships	1	2	3	4	5	1	2	3	4	5
Policy & Regulation	1	2	3	4	5	1	2	3	4	5

Students can be given an assignment asking them to draw the potential and exposure graphs (see Exhibit B). The instructor can ask the students to work in team or individually. If they work in team, students should be encouraged to start the assignment by individually listing the uncertainties and scoring them. Each individual answers and scores should then be discussed with the team or in the classroom. A set of suggested answers for the agronomy division is presented below.

One could argue that Excel's agronomy division faces at least four uncertainties. The division has recently introduced precision services. The adoption of precision service is uncertain: is the market ready for precision services? How big of a market does it represent? The demand facing the products of the agronomy division in general is uncertain depending on how long the current biofuels/ethanol trend will last and how big of an influence it will have on number of corn versus soybean acres. The ethanol trend will be heavily influenced by the biofuels policy: will the policy and the subsidies be favorable to ethanol or not? Demand for agronomy division products and services will also depend on how competitors respond to the potential change in demand: will they expand as well, will they quit the business, or will they maintain their size? Finally, as the future unfolds, there is some uncertainty on how much synergy the agronomy division can create with the other division of Excel.

Tables 5 and 6 present a set of suggested categories of uncertainty and scores for the potential and exposure of the agronomy division. The categories of uncertainty use terminology of Tables 3 and 4 while adding a level of details specific to the Excel case.

Table 5. Excel's Agronomy Division Strategic Uncertainty Assessment Scorecard Potential

Categories of Uncertainty	*Potential*		*Likelihood*	
	Score	Explanation	Score	Explanation
Technology -- Adoption of Precision Services	4	Precision services are high margin products and could generate significant profits if the demand is significant	3	High likelihood that there will be a demand for precision products, Low likelihood that the demand will be huge
Policy/Regulatory -- Direction of Biofuels Policy	4	If the biofuels policy is favorable to ethanol, the demand for agronomic products will increase	5	Extremely likely that the demand for biofuels will be favorable
Market Conditions -- Competitor Response	2	Even if competitors do not expand, Excel does not have great products that will satisfy the demand	1	Highly unlikely that Excel would become a leader or competitive player

Financial/Operational -- Synergies Across Divisions	2	Not much synergy with the other Excel divisions even if there is an ethanol boom	3	Not too likely that good synergies could be developed with the other divisions

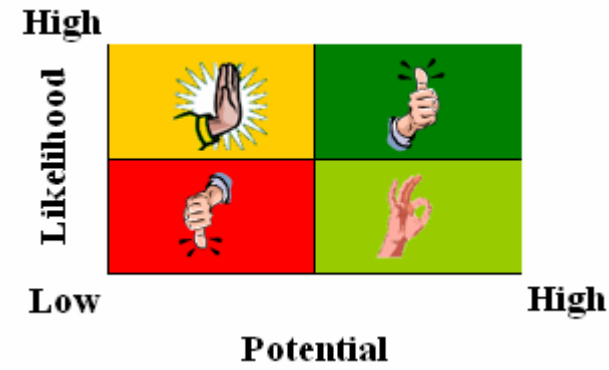
Table 6. Excel's Agronomy Division Strategic Uncertainty Assessment Scorecard Exposure

Categories of Uncertainty	*Exposure*		*Likelihood*	
	Score	Explanation	Score	Explanation
Technology -- Adoption of Precision Services	3	Excel has not invested too much in precision products so the loss would not be too significant	1	Extremely unlikely that there will not be some demand for precision products
Policy/Regulatory -- Direction of Biofuels Policy	2	Excel has not yet invested in ethanol so the loss would not be too significant	1	Extremely unlikely that there will not be some policy favorable to ethanol
Market Conditions -- Competitor Response	4	A significant competitor response could take all of Excel Business away	4	Extremely likely that there will be a competitive response. The potential reward for ethanol is too big to be passed on
Financial/Operational -- Synergies Across Divisions	4	Big synergies with other divisions in terms of customers. The agronomy is not too competitive but provide convenience to customers with a one stop.	2	Extremely unlikely that the cooperative system would spin-off one of its divisions

The graphs presented below (see Graphs 1 and 2) provide a visualization of the uncertainty scorecard; the quadrants are color-coded and hand-gestures are utilized to show how a firm has assessed the uncertainty. To illustrate, we will analyze Graph 1, the potential graph, beginning in the upper-right quadrant and moving clockwise through the quadrants. The upper-right quadrant is shaded dark green and contains a thumbsup gesture, indicating that an uncertainty in this quadrant is beneficial to the company because of the high potential and the high likelihood. The next quadrant, high potential and low likelihood, is shaded light green and is represented by a

hand-gesture signifying okay. In this quadrant, the uncertainty is unlikely to occur, but if it does, the payoff to the company is significant. The next quadrant is colored red with a thumbs down hand-gesture; here, the uncertainty has low scores for likelihood and potential, indicating that there is no benefit from the uncertainty. The upper-left quadrant contains a yield hand-gesture and is colored yellow. Even though the uncertainty occurs often, the payoff to the company is small.

Graph 1. Potential Plot



Graph 2. Exposure Plot

Using the two graphs above, you can superimpose the map for the likelihood/exposure graph into the correct quadrant of the likelihood/potential graph (see Figure 1).

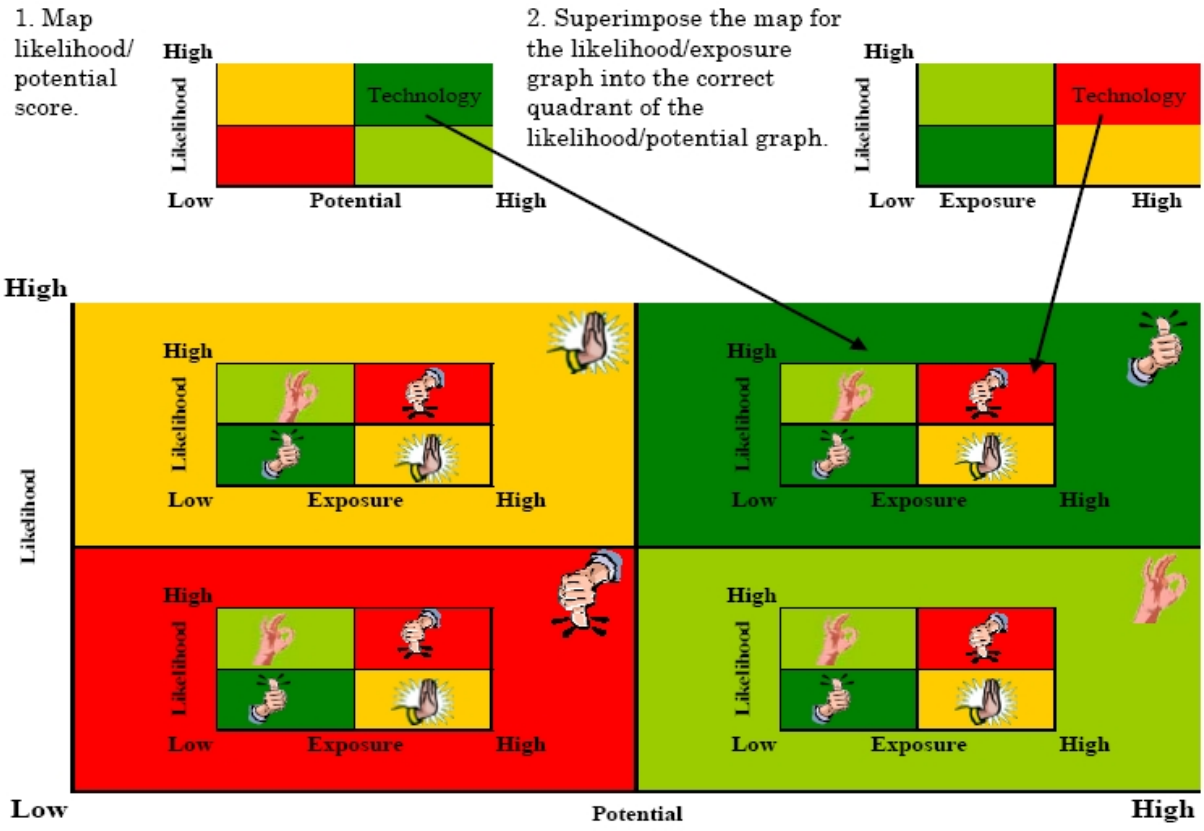


Figure 1. Integrated Likelihood/Potential and Likelihood/Exposure Graph

From the figure above, a strategy can be selected. The graph in Figure 2 contains the integrated heat map with one or more of six generic strategies for managing the uncertainty identified for each of the 16 quadrants. The generic strategies are capitalize, share, transfer, reduce, avoid, and monitor. These generic strategies serve as a filter for concentrating the firm's effort on choosing a specific action or set of actions to manage the uncertainty -- to simultaneously capture the potential and mitigate the exposure. Figure 3 represents the generic strategies for Excel.

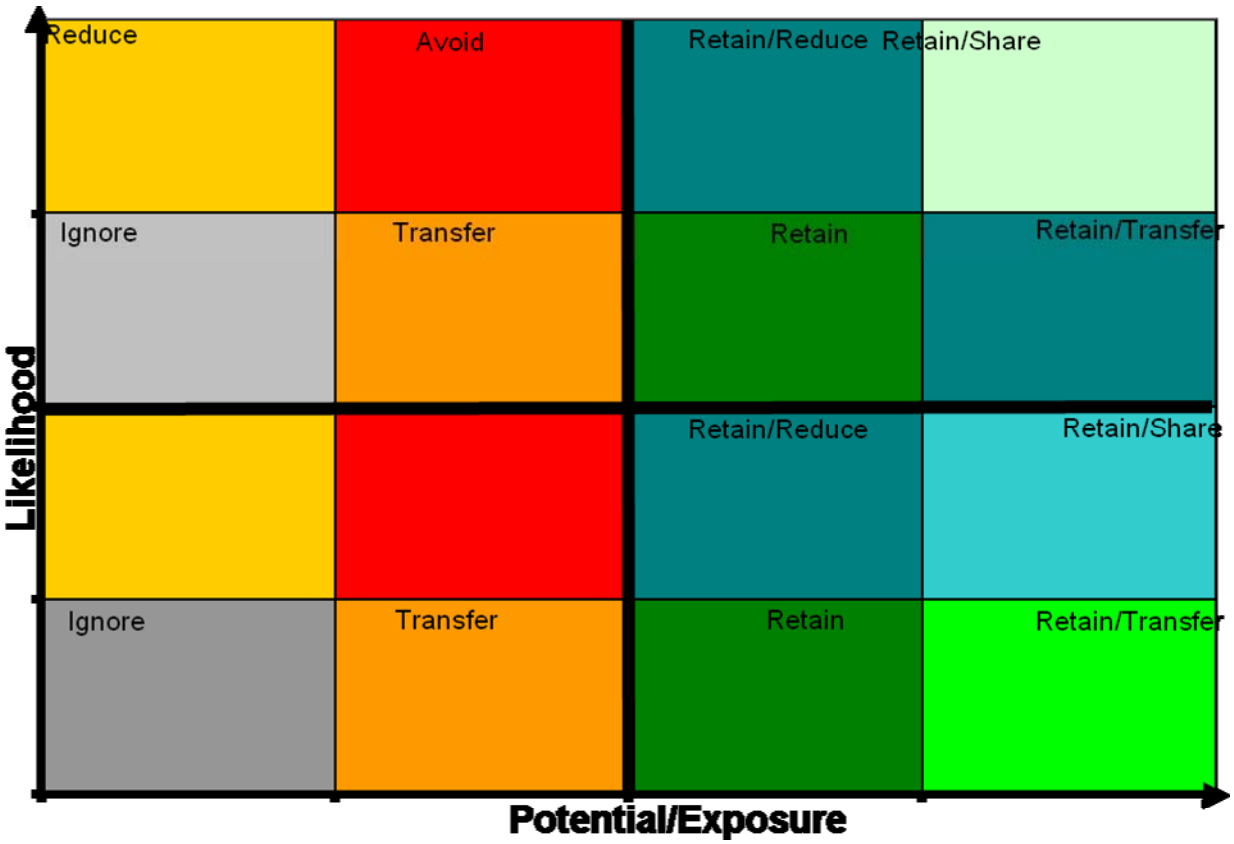


Figure 2. Generic Strategies for the Quadrants of the Integrated Likelihood/Potential and Likelihood/Exposure Graph with a Technology Uncertainty Example

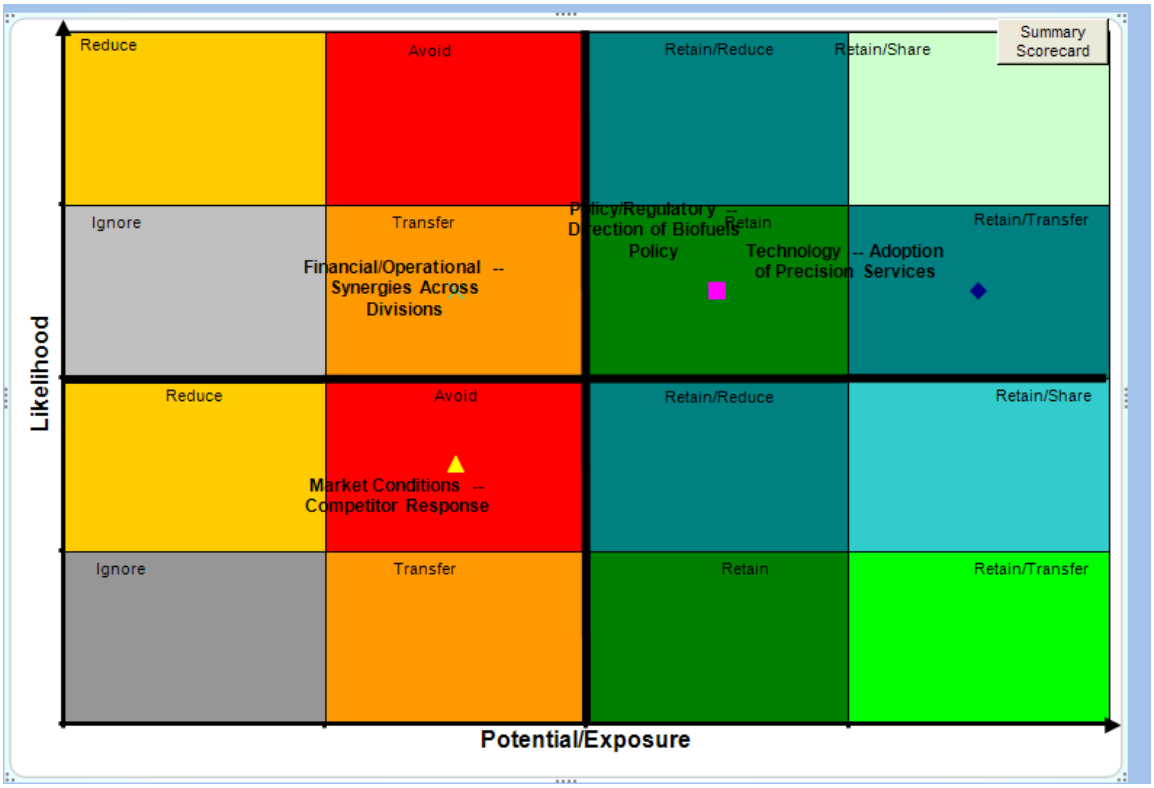


Figure 3. Excel's Agronomy Division Action Graph

From the standpoint of the uncertainty in competitor response and in synergies across divisions, the action graph would suggest avoiding the uncertainty, i.e., not continuing to operate the agronomy division. The decision is not as clear cut from the precision services standpoint: the uncertainty could be retained or transferred, i.e., the agronomy division could either be maintained or spinned off. Finally, the potential of a favorable biofuels policy suggests keeping the agronomy division. In conclusion, this mix suggests a joint venture with a current competitor to improve Excel's offerings and for Excel to reserve its option to possibly in the future expand activity in the precision service and biofuels markets.

A clear conclusion that we can draw from the action graph is that the great profit potential of an ethanol boom suggests that Excel should try to find some ways to potentially profit from it. While it is clear from the action graph that the agronomy division is not the right division to pursue this uncertainty, the grain division may be a great candidate.

2. Scenario Analysis[2]

Scenario analysis consists of analyzing different scenarios of the future based on the uncertainty, i.e., "future-now" thinking. It came into prominence in the 1970s when used to help Royal Dutch/Shell anticipate the future of the oil industry. The scenarios are specially constructed

[2] The following references (in order of importance) are useful to help in the teaching and the discussion on scenario analysis:

- Raynor, Michael E. "The Strategy Paradox: Why Committing to Success Leads to Failure [and What to Do About it]." Currency Doubleday Publishing. 2007. Chapter Nine.
- Schoemaker, Paul J.H. "Scenario Planning: A Tool for Strategic Thinking" *Sloan Management Review*; Winter 1995, p25.
- Schnaars, S. and P. Ziamou "The Essentials of Scenario Writing". *Business Horizons*, July-August 2001.
- Hammond, John S.; R. L. Keeney; H. Raiffa. "Smart Choices, A Practical Guide to Making Better Decisions". *Harvard Business School Press*, Boston, Massachusetts (1999)
- Wilkinson Lawrence. "How to Build Scenarios". http://www.wired.com/wired/scenarios/build.html
- Bristow, John B. "Note on Scenario Planning: An Abridged Version". *Graduate School of Business Administration, University of Virginia.* 1990.

stories about the future. Usually and preferably, scenarios come in sets – most often groups of three or four- each one modeling a distinct and plausible future world, rather than one likely end-state. They each determine a plausible path the present may take, with one event following another as a necessary consequence.

Scenario analysis is a five step process:

1) Define the Problem/Issue

Defining the issue or problem is best accomplished by considering the following dimensions:

a. What are the goals/objectives/criteria in the decision?
b. Specific product markets, geographic areas and technologies need to be determined
c. The time frame to look at depends on the rate of technological change, product life cycles, elections, competitors' planning horizons and so forth
d. What knowledge would be of greatest value (look at the past)?

2) Identify the Dimensions of Uncertainty

Several dimensions can be looked at: business/operation uncertainty, financial uncertainty, market uncertainty, technological uncertainty, business relationship uncertainty, policy/regulatory uncertainty. Once all the uncertainties have been listed, the key uncertainties must be identified; scorecarding assists with this process. The key uncertainties are the ones that are the most crucial to the outcome of any decision. Finally, relationships among these key uncertainties have to be recognized.

3) Determine the Limits of Uncertainty

Students need to define the boundaries of plausible outcomes for these dimensions: high/low, fast/slow, intense/weak, etc. It is often helpful to be somewhat explicit. For example, will a regulatory approval for a new plant take 6 months or two years?

4) Construct Scenario Sets

There are three different ways to construct the scenarios:

a. Intuitively: find some major themes and story lines to organize the elements
b. Heuristically: select the two most important uncertainties and place them in a matrix
c. Statistically: combine the outcomes of all the key uncertainties into internally consistent strings to provide feasible boundaries

Once the scenarios are written, they need to be given a name, the assumptions need to be stated clearly, and an optimal decision needs to be found for each scenario. Finally, a check for consistency and plausibility needs to be performed. There are three questions to test for internal consistency: 1) Are the trends compatible within the chosen time frame? 2) Do the scenarios combine outcomes of uncertainties that indeed go together? 3) Are the major stakeholders placed in positions they do not like and can change?

5) Determine the Relative Probabilities of Each Scenario

Once this is done, students should identify the "likely" scenarios and try to identify robust decisions (decisions that hold across a number of "likely" scenarios). It's best to look for flexible strategies that could allow rapid response to a "revealed" future. Finally, students need to understand that in reality executives will have to monitor the situation closely to identify indicators of the unfolding future.

In conclusion, scenarios are not predictions but sets of logically derived connected futures. Scenario analysis is a process designed to identify robust actions to take today and key early warning signals of critical changes. Scenarios help executives understand the uncertainties that lie before us, "rehearse" their response to those possible futures, and help them spot the scenario that unfolds early thanks to the warning signs.

Using Exhibits C and D, students can test their understanding of scenario analysis. Before writing the scenarios for Excel, students should be encouraged to read the interview with George Green available in Exhibit E. Let's call the first scenario "Acquiring grain more difficult". In this scenario, Excel expands by investing $2.2 million in additional grain storage and handling capacity (700,000 bushels of additional grain storage at the South Reynolds plant) to take advantage of the ethanol demand. The market uncertainties are whether the VeraSun company will build the rumored plant (a 60% chance) and how the Southeast (SE) feeders will react. In this scenario, the VeraSun plant is built and Excel supplies a good portion of the plant corn needs with its additional infrastructure. In addition, as a reaction to the VeraSun plant's construction, the Southeast feeders find corn from other markets by aligning with and sourcing from Excel's competitors (an 80% chance), and Excel has to compete aggressively to get the grain. According to the interview, in this scenario Excel could expect $0.192 million in returns.

A second possible scenario is called "Homerun". In this scenario, Excel also expands, VeraSun builds the rumored plant, but despite the construction of the VeraSun plant the Southeast feeders continue to procure most of their grain from Excel (this is less likely, i.e., a 20% chance). According to the interview, in this scenario Excel could expect $2.7 million in returns.

A third possible scenario is called “Disaster”. Excel expands but the VeraSun plant (40%) is not built, and in spite of this, the Southeast feeders get their grain from Excel’s competitors (20%). According to the interview, in this scenario Excel could expect a $2.447 million loss.

A fourth possible scenario is called “At least the Southeast feeders are still there”. Excel expands, the VeraSun plant is not built, but the southeast feeders continue to procure their grain from Excel (80%). According to the interview, in this scenario Excel could expect a $0.324 million return.

A fifth possible scenario is called “Could be worse”. Excel does not expand, the VeraSun plant is built and Excel supplies to the plant, but the Southeast feeders aggressively drive margins down (50%). According to the interview, in this scenario Excel could expect a $0.115 million loss.

A sixth possible scenario is called “Great if we don’t kill ourselves first”. Excel does not expand, the VeraSun plant is built and uses Excel as a supplier, and the Southeast feeders continue to source most of their grain from Excel (50%). According to the interview, in this scenario Excel could expect a $2.079 million return.

A seventh possible scenario is called “Ouch”. Excel does not expand, the VeraSun plant is not built, and the Southeast feeders source their grain from Excel’s competitors. According to the interview, in this scenario Excel could expect a $1.963 million loss.

An eighth possible scenario is called “Depends on oil prices”. Excel does not expand, the VeraSun plant is not built, and the Southeast feeders continue to source most of their grain from Excel. According to the interview, in this scenario Excel would at least breakeven, all being dependent on oil prices that will directly impact how competitive in price ethanol will be and therefore what the price of grain in Excel’s area will be.

Table 7 summarizes the eight scenarios with their associated probabilities and return/loss.

Table 7. Summary of the Possible Scenarios for Excel

Title	1st Decision	Event 1	Probability	Event 2	Probability	NPV ($1000's)
Acquiring grain more difficult	Expand Elevator	VeraSun	0.6	SE Others	0.8	**192**
Homerun	Expand Elevator	VeraSun	0.6	SE Excel	0.2	**2700**
Disaster	Expand Elevator	No Versasun	0.4	SE Others	0.2	**-2447**
At least SE feed still there	Expand Elevator	No Versasun	0.4	SE Excel	0.8	**324**
Could be worse	No Expansion	VeraSun	0.6	SE Others	0.5	**-115**
Great if we don't kill ourselves first	No Expansion	VeraSun	0.6	SE Excel	0.5	**2079**
Ouch	No Expansion	No Versasun	0.4	SE Others	0.5	**-2425**
Depends on Oil prices	No Expansion	No Versasun	0.4	SE Excel	0.5	**0**

3. Payoff Matrices[3]

Payoff matrices move risk analysis further from a qualitative evaluation to a more explicit quantitative numerical assessment. A payoff matrix is a table that summarizes the payoff associated with each decision and the realization of a specific event (see Table 8). The payoff values for Excel are calculated as the Net Present Value (present value of future revenue – expenses) of the decision given the realization of a specific event.

Table 8. Payoff Matrix Template

	Event A	Event B

[3] The following references (in order of importance) are useful to help in the teaching and the discussion on payoff matrices

- Hammond, John S.; R. L. Keeney; H. Raiffa. "Smart Choices, A Practical Guide to Making Better Decisions". *Harvard Business School Press*, Boston, Massachusetts (1999)
- Brandenburger, Adam M. and B. J. Nalebuff. "The Right Game: Use Game Thoery to Shape Strategy". *HBR*, July-August 1995

Alternative Decision A	*Payoff*	*Payoff*
Alternative Decision B	*Payoff*	*Payoff*
Alternative Decision C	*Payoff*	*Payoff*

Once the payoff matrix is created, a decision can be made. There are several ways to make the decision. The first three methods presented are non probabilistic methods. The maximax decision rule consists of selecting the alternative decision associated with the maximum payoff. It is an optimistic rule that does not take into account the potential loss associated with each decision. The maximin decision rule determines the minimum possible payoff for each decision and selects the alternative with the largest minimum payoff. The minimax regret decision rule involves the concept of regret or opportunity loss (or regret). It converts the payoff matrix into a regret/opportunity loss matrix filled with opportunity loss values. For example, the opportunity loss (or regret) for alternative decision A equals the maximum payoff among all alternatives under one state of nature minus the payoff for alternative A. To apply this decision rule, one lists the maximum amount of regret for each alternative decision and chooses the decision with the smallest (or minimum) maximum regret.

A probabilistic method, the Expected Monetary Value (EMV), can also be used instead using Formula 1.

$$EMV = p_1 r_1 + p_2 r_2 + ... + p_j r_j \qquad \text{(Formula 1)}$$

r_j = Payoff for the given alternative under the j^{th} state of nature

p_j = Probability of state of nature j occurring

The probabilities (the p's in Formula 1) are between 0 and 1 for any given event, and the sum of the probabilities across events must sum to 1. Historical data can be gathered to compute the probabilities. An expert may help. If probabilities are unknown, one may use their best judgment,

and then discusses the results with others to refine the estimate. Regardless of the method used to gather the probabilities, delays in the decision process should be used to continually search for information to refine the probabilities. Once an EMV has been computed for each alternative, one chooses the alternative with the largest EMV.

Exhibit F presents an assignment used in executive education courses to practice the development of a payoff matrix. A payoff matrix for Excel (based on the interview in appendix E) is presented in Table 9.

Table 9. Example of Payoff Matrix for Excel[4]

	VeraSun		No VeraSun	
	SE Others	SE Excel	SE Others	SE Excel
Expand elevator	192	2700	-2447	324
Does not expand elevator	-115	2079	-1963	0

The maximum payoff is $2.7 million, so under the maximax decision rule Excel should decide to expand its elevator. The decision to expand the elevator has a minimum payoff of -2.447 million while the decision to not expand the elevator has a smaller loss of 1.963 million, so under the maximum decision rule Excel should decide not to expand its elevator. The regret/opportunity loss matrix for Excel is presented in Table 10.

Table 10. Regret/Opportunity Loss Matrix for Excel

	Verasun		No Verasun	
	SE Others	SE Excel	SE Others	SE Excel
Expand elevator	0	0	=-1963+2447=484	0
Does not expand elevator	=192+115=307	=2700-2079=621	0	=324-0=324

[4] The figures in the matrix are in thousands of dollars.

If the decision is to expand the elevator, the maximum regret is $0.484 million; the decision to not expand the elevator results in a maximum regret of $0.621 million. So under the minimax regret decision rule Excel should choose to expand the elevator.

Finally, the expected monetary value associated with the decision to expand the elevator is $324.08 thousand[5] while the expected monetary value associated with the decision to not expand the elevator is $196.5 thousand[6], consequently under the expected monetary value rule the expansion should occur.

4. Decision Tree[7]

An alternative way to visualize the information displayed in a payoff matrix is to transform the matrix into a decision tree. A decision tree approach is useful for complex decisions/situations. It provides a graphical representation of all the interrelationships among choices and uncertainties which is particularly useful to explain decision process to others (as long as the labeling is self-explanatory) (see Figure 4). Creating a decision tree encourages thorough, logical thinking about a problem and allows for probabilities to be assigned to individual events and the expected outcomes. The TreePlan Software, an add-in to Excel Microsoft Office, can be used to build decision trees. A decision tree presents two or more decisions, followed by branches representing a set of potential unfolding events that will affect the net present value of the company. The probabilities of each event and the net present value associated with each event

[5] [192*0.8+2700*0.2]*0.6+[(-2447)*0.2+324*0.8]*.4=693.6*0.6+(-230.2)*0.4=324.08

[6] [(-115)*0.5+2079*0.5]*0.6+[(-1963)*0.5+0*0.5]*.4=982*0.6+(-981.52)*0.4=196.6

[7] The following references (in order of importance) are useful to help in the teaching and the discussion on decision tree:

- Hammond, John S.; R. L. Keeney; H. Raiffa. "Smart Choices, A Practical Guide to Making Better Decisions". *Harvard Business School Press*, Boston, Massachusetts (1999)
- Brandenburger, Adam M. and B. J. Nalebuff. "The Right Game: Use Game Thoery to Shape Strategy". *HBR*, July-August 1995
- Ragsdale, Cliff T. "Spreadsheet Modeling and Decision Analysis, a Practical Introduction to Management Science". South-Western College Publishing, 1997 (2nd edition). *Chapter 16.*

for a decision can be displayed on the graph. Using the information presented in the earlier discussions on scenario analysis and payoff matrices, the decision tree of Figure 4 can be constructed with the first node representing the decision to expand or not the elevator followed by two events. The first event is whether the VeraSun plant is built. This will affect the probabilities of the second event: whether the Southeast feeders continue to source their grain from Excel and go to others procurers (see Exhibit G for the example of an assignment).

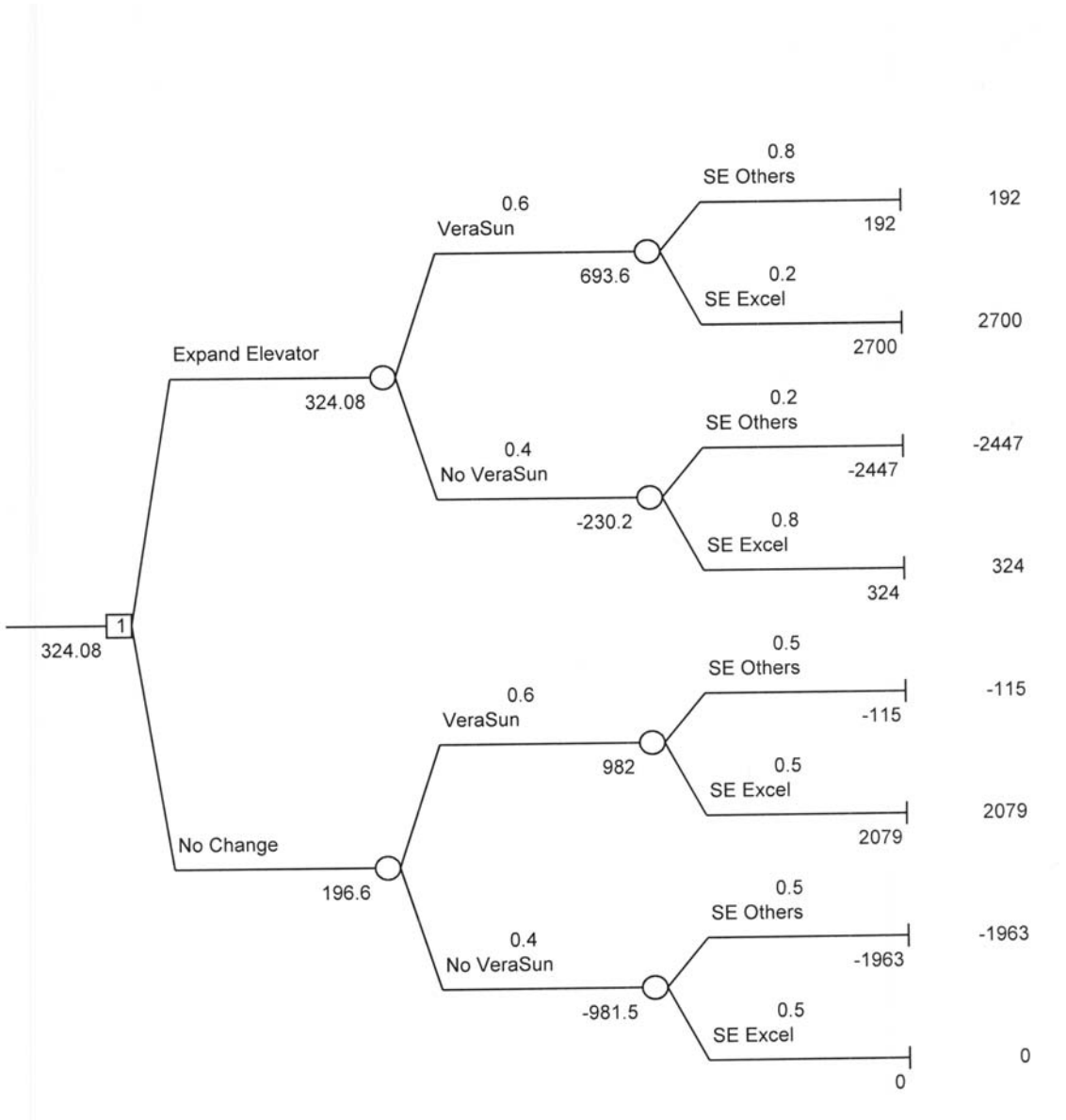


Figure 4. Example of Decision Tree for Excel

5. Real Options Valuation[8]

In addition to evaluating the uncertainties associated with decisions, it is also important to mitigate the uncertainties. One way to limit the risk is by using real options. Real options are a direct extension of financial options, but focus on physical or real assets instead of financial derivatives. In essence, a real option is like a financial option – investing a modest amount today to acquire a right to buy an asset in the future. When the future arrives, the purchase can be made or the option is allowed to expire, depending on the profitability or lack thereof of that asset at that point in time. In short, the option approach enables one to maintain the right or the position to exploit that potential opportunity without having to make a commitment to do so today. This same approach is regularly used in making business decisions where option payments are made to maintain the right to acquire a particular parcel of real property in the future, minority investments are made in startup companies with an agreement to have the first right to buy a majority interest in some future time period, or pilot plants are constructed to test an idea before a full scale manufacturing facility is built.

This method of thinking explicitly considers the benefits additional information will have on the value of a decision or investment. A real options framework is appropriate for situations where the manager can make incremental decisions throughout time, thus creating flexibility in the decision. Such options might include deferring, abandoning, or expanding a given project. This flexibility is only valuable if managers are allowed to incorporate new information into their

[8] The following references (in order of importance) are useful to help in the teaching and the discussion on real options valuation:

- McGrath, R. G., and I.C. MacMillan (2000). "The Entrepreneurial Mindset." Boston, MA: Harvard Business School Press.
- Luehrman, T. A. "Investment Opportunities as Real Options: Getting Started on the Numbers." Harvard Business Review, (1998): 51-67.
- Boehlje, M., A. W. Gray, J. D. Detre (2005). "Strategy Development in a Turbulent Business Climate: Concepts and Methods." International Food and Agribusiness Management Review, 8 (2): 21-40.

decisions over time. Thus, real options are a learning model that allows management to make informed and accurate decisions over the course of time.

There are different types of real options:

- Growth : making investments today to maintain the "option to play" in the future.
- Contract/Divest: flexibility to reduce the commitment or divest resources in the future at high residual values or minimum costs if events turn negative.
- Sequence/follow-on : Deliberately sequencing decisions and making incremental investments to maintain flexibility.
- Pause/Wait : deliberate reasons to delay with a trigger to commitment.
- Shut-down/switch: temporarily stop production when variable costs cannot be covered

To illustrate the application of options analysis, the value for Excel to wait until VeraSun makes its decision whether to build the plant can be estimated (see Exhibit H for an example of assignment). To do this, TreePlan can be used to create a new branch in the Excel decision tree (see Figure 5). The first node of the decision tree or initial decision would be a delay decision, and therefore the decision becomes: expand now or delay. Compared to the previous decision tree of Figure 4, in this one the decision on whether to expand the elevator is made after the VeraSun event has been determined. All other probabilities and the payoffs associated with each branch remain the same. One should recognize that some of the payoffs will be reordered relative to the original decision tree, but the amount of the payoffs does not change. For example, in the initial decision tree of Figure 4, the NPV of -$115 thousands was in fifth position while in the delay case of the second decision tree, the -$115 thousand NPV is in third position; in both cases

this value represents the combination of the following events: no expansion, presence of VeraSun plant, and the Southeast buyers switch distributor.

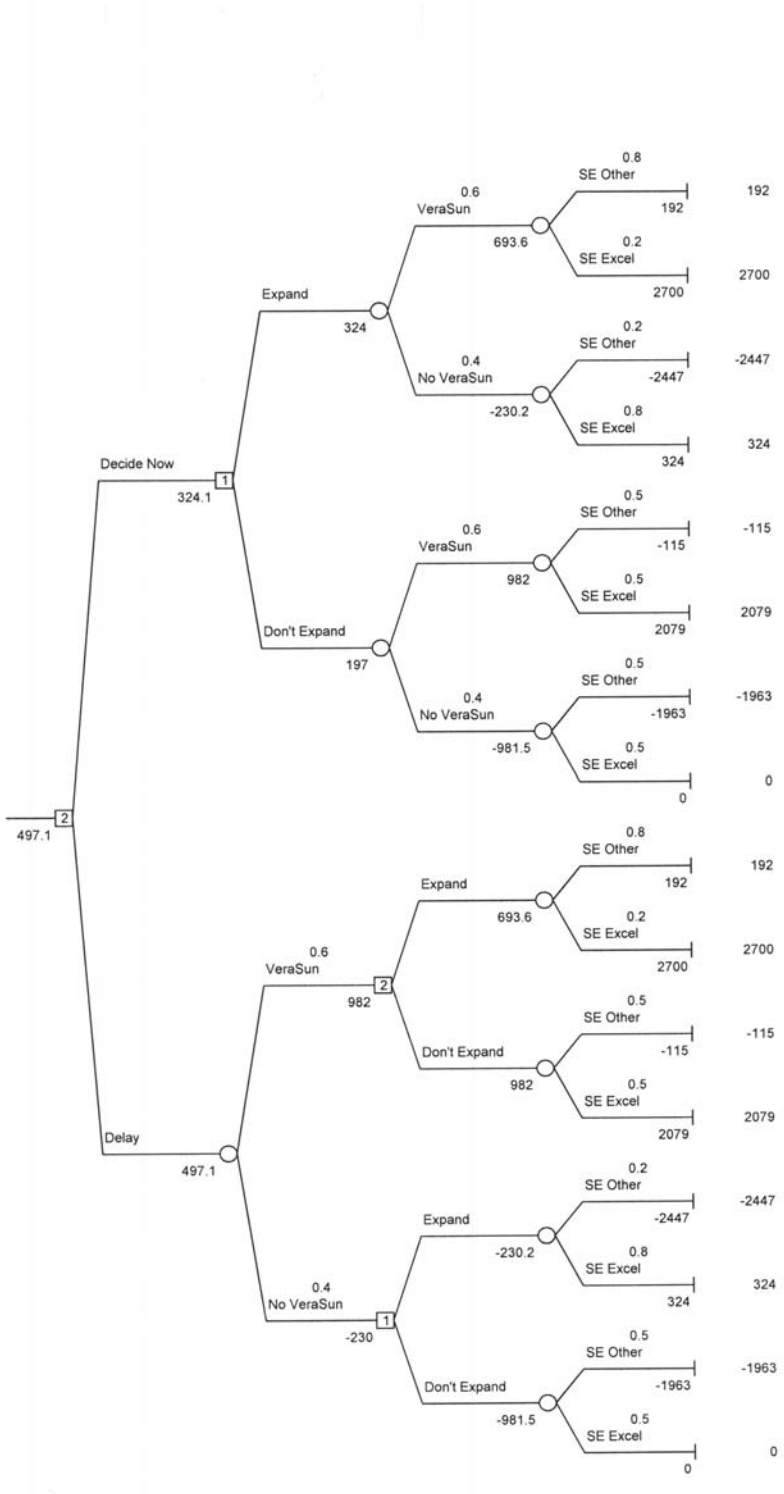


Figure 5. Example of Decision Tree for Excel with a Delay Option

Students/participants can also examine the option for George to make an incremental investment to increase his elevator capacity (see Exhibit H). Assume Excel has the option to enter a 50/50 Joint Venture with another elevator, to build an elevator of a capacity of 700,000 bushel of storage. Excel has the right to purchase the other 50% of the elevator for $1.5 million in 2 years. Meanwhile, George can gather additional information and decide whether to make the additional investment. Thus, Excel reserves the opportunity to invest more in the elevator after seeing how the market unfolds in a two year period, by exercising (or not) the option in two years. This decision tree is presented in Figure 6.

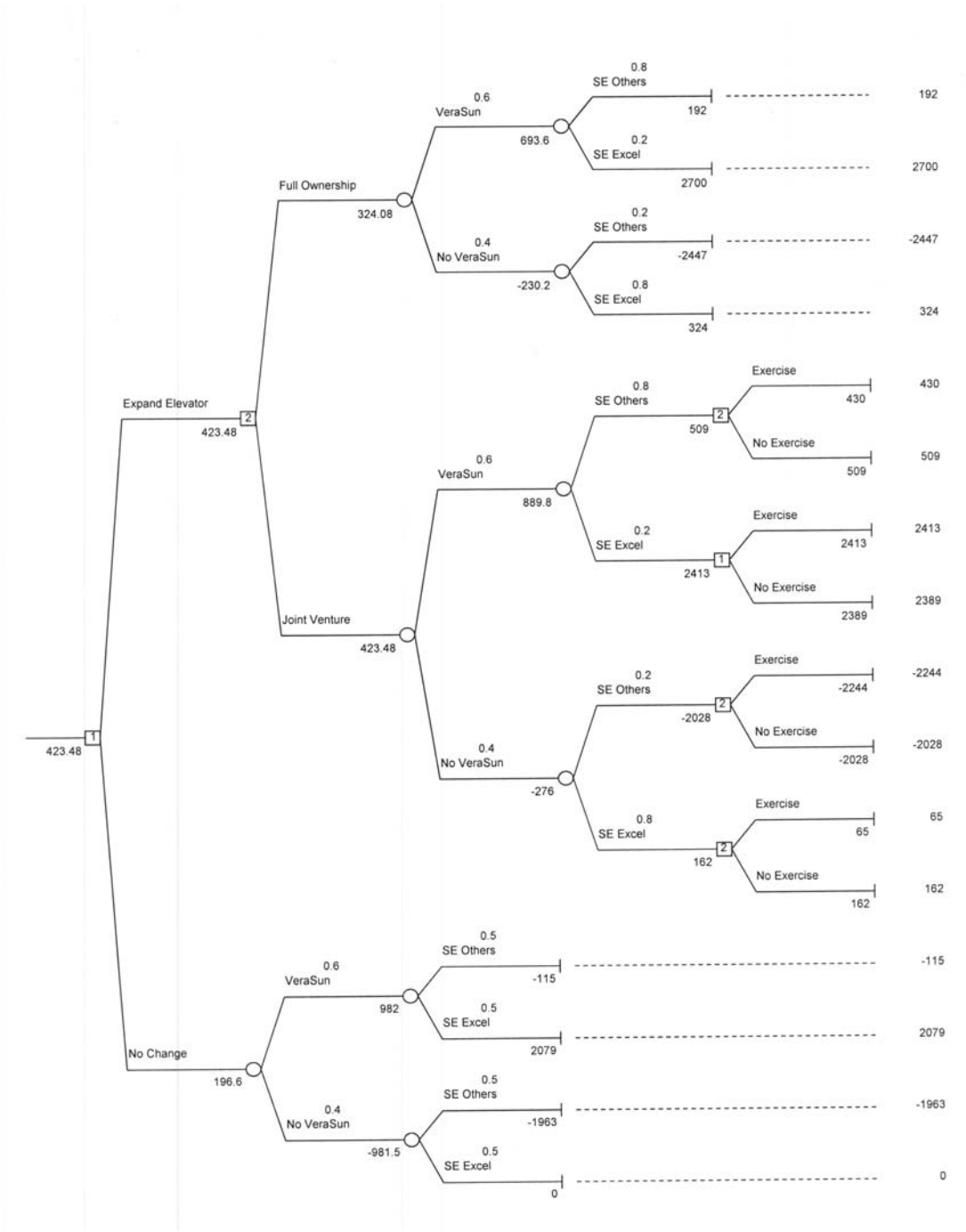


Figure 6. Example of Decision Tree for Excel with a Growth Option

6. Options portfolio mapping[9]

[9] The following reference is useful to help in the teaching and the discussion on options portfolio mapping: McGrath, R. G., and I.C. MacMillan. The Entrepreneurial Mindset. Boston, MA: Harvard Business School Press, 2000.

Beyond thinking about real options, it is also important to make sure a business considers diversification "don't put all your eggs in the same basket". The portfolio of options approach provides a useful framework for thinking about strategic choices in an uncertain environment. Given the technical and market uncertainty that surrounds almost all new projects, a real options approach combined with portfolio concepts has the potential to maximize the value of new innovations while minimizing the risk.

Market uncertainty refers to the lack of knowledge at the market and demand level. Major sources of uncertainty are the potential revenue/demand, the regulatory aspects, the associated cost, and the upstream supply chain reaction to the innovation project. Technical uncertainty comes from the lack of information about the viability of the innovation. The firm does not know whether or not the technology can be developed, and which inputs and skills are needed. The firm also does not know how and if the user will know how to use the product.

McGrath and MacMillian suggest that there are four basic categories of new projects when viewed from the perspective of market uncertainty and technical uncertainty – these four categories are shown in Figure 7. Positioning options create the right to wait and observe what technologies or standards will develop to serve a relatively well defined and certain market. Scouting options are focused on taking relatively well understood technologies and products to a new and not well understood potential customer base. Stepping stone options face both high technical and market uncertainty, and so should be initiated with "experiments" to either gain more information as to customer wants and needs, or increased capability and capacity relative to the preferred technology to respond to those needs. Launches (platform and enhancement) involve full blown commitments that can be safely made because both the technology and the customer base are reasonably well understood and less uncertain.

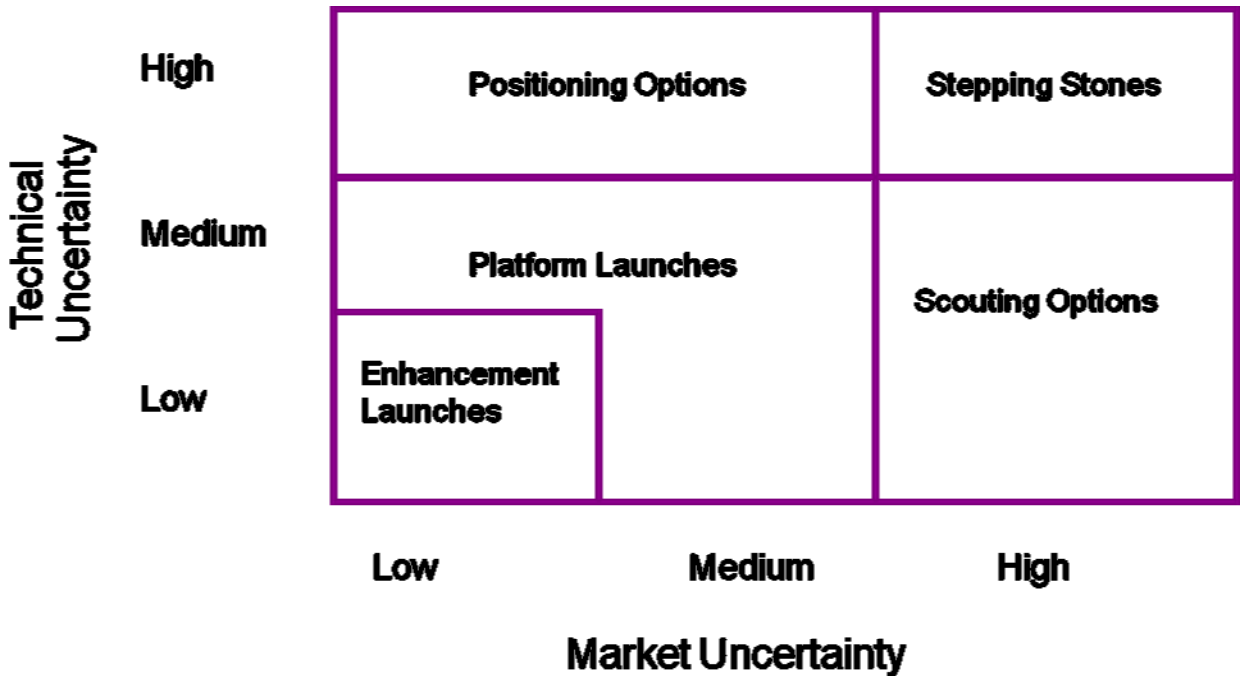


Figure 7. Portfolio Map

To foster the development of new projects and at the same time to reduce the risk of new ventures, expansion funding and activities should be allocated in a portfolio context with a specified percentage of the financial and personnel budget (say 10 or 20%) used to initiate activities that are positioning options, stepping stones, or scouting options rather than allocating all resources to platform or enhancement launches. The basic argument is that to sustain growth through innovation and new projects, but at the same time to manage the technical and market risk associated with that growth, a company should develop and manage a portfolio of innovations and new projects using this portfolio of real options framework.

Exhibit I presents an assignment that can be given to students/participants for them to apply the portfolio of options concepts. Figure 8 summarizes the responses that have been gathered from the participants of the executive program the case has been used in. There are several opportunities Excel can investigate. For example, Excel may decide to acquire excess storage in

case the quantity of grain produced in the area increases. Because the demand for additional storage is uncertain, Excel may joint venture with a competitor in another region and use the competitor's excess facilities. This would decrease the market risk in that the potential customer base for the additional grain storage would be increased by the competitor's clientele. It would increase technical uncertainty in the sense that transportation between the two companies will have to be organized. Excel could also joint venture with Verasun to invest in additional storage. This would not decrase the market uncertainty, but it would decrease the share of risk Excel takes on and would not create additional technical uncertainty.

Excel could also investigate some opportunities with DDGS because of its proximity to Versasun. This could be particularly useful if the demand for grain increases because of ethanol. DDGS could be used as a subsitute for grain in Excel's swine business and for the Southeast market. While the DDGS production bears some technical uncertainty, market uncertainty could be limited if Excel builds a small scale plant that would only answer the needs of its customers – thus a positioning option. Excel could also share the investment and the risk with Excel by building a larger DDGS plant and be in charge of the marketing of DDGS –thus a stepping stone.

Another area of opportunity is high extractable starch corn. High extractable starch corn provides more gallons of ethanol per bushel. Excel could be in charge of the storage and the identity preservation of high extractable starch corn. There is technical and execution uncertainty in the sense that the identity preservation (IP) would create a new organization for Excel. Currently, Excel stores in bulk. Whether Verasun would be willing to pay a premium for this corn and to finance the IP process creates market uncertainty. This would be a stepping stone.

In terms of scounting options, Excel can also investigate growing its offerings of variable rate technology (VRT) and precision services. The technical and execution uncertainty is medium to

low because the technology has already been developed and Excel already sells these services. Whether or not there is enough of a demand creates market uncertainty. We can also find some opportunities of platform launches for Excel. Excel could try to provide its members a one stop shop by also offering financing and crop insurance. New Excel's division would need to be created which would generate some technical uncertainty. Whether the member would use those services creates also some market uncertainty. Excel could also become a grain broker by buying grain from non cooperative members for the Southeast. This would generate medium technical uncertainty because Excel is used to buying grain but not as a broker per say and low to medium market uncertainty in that Excel already has contact with the Southeast market- - thus a platform launch.

Another avenue Excel could explore would be to partner with one of its competitors to sell seed, fertilizer, chemicals because Excel's performance in this area has been deteriorating. Excel could also create a cross division customer loyalty program and/or grow the swine business and feed the hogs DDGS. These projects would have both low technical (the technology exists) and market (Excel already has a customer base) uncertainties - - thus enhancement launches.

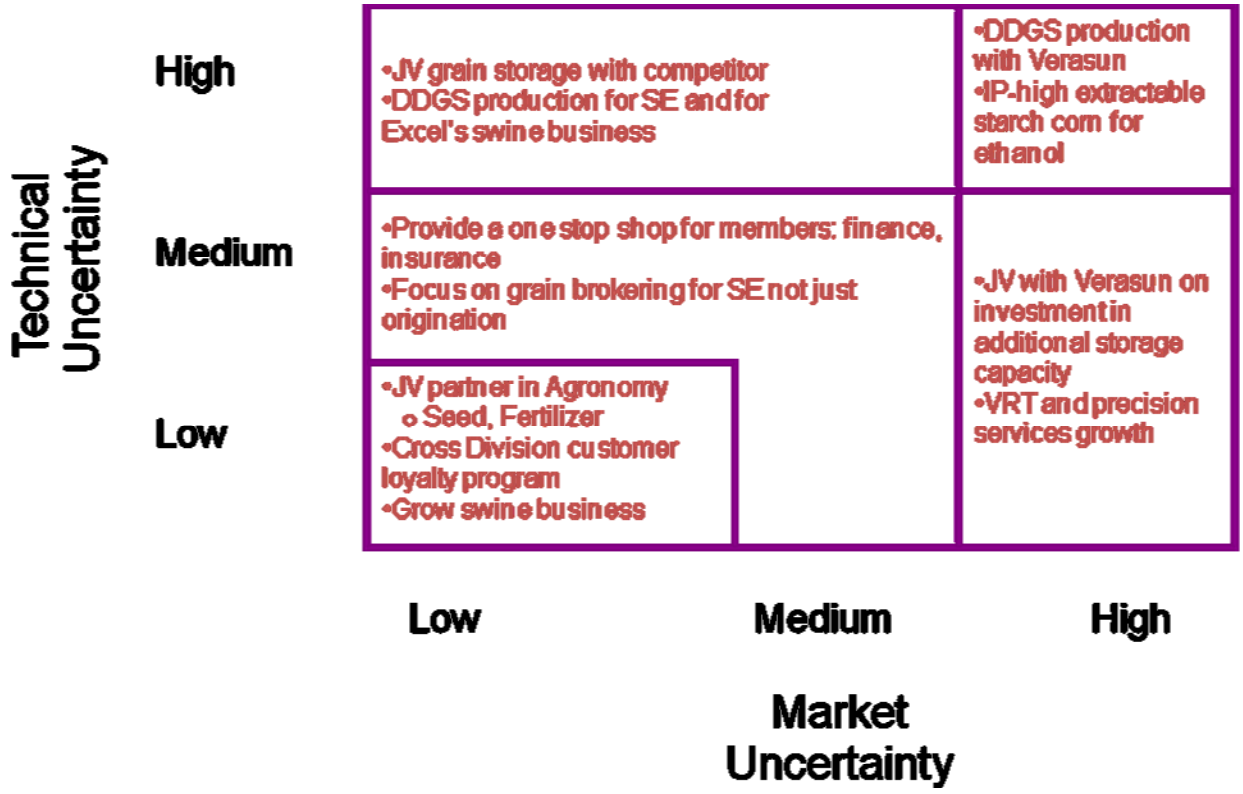


Figure 8. Excel's Portfolio Map

7. Psychological or Decision Traps[10]

It is easy for a decision maker to be biased, particularly for entrepreneurs/managers deciding on projects in which they have a vested interested. Knowing the common psychological traps (see Table 11) and using the tools described above may help reduce this bias. First, it is often not easy to accept that maybe it is time to kill a project particularly one in which substantial time and money have been invested. One may think about the sunk costs/non retrievable costs (the sunk cost trap) associated with a project, or refuse to acknowledge a mistake. Some tend to be

[10] The following references (in order of importance) are useful to help in the teaching and the discussion on psychological or decision traps:

- Hammond, John S.; R. L. Keeney; H. Raiffa. "Smart Choices, A Practical Guide to Making Better Decisions". *Harvard Business School Press*, Boston, Massachusetts (1999)
- Anderson, K. "More of the most common decision-making mistakes people make" at http://www.pertinent.com/articles/communication/kareCom12.asp
- Cevallos, E. "Decision Traps: Barriers to Better Decision Making". *Biz-Think* (2007). Available at http://biz-think.blogspot.com/2007/08/at-every-step-of-decision-making_1045.html

overconfident about their estimates (the overconfidence trap), or/and be too pessimistic in the choice of probabilities (the prudence trap), and/or exaggerate the probability of rare but catastrophic occurrences (the recallability trap) because we tend to be overly influenced by past dramatic events. Some may also be tempted to seek (subconsciously) evidence to support a decision (the confirming-evidence trap). The way a problem is specified can profoundly influence the choices one makes (the framing trap): if a problem is posed in terms of gains, people tend to be risk averse; alternatively they are risk seeking if a problem is posed in terms of avoiding losses. In addition, the problem may subconsciously be framed such that a proposed solution seems to be the best answer. Some decision-makers may give more weight to the first idea, or piece of information (the anchoring trap), give weight to the wrong piece of data while neglecting the relevant ones (the base-rate trap), or assign trends when none are present (the outguessing randomness trap). Sometimes no change seems like the only solution (the status quo trap); it is rarely the case and the switching costs are often exaggerated!

Table 11. Psychological and Decision Traps

Name	Definition	Solution
The Sunk Cost Trap	Throwing good money after bad Refusing to acknowledge a mistake	Deal with the reason the mistake is trouble for you Make the consequences of dealing with the issue part of the decision process How would I handle this if I were brought in to clean things up?
The Overconfidence Trap	We aren't nearly as good as we think we are when it comes to estimates Many times due to anchoring	Ask questions about the extremes, the 'remote' possibilities Homework! Use facts instead of opinions…
The Prudence Trap	Slanting odds, estimates to be safe A major problem in sales forecasting	Seek/demand honest input Document information/reasoning

	with limited supply	Sensitivity analysis Use a process to document problem areas, focus on fixing those
The Recallability Trap	We remember the disasters, the unconditional victories	Use data, or build up your estimates in pieces if data unavailable
The Confirming-Evidence Trap	'Biased research' Make the decision before gathering the facts, then seek (subconsciously) evidence to support your 'decision'	Use a 'devil's advocate' in any major decision exercise 'Pressure test' with those outside the decision Expose yourself to conflicting information Watch leading questions in seeking advice
The Framing Trap	Framing as gains vs. losses – biases toward the gains	Framing with different reference points Can bias the decision up or down, magnifying or minimizing the consequences Don't just accept the initial frame, look for distortions caused by the frame 'Let's look at this problem in a different way'
The Anchoring Trap	First idea, piece of data, history anchors decision	Widen your perspective with outside opinions Think about on your own before getting outside perspectives Don't share your ideas until you get outside perspectives
The Base-Rate Trap	Neglect Relevant Info Focus on the wrong data in a decision setting	Use data, don't mix probabilities
The Outguessing Randomness Trap	Assigning trends when none are present Stuff happens	Don't try to outguess random phenomena, it can't be done Revisit theory, seek good explanations
The Status Quo Trap	Change requires effort, 'the devil that you know and the one that you don't'	Status quo is virtually never the only option Would you choose the status quo, if it weren't the status quo? Avoid exaggerating the switching cost Don't compare 'is' vs. 'would be'

Table 11 describes some of the approaches that might be used to manage these biases. Using systematic analytical procedures including the ones previously discussed is the most effective way to reduce the impact of the biases or traps in making decisions in uncertain environment.

Exhibit

Exhibit A. Assignment 1: Strategy

In small groups, for your assigned division[11]:

- Assess the resources and capabilities of Excel: - What are the strengths and weaknesses of your division?
- Conduct a quick Market Scan:
  - What are the strategic issues facing your division?
  - What are the most important uncertainties facing your division?

[11] Each team should be assigned to one of the four Excel's divisions

Exhibit B. Assignment 2: Scorecarding and Heat Mapping
Using the Excel spreadsheet[12] and the information below, fill out the potential graph, the exposure graph and the action graph.

From Detre, Briggeman, Boehlje and Gray "Scrorecarding and Heat Mapping: Tools and Concepts for Assessing Strategic Uncertainty"

Examples of potentials and exposures for the strategic uncertainties

Categories of Strategic Uncertainty	Examples of	
	Potentials	**Exposures**
Business /Operational	Superior cost control/operational efficiency, Superior workforce, Creating synergies through scope	Business interruption, Loss of key employees
Financial	Strong financial position, Access to equity funds/investors, Attractive financing terms (amounts and terms), Financial reserves (pursue unanticipated opportunities, weather financial shocks, etc.)	Rising interest rates, Loss of lender, Highly leveraged
Market Conditions	Strong brand, Strong complementary products and bundling potential, First mover advantages, Create high switching costs (create loyalty)	Pricing pressure/discounting by competitors, Loss of market share, Consolidation of customer industry, Hyper-competition
Technology	Speed of innovation and commercialization, Niches not attractive to others, Enhanced learning capacity	Limited acceptance of biotechnology, Slow to commercialize new products, Competitor has preferred standards/platform
Business Relationships	Strong market position of distributors, Strong relationship with processors, Enhanced learning, Access to future opportunities	Dependence on distributors, Not a preferred supplier to processor, Not a key account to suppliers
Policy & Regulation	Increasing market from more open trade, Patent protection, Speed of approval	Changes in intellectual property law, Changes in farm income support, Local limits on technology adoption

[12] An Excel spreadsheet is available from the authors.

Strategic Uncertainty Scorecards

Strategic Uncertainty Assessment Scorecard for Potential

Categories of Strategic Uncertainty	Potential					Likelihood				
	Low				*High*	*Low*				*High*
Business/Operational	1	2	3	4	5	1	2	3	4	5
Financial	1	2	3	4	5	1	2	3	4	5
Market Conditions	1	2	3	4	5	1	2	3	4	5
Technology	1	2	3	4	5	1	2	3	4	5
Business Relationships	1	2	3	4	5	1	2	3	4	5
Policy & Regulation	1	2	3	4	5	1	2	3	4	5

Strategic Uncertainty Assessment Scorecard for Exposure

Categories of Strategic Uncertainty	Exposure					Likelihood				
	Low				*High*	*Low*				*High*
Business/Operational	1	2	3	4	5	1	2	3	4	5
Financial	1	2	3	4	5	1	2	3	4	5
Market Conditions	1	2	3	4	5	1	2	3	4	5
Technology	1	2	3	4	5	1	2	3	4	5
Business Relationships	1	2	3	4	5	1	2	3	4	5
Policy & Regulation	1	2	3	4	5	1	2	3	4	5

Exhibit C. Assignment 3: Scenario Analysis

- As a group, construct a scenario for the Grain Division of Excel Cooperative given your assigned intersection of two of the key uncertainties Excel faces[13]. Use the handout (see Exhibit D) and the interview with George Green (see Exhibit E).
- Focus is on two dimensions of risk
  - Ethanol plant expansion
    - Current plants only
    - Verasun builds
  - Southeast Feed Market Strategy
    - Southeast Feed Market continues to use Excel but looks elsewhere for additional corn reducing some of the competitive pressure
    - Southeast Feed Market seeks Excel's competitors to procure grain intensifying competition
- Fill out the information below

Name of your Scenario:

Key Phrases Describing Excel's Marketplace Under this Scenario (5 to 7):

Potential Strategies under this Scenario:

[13] Assign two key uncertainties to each team. For example:
- Group 1 – No VeraSun/SE Excel
- Group 2 – Verasun Enters/SE Excel
- Group 3 – No VeraSun/SE Others
- Group 4 – Verasun Enters/SE Others

Exhibit D. Handout for Assignment 3

1. Define the scope/focus/domain/issue
   - What are the goals/objectives/criteria in the decision?
   - Time frame
   - Scope of analysis: product markets, geographic areas and technologies
   - What knowledge would be of greatest value (look at the past)

2. Identify the driving forces/trends
   - Social dynamics (quantitative, demographic, value and lifestyle)
   - Economic issues/forces (macro and micro)
   - Political issues (electoral, legislative, regulatory)
   - Technological developments (direct, enabling, indirect)
   - Legal factors
   - Industry factors

3. Identify key uncertainties (2-3)
   - What events, whose outcomes are uncertain?
   - What will significantly affect the issues you are concerned with?
   - Identify relationships among these uncertainties

4. Construct initial scenario themes
   - 3 different ways:
     - Intuitively: find some major themes and story lines to organize the elements
     - Heuristically: select the two most important uncertainties and place them in a matrix
     - Statistically: combine the outcomes of all the key uncertainties into internally consistent strings to provide feasible boundaries
   - Name the scenario
   - State the assumptions clearly

5. Check for consistency and plausibility
   - Are the trends compatible within the chosen time frame?
   - Do the scenarios combine outcomes of uncertainties that indeed go together?
   - Are the major stakeholders placed in positions they do not like and can change?

Step 1. Defining the Problem

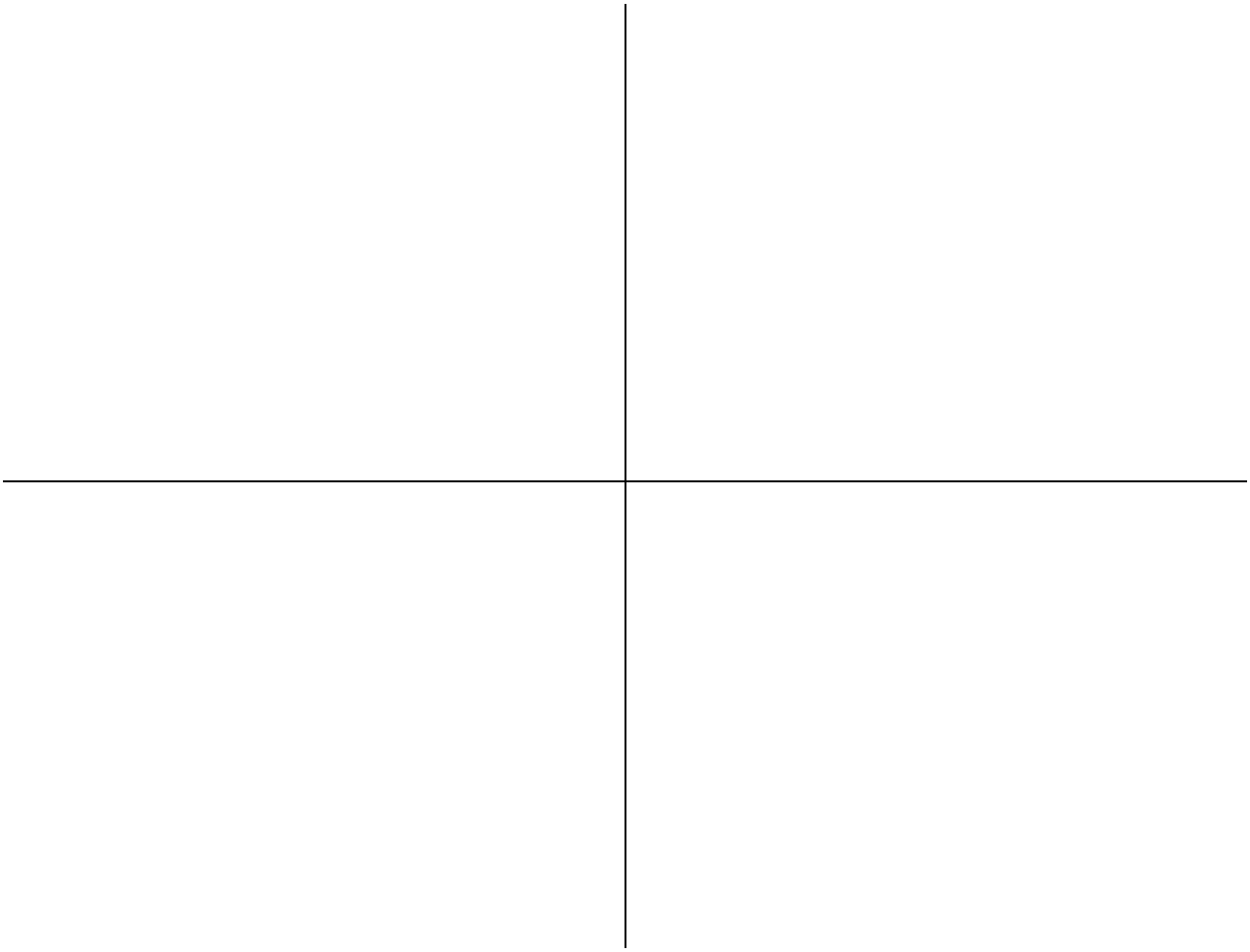
What is the issue?	
What is the timeline?	What is the scope of the analysis?
What knowledge would be useful?	What are the decision criteria?

Step 2. Constructing Scenarios – Identifying Outside Forces

Are there macro-economic issues impacting your decision?		
Are there social dynamics impacting your decision?		
Are there industry factors influencing your decision?		
Are there any potential delays?		
Legal Factors	Political Factors	Product Development Factors

Step 3. Identify Key Uncertainties

Identify two key uncertainties, select relevant dimensions, and state their polar outcomes. Use this graph to illustrate these outcomes.



Step 4. Identify the Most Likely Scenarios

Using the above diagram, describe in greater detail the most likely outcomes in each of these quadrants.

Step 5. Check for consistency and plausibility

Do the scenarios make sense for your:		
Time Frame	Combined Outcomes	Major Stakeholders

Exhibit E. An Interview with George Green, CEO Excel Cooperative

WSJ: George, The dynamics of the grain industry in your region have really changed in a short period of time. How is this affecting Excel Cooperative.

GG: The increase in ethanol demand, nationally, is changing the shape of the corn and soybean market without question. In our local area there are 4 Ethanol plants being built around us. Plus, VeraSun Corporation is considering building a 100 million gallon ethanol plant right in our backyard. This change has implications for all of our divisions including the agronomy and feed divisions. But, probably the most important implications are in our Grain division. We are trying to decide if we need to invest in additional storage and handling capacity to take advantage of the situation or just stay where we are and let things play out.

WSJ: What does your current plan look like for expanding the grain storage?

GG: We have begun the process of looking into building 700,000 bushels of additional grain storage at our South Reynolds plant. With attendant infrastructure improvements we believe that this will require about $2.2 million in investment on our part. If the VeraSun plant comes in we would be well positioned to supply a good portion of that plants corn needs with this additional infrastructure. Part of our concern is that we are not sure how the feeders in the southeast, which we serve with much of grain now, will react to the increased demand for corn locally. And, if we commit to this investment now and VeraSun decides not to go through with its plans we could be struggling to get our investment back.

WSJ: Assuming VeraSun enters the market what impact will that have on the profitability of your expansion.

GG: My team has been running some numbers on this. As long as corn production increases as expected in the area and SE feeders can find corn from other markets without becoming to aggressive in using our other competitors to acquire grain we could see returns in the neighborhood of $2.7 million. If the SE feeders get aggressive with our competitors and we have to compete aggressively to get the grain then we would probably see a reduction in our elevator turnover and might see only $0.192 million in returns.

WSJ: So either way it is not a bad deal it seems.

GG: Well, if the SE feeders are aggressive it isn't great but we could live with it since the VeraSun entry will probably raise margins a little. What is more concerning is if VeraSun doesn't enter but the SE feeders are aggressive with our competitors anyway. If that happens we have a problem on our hands because we could end up with lower turnover and lower margins resulting in a loss of -$2.4 million. Of course, if we can keep the SE feeders looking to us for their grain and working with us to be aggressive in the marketplace while still maintaining our normal margins we could still come out ahead at about $0.324 million.

WSJ: What do you think the probabilities are that VeraSun enters and how your SE feeders might react?

GG: Right now we think that there is about a 60 percent chance that VeraSun will enter the market. The reactions of the SE feeders are a little trickier. If VeraSun enters the market we expect the SE feeders to be more aggressive. If we expand and VeraSun enters the market then we think there is an 80 percent chance the SE feeders will seek out our competitors in local markets to acquire grain. But, if VeraSun doesn't enter the market and we have our expansion in place we believe this will signal to the SE feeders that we can meet their needs and there is an 80 percent chance they will come to us. If we don't expand then it seems there is 50/50 chance that the SE feeders will go either way.

WSJ: Speaking of not expanding, what do the economics look like for you if you don't expand?

GG: Well, if VeraSun enters and we haven't expanded but we can deliver to them and our SE feed markets will let us be aggressive then we will be in pretty good shape with about $2.0 million return. But if our SE feeders seek other elevators for procurement we could be in some trouble with about a $0.115 million loss. If VeraSun doesn't enter but we can keep our SE feed markets we will breakeven. Where it gets scary is if VeraSun doesn't enter and our SE feed markets look elsewhere for their grain. Then we are looking at about $2.4 million loss.

WSJ: George, you have some pretty hefty decisions to make here. Certainly, there is plenty of opportunity here but there is also a lot of downside. Thanks for giving us an overview of your thought process and good luck to you.

GG: Thank you.

Exhibit F. Assignment 4: Development of a Payoff Matrix for Excel

Develop a Payoff Matrix for Excel's Grain Division

- What are the choices (rows) you come up with?
- What are the events (columns) you come up with?
- Draw the matrix
- Using each decision rule, which alternative decision would you choose?

Exhibit G. Assignment 5: Decision Tree for Excel

Draw out the decision tree for Excel's Grain Division

- Base the tree on the case and the analysis of the payoff matrix
- Clearly identify decision nodes, events, and payoffs
- Which decision should Excel make?
- What could Excel do to limit the uncertainty? (hint: think about real options)

Exhibit H. Assignment 6: Growth Option for Excel

Choose one of the two following assignments.

Examine a Growth Option for Excel

- Excel has the option to enter a 50/50 Joint Venture with an elevator in a nearby market with 700,000 Bu. of Storage
- Excel has the right to purchase the other 50% of the elevator for $1.5M in 2 years
- Modify the original decision tree (from assignment 5) to examine the value of this option
    - What does change compared to the previous decision tree?
    - What are the drawbacks to this option?

Examine a delay Option for Excel

- Excel has the option to delay its decision to expand its elevator
- Modify the original decision tree (from assignment 5) to examine the value of this option
    - What does change compared to the previous decision tree?
    - What are the drawbacks to this option?

Exhibit I. Assignment 6: Growth Option for Excel

Thinking about the key strategic uncertainties faced by Excel, identify 3 different projects that Excel might pursue.

- The project can be associated with any of Excel's divisions
- Position each project on the portfolio map below