



The Charter Quest Institute

The CFO Case Study Competition 2019

Strategic Report for the Volkswagen AG

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By **Team UMCC**

Carmen Pölking
Maike Lammers

Ann-Kathrin Trilsbach
Kevin-Alexander Klus

University of Münster,
Germany



A. Executive Summary

1. Terms of References

The Volkswagen Group (VW AG) is a globally active manufacturer of automotive and commercial vehicles based in Wolfsburg, Germany. In the following, Team UMCC will identify, prioritize and evaluate the various urgent issues VW AG is facing with special focus on the transformation of the group's core business and its expansion in electric vehicles and battery technology.

2. Prioritization and Key Recommendations

Team UMCC prioritized the challenges VW AG has to deal with according urgency, financial impact and ethical importance:

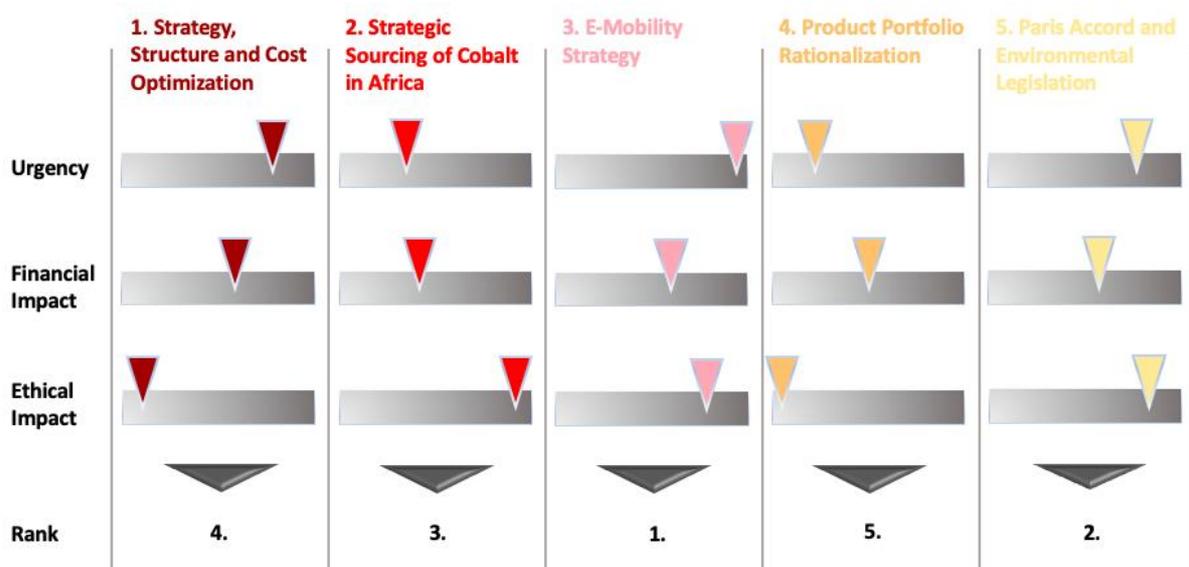


Figure 1: Prioritization

Taking all internal and external influences on VW AG's current issues into consideration (Figure 2), we recommend the group to perform the following steps to successfully control all dilemmas and threats. The advised actions will pay off in terms of a stable core business, financial stability and an integrated corporate social responsibility.

1. Focus on the neglected E-Strategy by extensive R&D and enter the market of electric vehicle batteries through a strategic partnership with another EVB supplier than Panasonic - all with the aim of rapidly enabling a profitable mass production of electric vehicles.
2. Intensively invest in R&D and develop a new modular electric drive matrix (MEB) technology platform in order to comply to upcoming regulatory changes and ensure the admission of VW AG's vehicles in developed countries.
3. Secure the supply of cobalt by clearly distancing the VW AG from supporting child labor and inhumane working conditions and reduce the amount of cobalt needed through intensive R&D.
4. Centralize functional units under the HQ in Wolfsburg to optimize the cost structure and develop an overall program for the volume and premium segments, whilst keeping each brand's individual product and marketing concepts. At the same time, global decentralization is important to adapt products to the respective target group and geographical and economic conditions.
5. Close down loss-making car models to optimize the group's product portfolio and simultaneously cut prices for specific models in South America to promote the market growth in emerging markets.

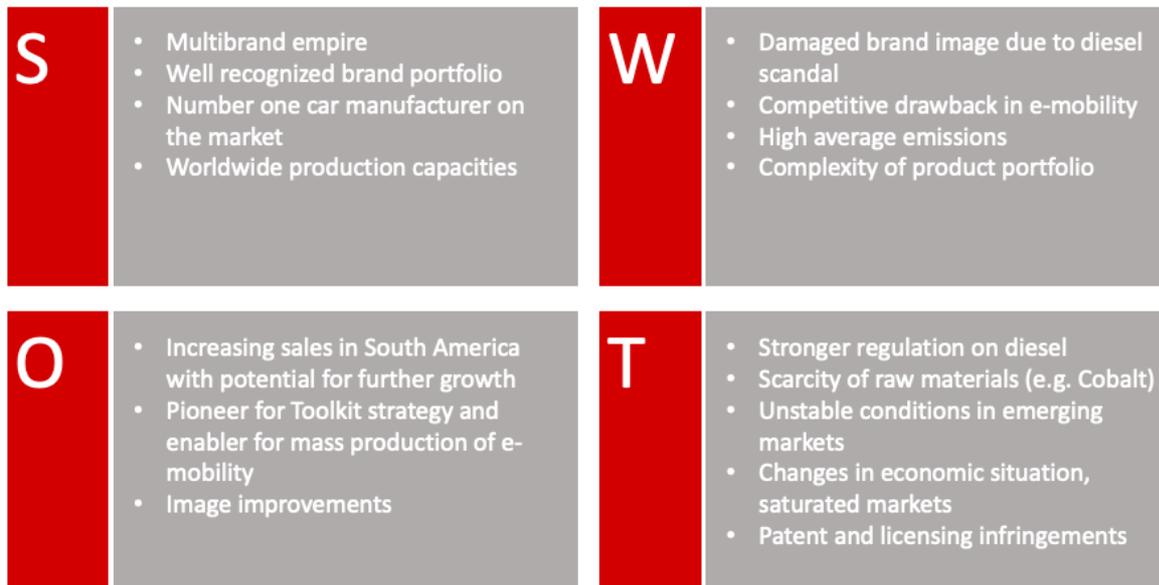


Figure 2: SWOT Analysis of VW AG

B. Detailed Report

3. Detailed Findings and Recommendations

3.1 E-Mobility Strategy

Overtaking Tesla as the current market leader for electric vehicles, whilst remaining the world’s leading car manufacturer requires a reinforced focus on VW AG’s e-mobility strategy. With the Electric Vehicle Battery (EVB) as the key component we advise VW AG to reconsider the current form of cooperation and to challenge Panasonic as the cooperation-partner with the long-term in mind.

Considering the low score of 15 points in the decision matrix, a contract as the selected type of cooperation must be avoided due to weak customer ownership and low confidentiality in the accuracy and completeness of the information contained in the development of EVB (Figure 3). Since VW AG is not yet experienced in manufacturing EVBs, it is necessary to complement the internal competency with a broad range of external capabilities and expertise. Therefore, we do not recommend to develop the EVBs without any third-party knowledge. With a score of 17 points the acquisition of an existing EVB supplier appears to be a convenient alternative. However, a closer look reveals a lack of independence in development once the acquisition is completed.

		Score 1 to 3	Development Alternatives						
			1. Make	2. Acquire	3. Partner	4. Outsource	5. Contract	6. License	7. Reference
Factors affecting choice	A. Central to whole product	3	2	2	2	1	1	0	-2
	B. Critical to performance	3	2	2	1	1	1	2	-2
	C. Third party capabilities	3	-2	2	2	2	2	-2	2
	D. Development independence	3	-2	-2	1	1	1	1	1
	E. Internal competency	1	2	-1	-1	1	-1	-1	0
	F. Confidentiality	2	2	1	1	-1	-1	1	-1
	G. Complementor availability	2	-2	-1	0	2	2	2	2
	H. Customer "ownership"	1	2	2	1	-2	-2	-1	-2
	I. Time to market pressure	2	2	1	1	-1	0	-1	0
	J. Price sensitivity	1	2	2	-1	1	1	0	0
Weighted Total:			10	17	21	15	15	5	-3

Figure 3: Decision Matrix



The decision matrix indicates that partnering with a supplier to refine and produce EVBs is the best alternative to go with. Due to an ongoing exchange of information between the partners no crucial information can be concealed and the existing expertise of both parties will be used as efficiently as possible. Because of the early stage of the e-car market, the potential customers are early adopters with a low price-sensitivity. Thus, additional costs that might be generated through a partnership will not be critical for sales numbers.

It is questionable whether VW AG should extend the current contract with Panasonic. Inconveniences during the 'diesel-issue', such as fewer EVB orders than committed and the refusal to pay higher prices as a compensation, have deteriorated the relationship between the two companies. Since Panasonic offers its excellent product solely to Tesla, we recommend to cancel the present arrangements and to build a Joint Venture with another supplier. The three residual suppliers available for VW AG's selection should be assessed with the long-term perspective in mind.¹ Despite the cost advantage of Supplier 2 (S2) (Figure 4), the only "reasonable" quality of production contradicts VW AG's quality standards. With a battery range of 110 km the product of S2 is below the average of 120 km of the most popular e-cars on the market and thus not advanced enough to push VW AG towards market leadership. Supplier 4 (S4) is located in China and the US. Since more than 58% of VW AG's production plants are located in Europe, with a significant amount of 28 plants based in Germany (Appendix 1), a JV with S4 would lead to extremely high total shipping and transport costs of €22,5 billion per annum. Additionally, a JV with an US-company leads to foreign exchange risks. Based on VW AG's forecast of a stable exchange risk of the Euro against the US dollar of 15% in 2018 a partnership with S4 would lead to immense total costs of €1.747 billion per annum. We suggest setting up a JV with the German supplier 3 (S3). Due to good quality, short delivery distances and a better-than-average performance S3 is no less attractive and equally priced as Panasonic. The avoided exchange risks make up for the higher average costs per unit, so that the total costs of €1.360 billion are as high as they would be with Panasonic. The relatively low capacity per annum of 5 million units will not lead to any problems. Before the maximum is reached 2024, VW AG can support S3 in increasing its production capacities by providing staff and production facilities. These resources will be free due to a product portfolio rationalization (see chapter 3.5). By that, VW AG and S3 can combine their expertise and establish their own EVB on the market, which is strong enough to fight Tesla's and Panasonic's current competitive edge.

	Panasonic (S1)	Supplier 2 (S2)	Supplier 3 (S3)	Supplier 4 (S4)
Total average costs per year in mio. €	1170	1200	1350	1500
Total Shipping and transport cost in mio. €	15	15	15	22,5
Effect of exchange rates in mio. €	175,5	0	0	225
Total costs in mio. €	1360,5	1215	1365	1747,5

Figure 4: Cost savings

3.2 Paris Accord and Environmental Legislation

With sustainable environmental protection being one of the biggest influences on the automobile industry, the VW group must deal with this issue to maintain their position as number one car manufacturer in the long-term. Especially after the 'diesel-issue', an extended focus on environmental matters is needed to regain customers' trust.

The impact of the US leaving the Paris Agreement on Climate is limited, as VW AG and other members of the private sector will have to apply the regulations dictated by the global market. VW AG is presented three different options (Appendices 2, 3).

Considering that none of the issues stated above are only concerning VW AG, but the whole automobile industry, the group must invest in the future to stay ahead of their competitors. We

¹ The CFO Global Case Study Pack 2019, Table 1.2, p. 9



recommend to not only focus on the adaptation of current engines to changing environmental legislation, but also to look beyond conventional drive technologies.

VW AG should choose option one. Although the NPV of this investment is smaller than the NPV of option two due to a larger initial investment, it is the most promising alternative. VW AG's cars would become significantly more attractive to customers, which reflects in the predicted increase of net profit from sales.

The NPV of option one does not include a possible increase of the market share and net profit due to increased popularity of the group's brands and products and of electric vehicles in general. Electric vehicles might even cannibalize VW AG's fossil fuel-driven cars, hence the MEB, usable on electric and conventional vehicles, is necessary to not be driven out of the market by competitors. If the VW AG successfully follows through with their Strategy 2025 and especially its component Roadmap E, it can be assumed that the group will not only strengthen their position as market leader, but that they will be able to make use of the consumption trend towards e-mobility as well.

We recommend to gradually introduce electric cars, starting with the volume segment. This way, VW AG can acquire important expertise in the segment that reaches most customers. Simultaneously, they can profit from the earnings coming from the premium and super-premium segments.²

3.3 Strategic sourcing of cobalt supplies in Africa

Today, VW AG faces a fundamental decision regarding the strategic sourcing of cobalt supplies. After the strategic supply talks with mining operators collapsed, there are two possible ways to go: obtaining the cobalt from mining giants in the Democratic Republic of Congo (DRC) by renegotiating or getting it from artisanal miners in the DRC.

Artisanal miners could meet the maximum price per unit set from VW AG, since they have a very low cost base. However, they will not be able to meet VW AG's volume requirement even though many artisanal miners would be bound by contract - which would also lead to higher coordination costs. Moreover, artisanal miners do not comply with most of the laws and standards they are held to. Often child labor cannot be precluded which contradicts VW AG's values.³ We do not recommend obtaining resources from dubious sources. The worldwide mine production of cobalt accounted 110,000 metric tons in 2017 (Appendix 4). The DRC as the world's largest producer brought out 73,000 metric tons – the majority by the mining giants. Therefore, only buying cobalt from the big operators can cover the demand and will guarantee a continuous supply of the highly requested raw material. In addition, the mining experts' company structures make the value chain more transparent. Binding laws and standards which should be controlled by VW AG, guarantee a certain level of working conditions, environmental standards and products' quality. Nevertheless, the big mining operators cannot meet the price per unit VW AG advertised in its tender. They claim more money per unit cobalt and they are not accepting the ten-year fixed price requirement. This problem has to be solved, since obtaining cobalt from mining giants like Glencore, which holds 60% of world's reserves, Vale, China Molybden or Gecamines is necessary. We urgently recommend VW AG to renegotiate to be able to realize *key element 6 - Battery technology as a core competency of the Group initiatives – Driver of change*.⁴ This recommendation also underpins the vision of being the 'role model for environment, safety and integrity' of *TOGETHER – Strategy 2025*. Currently, it is important for VW AG to avoid any potential scandals and recreate customer confidence. Since

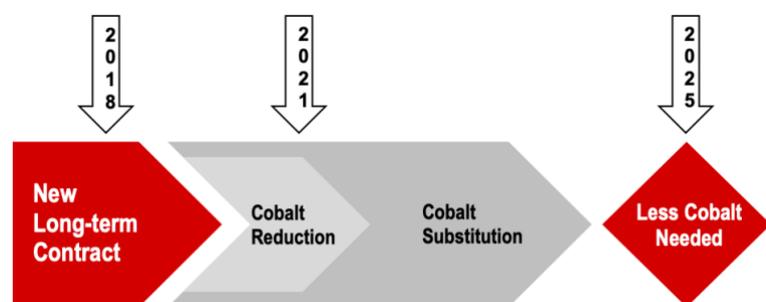


Figure 5: Action plan

² The CFO 2019 Global Case Study Pack, Table 2, p. 14

³ <https://www.amnesty.org/download/Documents/AFR6231832016ENGLISH.PDF>

⁴ <https://www.volkswagen.com/en/group/strategy.html>



some car manufacturers like Renault already try to develop accumulators without any cobalt⁵, in five to ten years it will probably be substituted. For this reason, VW AG has to think in a shorter scale. Cautiously assuming that the yearly amount of the needed cobalt can be reduced by 30% of the estimated volume after the predicted development for the next two years from 2021 to 2025, the maximum price per unit could be raised up to €36,284 per ton (from €21,357) and the total volume would decrease down to 65% (Appendix 5). Although the price per ton raises up, the savings of the originally planned budget would account €20 billion after seven years. These should be used for overseeing the cobalt production conditions and could be used for R&D for the cobalt-substitution.

3.4 Strategy, Structure and Cost Optimization

After the recent changes regarding the brand divisions and segments, a new long-term competitive strategy has to be defined. The comprehensive restructuring the VW- AG is heading for, concerns the group structure itself, the prioritization of the three segments and a geographical decentralization. The centralization of certain functional units does not only lead to leaner management and process improvement but also to cost optimization. Based on the probabilities for possible saving potential in the different cost categories, we calculated the following expected saving values. VW AG can expect the highest savings at 2.5% in marketing, distribution, pricing and trade discounts. Furthermore, a centralization of functional units reduces administrative expenses by 2% and costs of sales by 1.5%.

Functions & Source of Savings	Costs	High		Medium		Low		Expected Saving value
		Saving	Probability	Saving	Probability	Saving	Probability	
Procurement, Factory overheads	Costs of sales	4,00%	0,2	1,50%	0,4	0,25%	0,4	1,50%
Human Resources, including Saleries and Wages	Admin expenses	5,00%	0,1	3,00%	0,4	0,6%	0,5	2,00%
Marketing, Distribution, Pricing and Trade Discounts	Selling costs	5,00%	0,2	4,00%	0,3	0,6%	0,5	2,50%

Figure 6: Expected saving potential

Further calculations show that these cost savings have an enormously positive effect on current and future profits, even under the assumption that one-time investment costs of €700 million will be incurred for the restructuring in 2018. A centralization of the units that are responsible for the procurement, HR and Marketing increases the possible earnings after tax in 2018 by €9.8 billion.

	Actual Costs		Reduced Costs		Tax Rate	
	2017 Actual	2018 Forecast	2017 Actual	2018 Forecast	2018	2017
Revenue	230.682	245.900	230.682	245.900		
Cost of Sales	-188.140	-198.500	-185.318	-195.523		
Gross Profit	42.542	47.400	45.364	50.378		
Distribution Expenses	-22.710	-23.442	-22.142	-22.856		
Administrative Expenses	-8.254	-9.600	-8.089	-9.408		
Other Operating Income	14.500	14.500	14.500	14.500		
Other Operating Expenses	-12.259	-12.252	-12.259	-12.252		
Restructuring Costs (Investment)				-700		
Operating Results	13.819	16.606	17.374	20.362		
Net Interest and ther Financial Effect	94	94	94	94		
Earnings Before Tax	13.913	16.700	17.468	20.456		
Net Tax	2.275	2.731	2.856	3.345		
Earnings after Tax	11.638	13.969	20.324	23.801		

Figure 7: Profitability

From a financial point of view, there is no doubt that a centralization of functional units will lead to a cost optimization. Of course, restructuring must also consider the consequences for employees such as possible job cuts or spatial changes due to relocation to the headquarters in Wolfsburg.

⁵ <https://www.electrive.com/2018/02/12/samsung-sdi-reduce-cobalt-batteries-zero/>

This chance of saving money raises the question if a similar approach in terms of centralizing all brand's geographical strategies would be as profitable as centralizing the functional units. It is undeniable that there is a certain saving potential, but it might not be efficient for the whole company.

VW AG is a conglomerate of 12 key brands summarized to six divisions and three segments operating in five geographical markets. A broad and competitive positioning in each segment is essential for the future of VW AG. Different markets bring different challenges. Hence, each brand should maintain their own concept for the different markets, but we recommend establishing distinguished strategy programs for each segment. For instance, the VW up! in South Africa was not as successful as in Europe where it became the best-selling vehicle in its category (Germany, Netherlands)⁶. Defining the right target group and an effective communication strategy is a complex task which will be supported by establishing strategy programs as mentioned above.

The same approach should be followed for the segment strategies.

Considering that VW AG faces many challenges, focus will be on the volume segment, because it has the highest potential for changes (forecast: 8,600,000 of 11,100,00 sold units⁷). The extended introduction of electric vehicles should begin in the volume segment. Here, VW AG can obtain know-how and experiences, which can later be applied in the premium and super-premium segments. Therefore, VW AG needs the earnings from those two segments (combined €44,439 million forecast in 2018) to be able to realize the introduction.

The retention of all geographical strategies for each brand is highly recommended to prevail the position of VW AG as market leader. This can only be realized by implementing the *GLOBAL FRONTRUNNER PROGRAMS (GFP)* which set the agenda for the different segments and markets. Part of the program is the *GFP-volume*, which focuses on electric vehicles, affordable for large ranges of customers. We recommend VW AG to invest heavily in e-mobility to become a pioneer in this field. Secondly, the current fossil fuel-driven models should be further developed to prevent the loss of market shares. *GFP-premium+* focuses on defending market shares. Because the premium and super-premium segments generate the most profit, falling behind competitors must be prevented. To achieve that, we recommend conducting research on how to further reduce CO₂-emissions. Electric models should be targeted secondarily. The *GFP-emerging markets* concentrate on gaining market shares in emerging markets. To make VW AG's products more attractive to customers, we recommend introducing lower prices for existing models (see chapter 3.5). Contrary to that, *GFP-developed countries* focuses on clean cars and e-mobility. Since the EU introduced a new test procedure for determining pollutants and CO₂-emissions, those have to be reduced urgently. The GFPs express the focus of the brands operating in different markets in a modular concept.

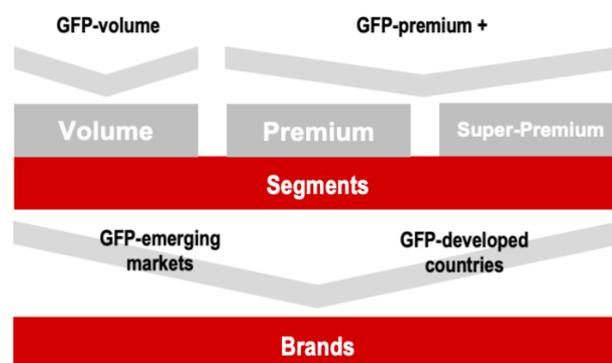


Figure 8: Impact of GFP-Program

Following this concept, an efficient and broad product range can be realized, and VW AG is able to cover various segments with its own specialists in each segment.

3.5 Product Portfolio Rationalization

Since an analysis of the bank Goldman Sachs has proven that a product portfolio rationalization could generate additional €160 billion in the European car sector, the VW AG's consideration of restructuring its broad product range is recommendable.

Regarding the first quarter results, consisting of the numbers of cars sold and the profits made on its sale, it becomes clear that VW AG sells the most cars in its volume brand category (2,015 million),

⁶ Volkswagen South Africa: VW up! Marketing, p.2

⁷ The CFO 2019 Global Case Study Pack, Table 2, p. 14



corresponding to a 73% of the total. Even though the volume segment has by far the highest sales numbers it leads to a loss of €59.5 million. In contrast, the group generates €7,733.29 million in the super-premium segment representing 93% of the gross profit. In the medium price range, VW AG makes a gross profit of €631.37 million. Based on the earnings situation, it can be concluded that the volume segment is the most inefficient.⁸

VW - VOLUME SEGMENT							
VW	Units 2017	Skoda	Units 2017	Seat	Units 2017	VW commercial Vehicles	Units 2017
Golf	986.284	Ocatvia	420.802	Leon	163.306	Caravelle/Mu	115.553
Jetta/Sagitar	883.346	Rapid	210.002	Ibiza	160.377	Caddy Komb	93.167
Tiguan	76.987	Fabia	209.471	Ateca	77.483	Transporter	92.876
Polo	755.506	Superb	147.103	Alhambra	33.638	Amarok	80.328
Passat/Magc	660.996	Kodiaq	123.982	Arona	17.527	Caddy	75.501
Lavida	507.574	Karoq/Yeti	81.693	Mii	13.825	Crafter	36.313
Bora	334.900	Citigo	38.749	Toledo	13.146		
Santana	293.313						
Fol	203.148						
up!	158.795						
Touran	144.676						
Lamando	138.943						
Atlas/Teramc	129.724						
Saveiro	66.431						
Beetle	59.483						
Fox	50.739						
Sharan	45.695						
Touareg	42.407						
Arteon/CC	37.972						
T-Roc	22.724						
Suran	21.093						
Phideon	13.014						
Scirocco	8.199						
Phaeton	0						

Options	Production stop of	Hypothetic Sales Salue/ Revenue	Production Cost (COGS) Saving Potential
1	Toledo	149.207.100	89.524.260
2	Toledo Mii	149.207.100 156.913.750	183.672.510
3	Toledo Mii Scirocco	149.207.100 156.913.750 93.058.650	239.507.700

Assumptions:

Revenue (100%)	< 50000 = loss making models
- COGS (60%)	> 50000 = profitable models
- Marketing Costs (10%)	11350 = average price / car
- SG&A (25%)	
- other (5%)	
= Margin (10%)	

Figure 9: Portfolio rationalization

Considering the idea of a slimmer product portfolio, it would be reasonable to identify loss-making car models and cease its production, especially focused on a reduced product range in the volume sector. Analyzing the number of units sold in the volume sector in 2017 consisting of the brands VW, Skoda, Seat and VW commercial vehicles, it becomes clear that the group makes the least turnover with Seat, since its sales revenue represents only 1.9% of the total, followed by VW with 4.1% (VW commercial vehicles: 7.2%, Skoda: 9.7%).⁹ Also, it should be taken under consideration, that within a brand the number of cars sold varies greatly from model to model. Based on these figures, we recommend VW AG to start slimming down its product portfolio by stopping the production of the least sold models of Seat. Under the assumption that a car model is loss making if it does not sell more than 50000 units, VW AG could progressively reduce its product portfolio in the volume range by removing those car models from the program. The implementation of this strategy comes with the benefit that the group could use the production capacities gained in this way, for example, for the development of electric cars. Based on the annual results of 2017 and the average price of €11350 per model, we developed three different options which show the groups possible production cost saving potential. As a first step we strongly recommend VW AG option two, i.e. a production stop of the models Toledo and Mii. That signifies a possible production cost saving of €183.6 million under the assumption of 60% COGS.

⁸ The CFO Case Study Pack 2019, p.12

⁹ Volkswagen AG Annual Report 2017, pp. 25-37



Therefore, we propose to slim down the product portfolio. In the following period, the Scirocco model should also be deleted from the production program (option three). In this way, production can be gradually focused on the core business.

Another strategy proposed by the supervisory board, consists of reducing the price of the volume range in key emerging markets. In consideration of the already low/ negative gross profit generated in the volume segment described above, this proposal seems problematic. Following this strategy, it should be kept in mind that a price reduction is achievable either by reducing the already low margin of 10% in the volume segment (premium: 30%, super premium: 40%) or by reducing production costs. However, lower production costs should not lower quality, as product quality distinguishes the VW brand from its competitors in particular. Even if from a financial point of view the strategy seems unprofitable today, strengthening its market position in emerging markets signifies a chance for the group, since those markets show enormous growth potential, especially the South American market with a growth of 23.7% in 2017. By reducing the price of particular models of the volume range, VW AG could satisfy the rising demand in the mid-sized vehicle category in emerging markets in South America and Asia Pacific. There the car density is still quite low. We recommend VW to build a strong customer base in those markets and assess a price reduction as an investment in the future. Satisfied customers VW wins today, through a high-quality vehicle with a lower price, represent future potential customers for electric cars. The prerequisite for this strategy is an intensive market analysis in the respective developing country. This is to reduce the prices of the models that are particularly in demand so that such a misjudgment as that for demand of the VW Up in South Africa is not repeated. As the Volkswagen Group developed for example the models Gol and Virtus specially for the Brazilian market, it would be reasonable to lower the price of those two models to increase sales.

4. Summary of Ethical Issues and Conclusion

Apart from being a major financial impact, the 'diesel-scandal' has cost the VW AG a considerable amount of trust of their customers and business partners. They have introduced their Strategy 2025 to re-establish integrity and trust in their brands.

Roadmap E is part of that new business strategy and essential for VW AG's future success. Drastically expanding their range of e-vehicles across all three segments over the next seven years (volume, premium, super-premium) does not only mean to follow the consumer trend, but also to take up the responsibility that comes with their position as market leader. An extended selection of electric cars will make it easier for customers to make environmentally conscious choices. VW AG may even be able to lead their customers to make such decisions, as they have a substantial influence on the market.

With extensive investment into the R&D of e-mobility technologies VW AG can ensure staying ahead of their competitors. Other car producers will be forced to offer more electric vehicles, which will in turn lead to a further reduction of worldwide CO₂ emissions.

Not to be neglected are the resources needed to produce batteries for electric vehicles. Cobalt is a metal heavily demanded by the car industry as well as other business fields incorporating batteries in their products. Therefore, the sourcing of cobalt is not only a financially sensitive topic but can also be ethically questionable. Our recommendation, for VW AG to work with large mining corporations instead of artisanal cobalt miners, is based on the fact that inside those smaller cobalt mines, led by independent miners, safe working conditions cannot be ensured. The purchase of cobalt at much lower prices compared to the 'mining giants' is not justifiable in face of inhumane working conditions, such as child work.

The extension of e-mobility is necessary for a long-term reduction of CO₂ and other pollutants emission. However, on the short-term, the MEB used on fossil fuel-engines is a technology that is needed to contribute to the protection of the planet. Carbon emissions coming from cars make up a significant portion of the world's total CO₂ emissions. If VW AG play their part and lower the emission values of conventional car models, negative effects on the environment can already be decreased today.



Part of the Strategy 2025 is to be an 'excellent employer' and to be a 'role model for environment, safety and integrity'.¹⁰ To reach these goals, VW AG has to introduce a more efficient business structure and focus on their core competencies.

Delivering on their promises will help VW AG to regain their customers' trust. Not only will it improve VW AG's public image, it is also the most sustainable and future-oriented way to act. Doing business in ethically correct ways will pay off in the long term.

¹⁰ Volkswagen AG Annual Report 2017, p. 51



C. Appendices

Location	Number of Production Plants	%
Germany	28	28,0
Rest of Europe	43	43,0
North America	5	5,0
South America	9	9,0
Africa	4	4,0
Asia	33	33,0
Total	122	122

Appendix 1

	Option 1	Option 2	Option 3
Description	Modular electric drive matrix (MEB), usable for adaption of fossil fuel-powered engines and the production of e-vehicles	MEB, usable for adaption of fossil fuel-powered engines	Do nothing
NPV (in 2025)	€ -2,102 million	€ 4,696 million	€ 3,161 million
Ethical Evaluation	<ul style="list-style-type: none"> responsibility towards current and future consumers to minimize damages that are inflicted on the environment lower emission of CO₂ is an important step towards being the leading example of environmental protection in the car industry 	<ul style="list-style-type: none"> Technology only decreases CO₂ emission on the short-term No long-term solution 	<ul style="list-style-type: none"> strategy does not cohere with increasing focus on social responsibility no any measures to decrease the emission of CO₂
Compatibility with Strategy 2025	<ul style="list-style-type: none"> indispensable for Strategy 2025 and Roadmap E Without it, VW AG would either not be able to increase the number of electric car models as planned or would have to make another investment in the development of an electric engine technology 	<ul style="list-style-type: none"> does not include the development and electric vehicle-enabling technology no possibility to increase number of e-vehicles as planned 	<ul style="list-style-type: none"> short-sighted strategy brings VW AG further away from reaching its Strategy 2025 goals
Degree of innovation	high	medium	low

Appendix 2 – Calculation of NPV in Appendix 3



	Initial Investment		Income Forecast		
	MEB 1	MEB 2	MEB 1	MEB 2	Do nothing
2016					
2017					
2018	- 19.500	- 11.750	1.750	1.750	500
2019			1.925	1.925	505
2020			2.118	2.118	510
2021			2.329	2.329	515
2022			2.562	2.562	521
2023			2.818	2.818	526
2024			21.680	21.680	4.046

All numbers are in million €

Prediction of additional net profit from sales MEB 1 and MEB 2:
 + 1750/year in 2019, increase of 10 % each year to 2023
 from 2024 on 1% increase/year

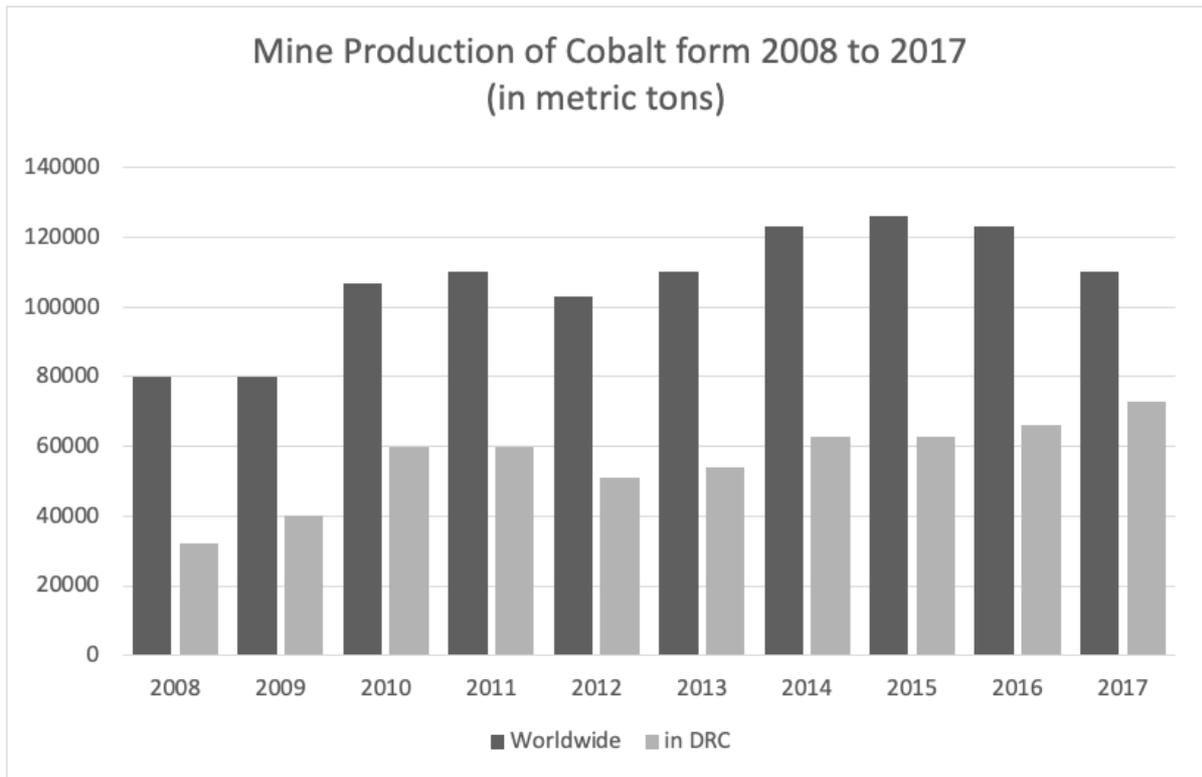
Prediction of increase in net profits for 'Do nothing' option:
 + 500/year in 2019, increase of 1,02 % each year until 2023
 from then on 1% increase/year

MEB 1 = MEB technology, usable for fossil fuel and electric engines
 MEB 2 = MEB technology, usable only for fossil fuel engines

Calculations of NPV based on WACC = 14%

	NPV 1	NPV 2	NPV 3
-	2.102	4.696	3.161

Appendix 3



Appendix 4 (<https://www.statista.com/statistics/339759/global-cobalt-mine-production/>, <https://www.statista.com/statistics/339834/mine-production-of-cobalt-in-dr-congo/>)

	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	In total:	Volume (in mio. €)	price per ton (€)
Current Tender (€55billion, 55000 metric tons in 2018, + 25% per year for 10 years)	55.000	68.750	85.938	107.422	134.277	167.847	209.808	262.260	327.826	409.782	512.227	2.341.137	50.000	0
New Tender (€30billion, 55000 metric tons in 2018, + 25% for 2019 & 2020, - 30% from 2021-2025)	55.000	68.750	85.938	75.195	93.994	117.493	146.866	183.582	0	0	0	826.817	30.000	0

Saving: 20.000

Appendix 5