IMA EDUCATIONAL Case Journal | Case Study

IMA INSTITUTE OF MANAGEMENT ACCOUNTANTS Advancing the Profession™

ISSN 1940-204X

Mercedes-Benz All Activity Vehicle (AAV)

Tom Albright
The University of Alabama

INTRODUCTION

During the recession beginning in the early 1990s, Mercedes-Benz struggled with product development, cost efficiency, material purchasing, and problems in adapting to changing markets. In 1993, these problems caused the worst sales slump in decades and the luxury carmaker lost money for the first time in its history. Since then, Mercedes has streamlined the core business, reduced parts and system complexity, and established simultaneous engineering programs with suppliers.

In its search for additional market share, new segments, and new niches, Mercedes started developing a range of new products. New product introductions included the C-class in 1993, the E-class in 1995, the new sportster SLK in 1996, and the A-class and the M-class in 1997. Perhaps the largest and most radical of Mercedes's new projects was the All Activity Vehicle (AAV). In April 1993 Mercedes announced it would build its first passenger-vehicle manufacturing facility in the United States. The decision emphasized the company's globalization strategy and desire to move closer to its customers and markets.

Mercedes-Benz United States International used function groups with representatives from every area of the company (marketing, development, engineering, purchasing, production, and controlling) to design the vehicle and production systems. A modular construction process was used to produce the AAV. First-tier suppliers provided systems, rather than individual parts or components, for production of approximately 65,000 vehicles annually.

THE AAV PROJECT PHASES

The AAV moved from concept to production in a relatively short period of time. The first phase, or concept idea phase, was initiated in 1992. The concept phase resulted in a feasibility study that was approved by the board. Following board approval, the project realization phase began in 1993, with production commencing in 1997. Key elements of the various phases are described below.

CONCEPT PHASE: 1992 – 1993

Team members compared the existing production line with various market segments to discover opportunities for new vehicle introductions. The analysis revealed opportunities in the rapidly expanding sports utility vehicle market that was dominated by Jeep, Ford, and GM. Market research was conducted to estimate potential worldwide sales opportunities for a high-end AAV possessing the characteristics of a Mercedes-Benz. A rough cost estimate was developed that included materials, labor, overhead, and one-time development and project costs. Projected cash flows were analyzed over a 10-year period using Net Present Value (NPV) analysis to acquire project approval from the board of directors. The sensitivity of the NPV was analyzed by calculating "what-if" scenarios involving risks and opportunities. For example, risk factors included monetary exchange rate fluctuations, different sales levels due to consumer substitution of the AAV for another Mercedes product, and product and manufacturing costs that differed from projections.

Based on the economic feasibility study of the concept phase, the board approved the project and initiated a search for potential manufacturing locations. Sites located in Germany, other European countries, and the United States were evaluated. Consistent with the company's globalization strategy, the decisive factor that brought the plant to the U.S. was the desire to be close to the major market for sports utility vehicles.

PROJECT REALIZATION PHASE: 1993 – 1996

Regular customer clinics were held to view the prototype and to explain the new vehicle concept. These clinics produced important information about how the proposed vehicle would be received by potential customers and the press. Customers were asked to rank the importance of various characteristics including safety, comfort, economy, and styling. Engineers organized in function groups designed systems to deliver these essential characteristics. However, Mercedes would not lower its internal standards for components, even if initial customer expectations might have been lower than the Mercedes standard. For example, many automotive experts believed the superior handling of Mercedes products resulted from manufacturing the best automobile chassis in the world. Thus, each class within the Mercedes line met strict standards for handling, even though these standards might have exceeded customer expectations for some classes. Mercedes did not use target costing to produce the lowest priced vehicle in an automotive class. The company's strategic objective was to deliver products that were slightly more expensive than competitive models. However, the additional cost had to translate into greater perceived value on the part of their customer.

Throughout the product realization phase, the vehicle (and vehicle target cost) remained alive because of changing dynamics. For example, the market moved toward the luxury end of the spectrum while the AAV was under development. In addition, crash test results were incorporated into the evolving AAV design. For these reasons, Mercedes found it beneficial to place the design and testing team members in close physical proximity to other functions within the project to promote fast communication and decision-making. Sometimes new technical features, such as side airbags, were developed by Mercedes. The decision to include the new feature on all Mercedes lines was made at the corporate level because experience had shown that customers' reactions to a vehicle class could affect the entire brand.

PRODUCTION PHASE: 1997

The project was monitored by annual updates of the NPV analysis. Additionally, a three-year plan (including income statements) was prepared annually and reported to the headquarters in Germany. Monthly departmental meetings were held to discuss actual cost performance compared with standards developed during the cost estimation process. Thus, the accounting system served as a control mechanism to ensure actual production costs conformed to target (or standard) costs.

TARGET COSTING AND THE AAV

The process of achieving target cost for the AAV began with an estimate of the existing cost for each function group. Next, components comprising each function group were identified with their associated costs. Cost reduction targets were set by comparing the estimated existing cost with the target cost for each function group. These function groups included the following: doors, sidewall and roof, electrical system, bumpers, powertrain, seats, heating system, cockpit, and front end. Next, cost reduction targets were established for each component. As part of the competitive benchmark process, Mercedes bought and tore down competitors' vehicles to help understand their costs and manufacturing processes.

The AAV manufacturing process relied on high value-added systems suppliers. For example, the entire cockpit was purchased as a unit from a system supplier. Thus, system suppliers were part of the development process from the beginning of the project. Mercedes expected suppliers to meet established cost targets. To enhance function-group effectiveness, suppliers were brought into the discussion at an early stage in the process. Decisions had to be made quickly in the early stages of development.

The target costing process was led by cost planners who were engineers, not accountants. Because the cost planners were engineers with manufacturing and design experience, they could make reasonable estimates of costs that suppliers would incur in providing various systems. Also, Mercedes owned much of the tooling used by suppliers to produce components, such as dies to form sheet metal. Tooling costs were a substantial part of the one-time costs in the project phase.

INDEX DEVELOPMENT TO SUPPORT TARGET COSTING ACTIVITIES

During the concept development phase Mercedes team members used various indexes to help them determine critical performance, design, and cost relationships for the AAV. To construct the indexes, various forms of information

were gathered from customers, suppliers, and Mercedes' own design team. Though the actual number of categories used by Mercedes was much greater, Table 1 illustrates the calculations used to quantify customer responses to the AAV concept. For example, values shown in the "Importance" column resulted from asking a sample of potential customers whether they considered each category extremely important when considering the purchase of a new Mercedes product. Individuals could respond affirmatively to all categories that applied.

Table 1

Category	Importance	Relative Percentage
Safety	32	41%
Comfort	25	32%
Economy	15	18%
Styling	7	9%
Total	79	100%

To gain a better understanding of the various sources of costs, function groups were identified together with target cost estimates. (Mercedes also organized teams called function groups, whose role was to develop specifications and cost projections.) As shown in Table 2, the relative target cost percentage of each function group was computed.

Table 2 : Target Cost and Percentage by Function Group

Function Group	Target Cost	Percentage of Total
Chassis	$ X,XXX	20%
Transmission	$ X,XXX	25%
Air conditioner	$ X,XXX	5%
Electrical system	$ X,XXX	7%
Other function groups	$ X,XXX	43%
Total	$ X,XXX	100%

Table 3 summarizes how each function group contributes to the consumer requirements identified in Table 1. For example, safety was identified by potential customers to be an important characteristic of the AAV; some function groups contributed more to the safety category than others. Mercedes engineers determined that chassis quality was an important element of safety (50% of the total function group contribution).

Table 3: Function Group Contribution to Customer Requirements

Function Group	Safety	Comfort	Economy	Styling
Chassis	50%	30%	10%	10%
Transmission	20%	20%	30%	
Air conditioner		20%		5%
Electrical system	5%		20%	
Other groups	25%	30%	40%	85%
Total	100%	100%	100%	100%

Table 4 combines the category weighting percentages from Table 1 with the Function Group contribution from Table 3. The result is an Importance Index that measures the relative importance of each function group across all categories. For example, potential customers weighted the categories of safety, comfort, economy, and styling as .41, .32, .18, and .09, respectively. The rows in Table 4 represent the contribution of each function group to the various categories. The Importance Index for the chassis is calculated by multiplying each row value by its corresponding category value, and summing the results ((.50 x .41) + (.30 x .32) + (.10 x .18) + (.10 x .09) = .33).

Table 4: Importance Index of Various Function Groups

Function Group	Safety	Comfort	Economy	Styling	Importance Index
Chassis	.50	.30	.10	.10	.33
Transmission	.20	.20	.30		.20
Air conditioner		.20		.05	.07
Electrical system	.05		.20		.06
Other systems	.25	.30	.40	.85	.35
Total	1.00	1.00	1.00	1.00	

As shown in Table 5, the Target Cost Index is calculated by dividing the Importance Index by the Target Cost percentage by Function Group. Managers at Mercedes used indexes such as these during the concept design phase to understand the relationship of the importance of a function group to the target cost of a function group. Indexes less than 1 could indicate a cost in excess of the perceived value of the function group. Thus, opportunities for cost reduction, consistent with customer demands, could be identified and managed during the early stages of product development. Choices made during the project realization phase were largely irreversible during the production phase because approximately 80% of the production cost of the AAV was for materials and systems provided by external suppliers.

Table 5: Target Cost Index

Function Group	(A) Importance Index	(B) % of Target Cost	(c) A/B Target Cost Index
Chassis	.33	.20	1.65
Transmission	.20	.25	.80
Air conditioner	.07	.05	1.40
Electrical system	.06	.07	.86
Other systems	.35	.43	.81
Total	1.00	1.00	1.00

The AAV project used a streamlined management structure in order to facilitate efficient and rapid development. The streamlined Mercedes organization produced an entirely new vehicle from concept to production in four years. Using the target costing process as a key management element, Mercedes manufactured the first production AAV in 1997.

QUESTIONS FOR DISCUSSION

1. What is the competitive environment faced by Mercedes?
2. How has Mercedes reacted to the changing world market for luxury automobiles?
3. Consider two of the elements of target costing, i.e., the target selling price and required margin. How might Mercedes determine the values for these elements?
4. Explain the process of developing a component-importance index. How can such an index guide managers in making cost reduction decisions?
5. How does Mercedes approach cost reduction to achieve target costs?
6. How do suppliers factor into the target costing process? Why are they so critically important to the success of the Mercedes AAV?
7. What types of organizations typically benefit (do not benefit) from target costing?

The author wishes to express his gratitude to Ola Kallenius, Johnathan DeHart, Jason Hoff, Henrik Jonsson, Josef Pfau, and Günther Thuss of Mercedes-Benz for their generous contributions to the development of this case. Subsequent to the preparation of this case, Mercedes designated the all-activity vehicle as the "M Class".