

**Deciding to Produce a New Product  
Or License the design  
For a Electronic Component Manufacturer**

By

Matt Pope

[mpope@EM.com](mailto:mpope@EM.com)

George Washington University  
December 3, 2000

<b>Table of Contents</b>	<b>Page</b>
Background . . . . .	3
Problem Statement . . . . .	4
Decision Importance . . . . .	4
Methodology Used to Make the Decision . . . . .	5
Results and Conclusions . . . . .	10
Implementation . . . . .	13
Bibliography . . . . .	14
Appendix A . . . . .	15
Appendix B . . . . .	16
Appendix C . . . . .	17
Appendix D . . . . .	18
Appendix E . . . . .	19
<b>Tables</b>	
Description of Alternatives . . . . .	7
Description of Objectives . . . . .	8
<b>Figures</b>	
Decision Hierarchy . . . . .	9
Pairwise Weighting of Objectives . . . . .	9
Results of Pairwise Assessment of Objectives . . . . .	10
Results of Synthesis . . . . .	10
Performance Sensitivity Analysis for new Product Introduction Strategy . . . . .	11

**Background:**

The EM Company designs and manufactures radio frequency (RF) electronic components for the wireless industry. This industry has a great amount of diversity in the products produced with everything from pagers to cell phones to basestation hardware to traffic light controllers. The only thing that equals the diversity of the products produced is the rate of evolution of the technologies employed with technologies changing and improving every 12 to 18 months.

The keys to succeeding in this fast moving industry are the introduction of new products and technologies with regularity, the ability to deliver large amounts of product at a low price, on schedule, with excellent reliability, that demonstrate superior technical performance. When a new technology is developed it can rapidly obsolete the current product of a competitor and the market may vanish within months of a new products introduction. This is driven by the seemingly insatiable desire for consumers to have a “hot” feature in their phones. Sometimes this is cosmetic, sometimes it’s a higher data rate, sometimes its better reception that causes these radical demand fluctuations.

Due to this fickle nature of demand for a particular product it is necessary to constantly evaluate new technologies and to optimize the introduction of technologies and products to minimize risk and maximize profit potential to the company. The introduction of a new product may require capital spending and the application of significant design engineering, management, production, and manufacturing engineering resources to introduce the product and to initiate and maintain production. The EM Company faces several external challenges at the current time that add to the uncertainty of this decision.

The company has been under investigation by the SEC for accounting irregularities and this has produced several relevant developments. The CEO and the CFO have both resigned, the stock has been delisted from NASDAQ, the stock price has fallen dramatically and the credit line has been frozen. All of these limit the ability of the company to raise capital funds and recruit talented people that may be needed to launch a new product.

A decision analysis will be performed to determine if a new product should be introduced, not introduced, or licensed to a third party for production.

### **Problem Statement**

A new product in the R&D Phase has shown technical promise for potential high volume production in wireless applications including cell phones, pagers, and PDAs. This product would be potentially allow wireless products to handle a larger dynamic range which could be important in higher data rate applications and areas where frequency spectrum is crowded and there are potential interfering signals from other users. The decision to be made is whether to market and produce this product, to not produce the product, or to license the technology to a third party.

### **Decision Importance**

This decision is a very important strategic decision for the company. On one hand the successful introduction of a new product could significantly increase the revenues of the company, potentially increasing profits, decreasing product obsolescence risk and potentially raising the stock price. On the other hand, the company has existing products that are growing in revenues to the company at 150% per year compounded. These products have maintained a consistent technical advantage over the competition for

5 years. The annual revenues of the company have increased over the last 5 years from \$6M annually to an estimated \$40M in 2000. This product area has been very profitable for the company and it is strategically important to continue the support of this product area. The company has limited access to funds for capital expenditures for expansion of production capacity and personnel. This necessitates that all expansion be funded from current free cash flow from operations. This limits the amount of expansion that may be done at any time without needed credit. Care must be taken with all spending decisions, if money is spent on a new product, there may not be enough funds to support an increase in demand for the existing product.

This decision has the potential to either damage the company to a point where it may not be salvageable or catapult the company to new levels.

### **Methodology Used to Make the Decision**

This decision analysis is based upon the process discussed in Decisions by Objectives by Ernest H. Forman<sup>1</sup>. This was first suggested by Herbert Simon<sup>2</sup> and is an effective method for making a decision. This method has 3 phases:

- Intelligence
- Design
- Choice

The intelligence phase identifies the problem or opportunity. In this case the opportunity was determined by soliciting members of management of the company regarding what was the biggest opportunity facing the company today. The answer was what were we going to do with this promising new product.

---

<sup>1</sup> Ernest H. Forman, Decision by Objectives (How to convince others that you're right) Expert Choice 1998. Pittsburgh Pennsylvania

<sup>2</sup> Ibid

There was another statement that was usually asked immediately after identifying this new product as an opportunity. The statement was “I have no idea how we are going to support this”, clearly this was the beginning of the design stage where alternatives are developed to address this opportunity. In this case, there are several clear alternatives that are available for this new product. These alternatives are:

- Introduce the new product at a high price to limit incorporation in designs
- Introduce the product at a low price to capture market share
- Don't introduce the product
- License the design to a third party for introduction

Table 1 contains a brief description of the alternatives.

The last step in the process is choice. Choice is choosing the best alternative available to meet the stated goal<sup>3</sup>. The goal in this case is to choose a strategy for new product introduction that maximizes the profits of the company. The Analytic Hierarchy Process (AHP) was used synthesize the solution. A set of objectives was developed evaluate which strategy was the preferred strategy. In some cases there are sub-objectives. Table 2 summarizes the objectives for evaluating the alternatives. The objectives and the evaluation hierarchy are shown in Figure 1.

---

<sup>3</sup> Ernest H. Forman, Decision by Objectives (How to convince others that you're right) Expert Choice 1998. Pittsburgh Pennsylvania

**Table 1 Description of Alternatives**

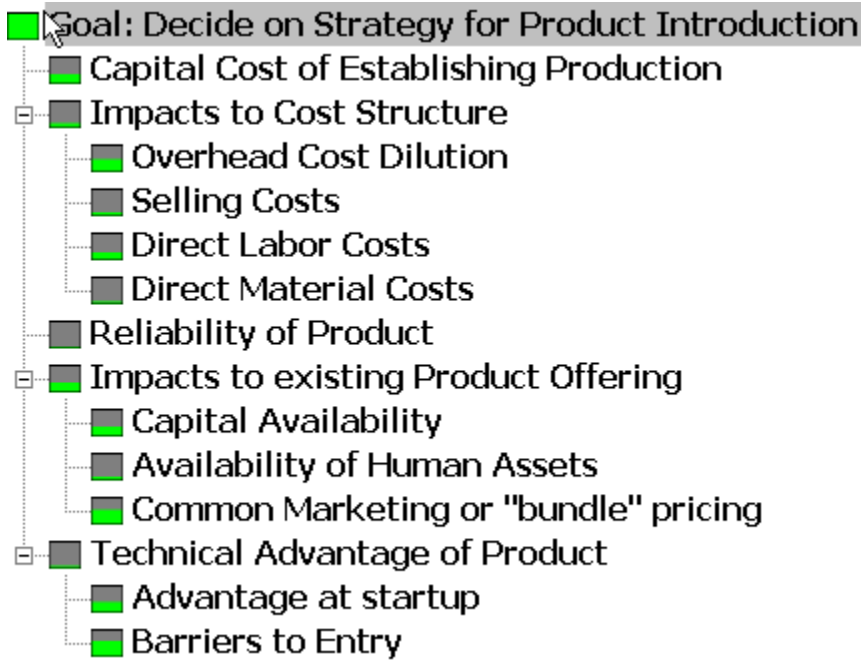
<b>Alternative</b>	<b>Description</b>
Introduce the new product at a high price to limit incorporation in designs.	This strategy involves utilizing the technical advantage of the product and introducing the product at a high unit price. This results in high margins on each unit sold and limits the number of pieces sold. This may limit the funds and human capital needed to establish a production capability to meet the market demand.
Introduce the product at a low price to capture market share.	This strategy utilizes the technical advantages of the product and the barriers to entry (in the form of patents) to introduce the product. The first mover often establishes a large market share that discourages other competitors and yields good returns. This strategy involves a significant investment in equipment and human capital to establish a large volume production capability.
Don't introduce the product.	This is a simple strategy of not pursuing the product due to not being able to fund it, a belief that the technical advantages or reliability may not result in market demand.
License the design to a third party for introduction	This strategy utilizes the technical advantage and barriers to entry features of the product. The design would be licensed on a royalty or fixed fee basis to a third party for production. This would minimize capital funds and human capital required to establish a production capability and would result in some profit.

**Table 2 Description of Objectives**

Objective	Description of the Objective
Capital Cost of Establishing Production	Risk exists in any new product launch, if the product is not successful in the strategy pursued, the capital will be idle which hurts profits. The alternatives were evaluated against the amount of capital needed pursue the strategy.
Impacts to Cost Structure	<p>Introduction of a new product may have impacts to the existing cost structure such as increasing or decreasing the following:</p> <ul style="list-style-type: none"> <li>• Overhead Rate</li> <li>• Selling Cost</li> <li>• Direct Labor Cost</li> <li>• Direct Material Cost</li> </ul> <p>The added product may allow increased economies of scale in any of these areas. The alternatives were evaluated for subjective feelings on whether the impact was positive or negative.</p>
Reliability of the Product	All products must be reliable, the alternative were evaluated on the impact reliability would have to producing and delivering the product.
Impacts to existing Product Offering	Capital and Human assets are resources that must be carefully utilized, the alternatives were evaluated against whether the diversion of assets would impact the existing, fast growing product areas.
Technical Advantage of the Product	The alternatives were evaluated with respect to the importance of having a technical advantage to be successful in the strategy.



**Figure 1 Decision Hierarchy**



Pairwise comparisons were done to determine the importance of each objective.

These pairwise weightings are shown in Figure 2.

**Figure 2 Pairwise Weightings of Objectives**

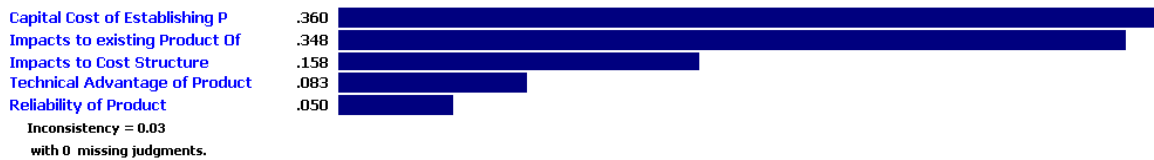
	Cap	Impact	Rel.	Existing	Tech
Capital Cost of Establishing Production		3.0	5.0	1.0	5.0
Impacts to Cost Structure			5.0	3.0	2.0
Reliability of Product				7.0	1.5
Impacts to existing Product Offering					3.0
Technical Advantage of Product					

Incon: 0.03

It is seen from these results that some factors were clearly considered to be more important than others in the assessment of the alternatives. Examination of these comparisons shows the impact to the existing product areas is much more important than

the reliability of the product. This can be seen from the red 7.0 in table 2. However objectives such as the impact to existing product areas and capital costs are considered to be equal, this is denoted with a 1.0 in the table. The Expert Choice software determines the eigenvalues for the objectives and these weights are shown in Figure 3.

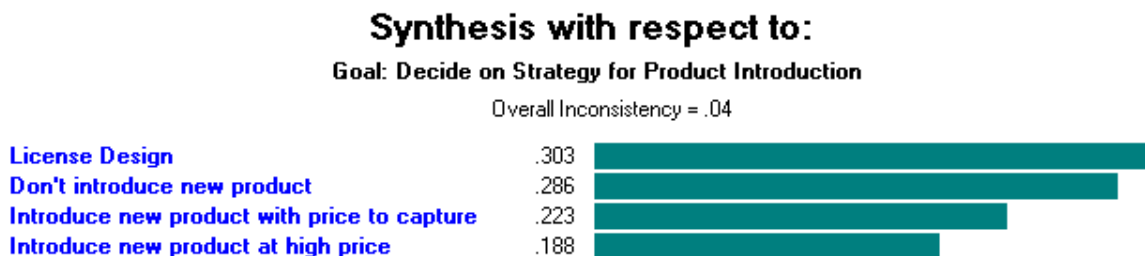
**Figure 3 Results of Pairwise Assessment of Objectives**



## Results and Conclusions

A pairwise comparison of the alternatives was performed with respect to each objective and sub-objective shown in Figure 1. The results with respect to the alternatives are shown in Figure 4.

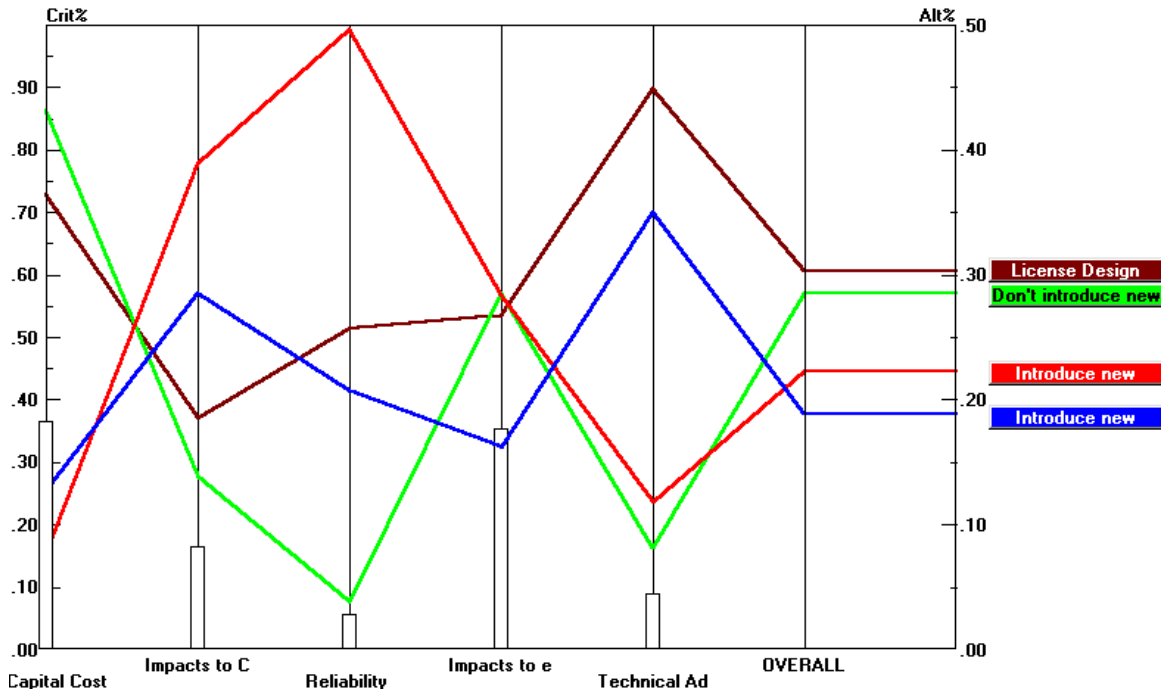
**Figure 4 Results of Synthesis**



The results show the recommended strategy is to license the design to a third party to build to maximize the profits of the company. A sensitivity analysis of these results was

performed to determine which alternative was preferable for each objective. The plot is shown in Figure 5.

**Figure 5 Performance Sensitivity Analysis for new Product Introduction Strategy**



The vertical bars in the graph reflect the weight that each objective received from the pairwise comparisons of the objectives with respect to the goal. The higher the bar, the more weight the objective has. The colored lines reflect each alternative. The intersection of each colored line with the vertical bar shows the value received for each alternative with respect to each objective.

The recommended strategy of licensing the design was the preferred alternative in only in technical advantage which was weighted relatively low. This is an advantage in licensing a product to a third party since a competitive advantage in this market offers the

possibility of rapidly capturing market and realizing profits. This was based upon significant barriers to entry in this market, namely patent protection for the product.

The licensing alternatives real strength was its high finish in two objectives that were weighted highly. The first highly weighted objective was impacts to existing product lines. Licensing the product would impose very little resource drain on the existing product lines, this indicates the company would reap the profits of the existing product lines and the proceeds from licensing the technology. This had a significant advantage over introducing the product at a low price to capture market share. This alternative has the potential to drain capital and labor resources from the existing product lines potentially decreasing the profitability of the company. The second area the licensing alternative was highly favored was with respect to the Capital expenditure objective. Since all new product launches have risk associated with them, the desire is to minimize the amount of capital committed to the project. Licensing is not the most favored approach, not introducing the product obviously minimizes capital expenses but this alternative is preferred to introducing and manufacturing the product.

The objective of positive impacts to the cost structure favored the introduction of the product at low prices to capture market. This had the advantage of decreasing sales costs and overhead costs since selling could be done in conjunction with existing products and there would be a dilution in the amount of overhead contribution required from each part sold. This is simply a function of realizing that it is not necessary to add a new CEO or other administrative types to double the number of parts produced. The numerator of the overhead dollars per part increases but not nearly as quickly as the number of parts produced resulting in lower overhead cost per part.

The benefits of pursuing the alternative of licensing the design are the capital expenditure required is minimal, the technical advantage makes it possible to license and this does not divert precious human and financial capital from existing product areas, these should all work to increase the profits of the company.

**Implementation:**

The proof of concept phase is proceeding with a pilot production run being run through production at the current time. The results of this decision analysis have been discussed amongst the management of the EM Company and there is a significant amount of debate occurring within the company at the present time. This is a significant shift in the method of examining alternatives. The company has also never licensed technology and is struggling with the concept of switching being both a manufacturing company and an engineering company. The final decision will be made during the first quarter of 2001 based on a marketing study and completion of the proof of concept production run.

**Bibliography:**

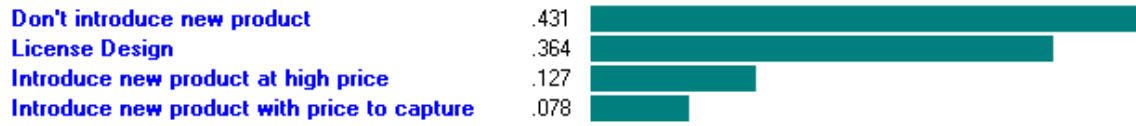
Forman, Ernest H. *Decision by Objectives (How to convince others that you're right)*.  
Expert Choice 2000 . Pittsburgh Pennsylvania.

## APPENDIX A

### Synthesis with respect to: Capital Cost of Establishing Production

(Goal: Decide on Strategy > Capital Cost of Establish)

Overall Inconsistency = .08

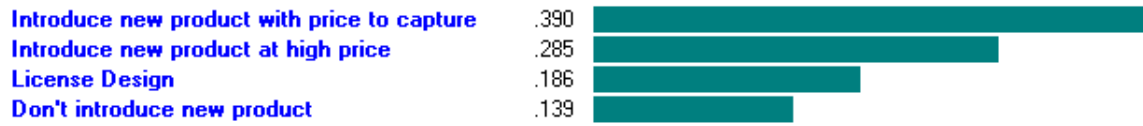


## APPENDIX B

### Synthesis with respect to: Impacts to Cost Structure

(Goal: Decide on Strategy > Impacts to Cost Structure)

Overall Inconsistency = .04





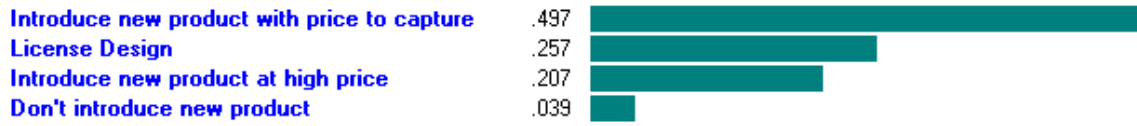
## APPENDIX C



### Synthesis with respect to: Reliability of Product

(Goal: Decide on Strategy > Reliability of Product)

Overall Inconsistency = .05

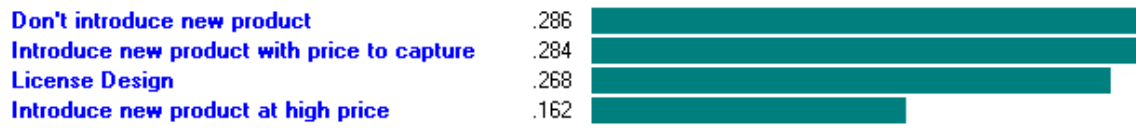


## APPENDIX D

### ☞ Synthesis with respect to: Impacts to existing Product Offering

(Goal: Decide on Strategy > Impacts to existing Produ)

Overall Inconsistency = .04



## APPENDIX E

### Synthesis with respect to: Technical Advantage of Product

(Goal: Decide on Strategy > Technical Advantage of Pr)

Overall Inconsistency = .04

