

“The next generation of sheet steel
formed e-bikes for the daily commute”

GRADUATION REPORT

APPENDICES

APPENDIX A: COST PRICE

Kostprijs staffel										
modellen en opties	Dam Alloy 8-sp		Dam Alloy 11-sp		Dam City single speed		Dam Electric		Fiets Mark	
catalogus prijs	€	2.999,00	€	3.299,00	€	2.099,00	€	3.399,00	€	3.599,00
btw	€	520,49	€	572,55	€	364,29	€	589,91	€	624,62
verkoopprijs	€	2.478,51	€	2.726,45	€	1.734,71	€	2.809,09	€	2.974,38
kostprijs (bij 50 stuks)	€	1.153,65	€	1.273,91	€	824,58	€	1.284,66	€	1.403,37
marge (bij 50 stuks)	€	1.324,86	€	1.452,54	€	910,13	€	1.524,43	€	1.571,01
marge % (50 stuks)		53,5%		53,3%		52,5%		54,3%		52,8%
Productiekosten frame										
50 stuks	€	312,20	€	312,20	€	312,20	€	312,20	€	179,00
Nabewerking										
poedercoaten/lakken	€	77,50	€	77,50	€	77,50	€	77,50	€	77,50
Assemblage	€	32,00	€	32,00	€	32,00	€	32,00	€	25,00
Totaal nabewerking	€	109,50	€	109,50	€	109,50	€	109,50	€	102,50
Onderdelen										
frametas	€	-	€	-	€	-	€	-	€	-
voordynamo SP	€	-	€	-	€	-	€	-	€	-
Voordynamo Son	€	105,00	€	105,00	€	-	€	-	€	-
Verlichting	€	59,75	€	59,75	€	-	€	59,75	€	21,00
RYDE velgen	€	16,00	€	16,00	€	16,00	€	16,00	€	16,00
Brooks zadel	€	26,00	€	26,00	€	26,00	€	26,00	€	26,00
Handvatten	€	4,00	€	4,00	€	4,00	€	4,00	€	4,00
Gates CDX Belt	€	39,97	€	39,97	€	39,97	€	39,97	€	39,97
Gates CDN crank 55T	€	-	€	-	€	-	€	-	€	-
Gates Crank + tandwiel	€	-	€	-	€	-	€	-	€	-
Gates CDX achttertandwiel 22T	€	42,88	€	42,88	€	42,88	€	42,88	€	42,88
Gates CDX voortandwiel 46T	€	45,03	€	45,03	€	45,03	€	45,03	€	45,03
FSA ACR Lagere	€	-	€	-	€	-	€	-	€	21,00
Superstarr headset	€	15,00	€	15,00	€	15,00	€	15,00	€	-
Superstar zadelklem	€	7,00	€	7,00	€	7,00	€	7,00	€	7,00
Tune headset	€	-	€	-	€	-	€	-	€	-
Schwalbe	€	15,00	€	15,00	€	15,00	€	15,00	€	15,00
binnenbandenset	€	3,46	€	3,46	€	3,46	€	3,46	€	3,46
Magura MT4 voorremset	€	-	€	-	€	-	€	33,40	€	-
Magura MT4 achterremset	€	-	€	-	€	-	€	35,90	€	-
Shimano remset voor+achter	€	44,97	€	44,97	€	44,97	€	-	€	44,97
Shimano alfine crank	€	49,99	€	49,99	€	49,99	€	-	€	49,99
Shimano Nexus Inter 5E	€	-	€	-	€	-	€	-	€	120,00
E-bike parts	€	-	€	-	€	-	€	300,00	€	500,00
Tracify GPS unit	€	-	€	-	€	-	€	99,00	€	-
Shimano 8/11-speed	€	110,36	€	209,24	€	-	€	-	€	-
Shimano 8/11-speed shifter	€	14,71	€	36,09	€	-	€	-	€	-
Shimano Cap Nut	€	7,99	€	7,99	€	-	€	-	€	7,99
Rohloff 14-speed hub	€	-	€	-	€	-	€	-	€	-
Spatborden	€	31,26	€	31,26	€	-	€	26,99	€	31,26
Lightskin Zadelpen	€	-	€	-	€	-	€	-	€	20,00
Satori zadelpen	€	8,11	€	8,11	€	8,11	€	8,11	€	-
Satori stuur	€	5,63	€	5,63	€	5,63	€	5,63	€	5,63
Satori stuurpen	€	11,00	€	11,00	€	11,00	€	11,00	€	-
FSA ACR Stuurpen	€	-	€	-	€	-	€	-	€	40,00
Excentrische trapas	€	8,15	€	8,15	€	8,15	€	8,15	€	-
HT pedalenset	€	20,00	€	20,00	€	20,00	€	20,00	€	20,00
EVO voorvork	€	40,69	€	40,69	€	40,69	€	40,69	€	40,69
Totaal Onderdelen	€	731,95	€	852,21	€	402,88	€	862,96	€	1.121,87

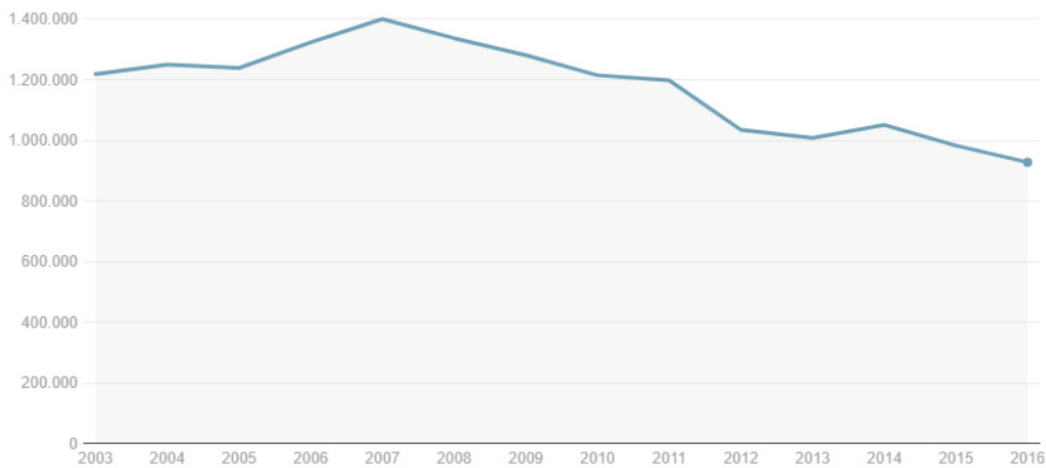
Frame productiekosten staffel								
Aantal stuks	50	50 (staal)	50 (staal) e-bike	100	200	1000	5000	
Frame helftenset	€ 92,46	€ 70,00	€ 100,00	€ 88,46	€ 84,46	€ 72,46	€ 37,30	
Achternork inzet stuk	€ 13,96	€ -	€ -	€ 12,96	€ 11,96	€ 8,96	€ 6,50	
subtotaal	€ 106,42	€ 70,00	€ 100,00	€ 101,42	€ 96,42	€ 81,42	€ 43,80	
CNC delen								
dropouts L+R	€ 10,00	€ 10,00	€ 21,00	€ 15,00	€ 10,00	€ 10,00	€ 10,00	
balhoofd	€ 8,66	€ 6,00	€ 12,00	€ 2,60	€ 2,35	€ 2,20	€ 1,17	
trapas	€ 6,06	€ -	€ -	€ 2,23	€ 2,00	€ 1,91	€ 1,87	
zadelbuis	€ 5,46	€ 3,00	€ -	€ 2,80	€ 2,52	€ 2,40	€ 2,32	
adaptor	€ 5,60	€ 3,00	€ 4,00	€ -	€ -	€ -	€ -	
subtotaal	€ 35,78	€ 22,00	€ 37,00	€ 22,63	€ 16,87	€ 16,51	€ 15,36	
Laswerk	€ 159,00	€ 35,00	€ 42,00	€ 125,00	€ 120,00	€ 105,00	€ 60,00	
Lassen zadelpen trapas	€ 11,00	€ -	€ -	€ 5,50	€ 5,25	€ 5,00	€ 4,50	
subtotaal	€ 170,00	€ 35,00	€ 42,00	€ 130,50	€ 125,25	€ 110,00	€ 64,50	
Totaal frame productiekosten	€ 312,20	€ 127,00	€ 179,00	€ 254,55	€ 238,54	€ 207,93	€ 123,66	
kostenreductie		-59%	41%	-18%	-24%	-33%	-51%	

APPENDIX B: MARKET FIGURES

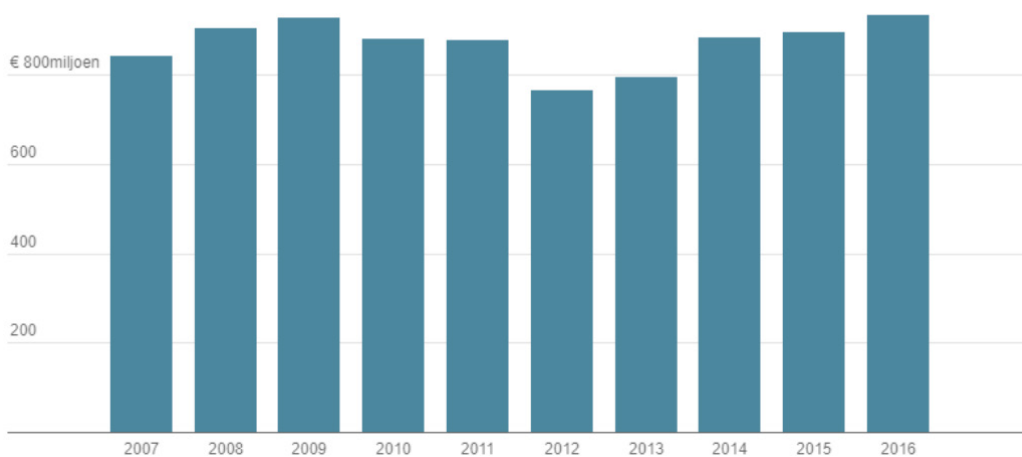
Most people dislike bicycling for more than 30 minutes for their commute, but most people live a longer distance from their work than these 30 minutes. With the help of an electrically aided bicycle, a commute of 1 hour or more suddenly is no issue for the rider. Because you will not arrive all sweaty at work, like with a conventional bicycle. An extra effect on the consumer is that they already had some relaxed exercise before they arrive for their day at work, which will lead them to be more energized than when this time had been spent in a traffic jam.

The figures

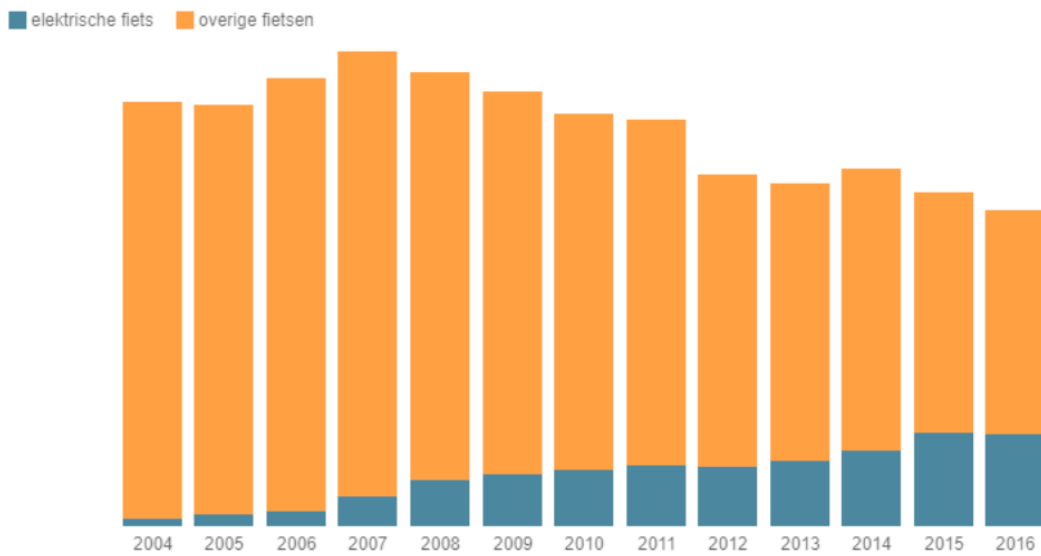
Amount of new bicycles sold each year



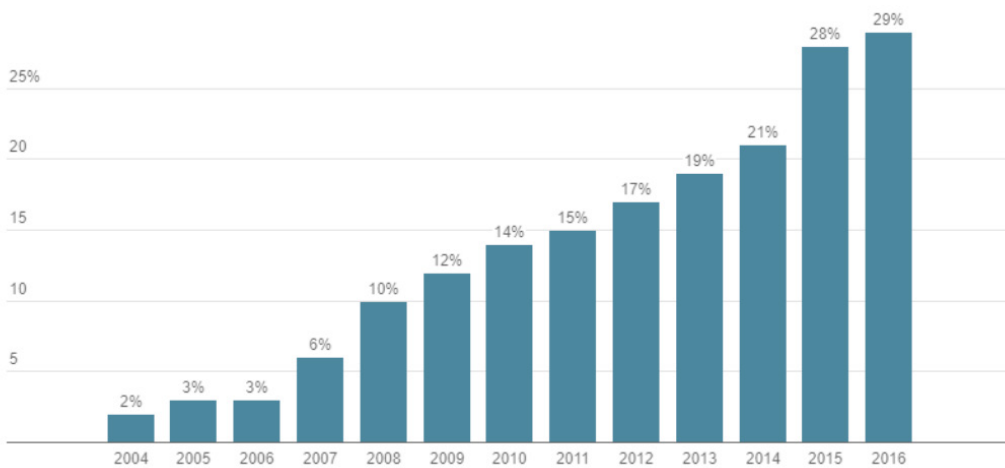
Total net worth of newly bought bicycles



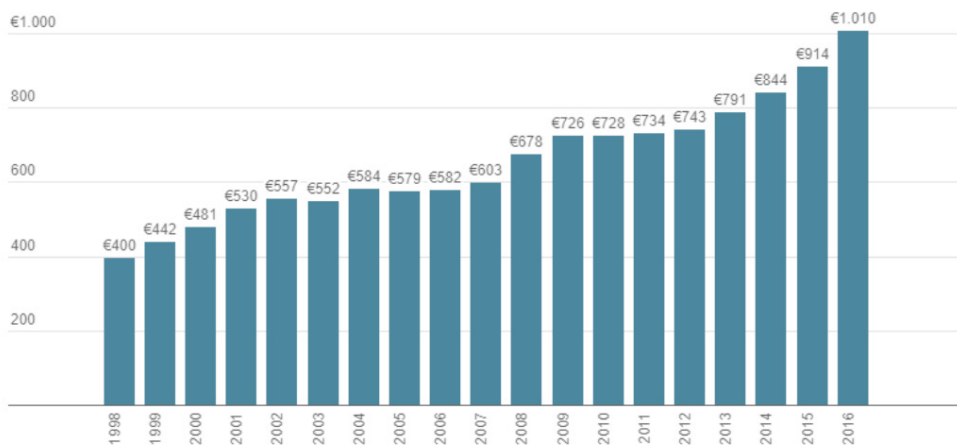
New e-bikes sold in comparison to regular bicycles



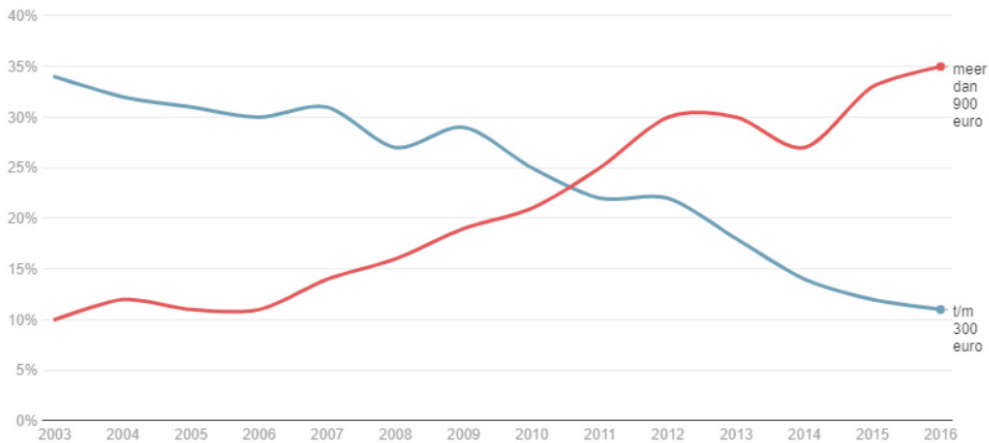
Market share e-bikes of total sold bicycles



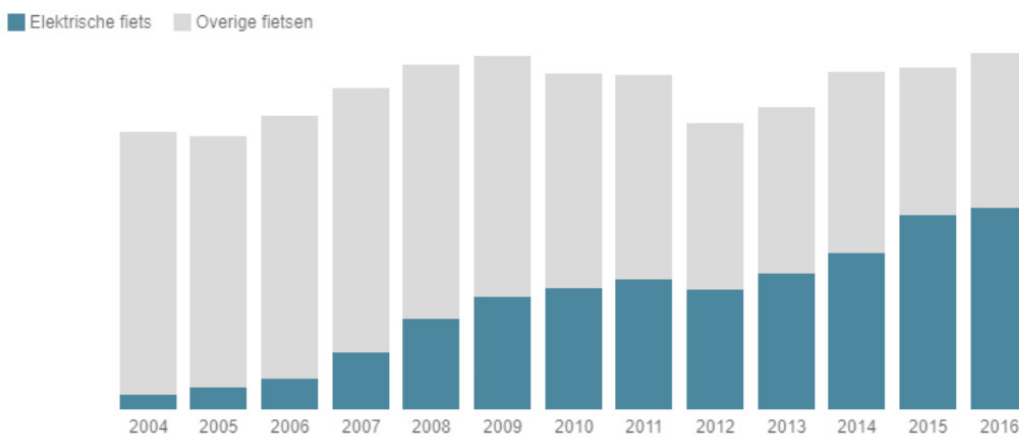
Average costs of a new bicycle



Market share per price category



Revenue regular bicycles versus e-bikes



As seen from the figures before, it becomes clear that the e-bike is indeed on a rise since the last few years. Another interesting finding from these figures is that bicycles are getting more expensive, but customers are still willing to buy these expensive bicycles, especially when it comes to e-bikes. Seeing that even in 2016 there was already a 29 percent market share of e-bikes as a part of regular bicycles, which includes road cycling, mountain biking and children's bicycles as well, is very impressive. From these different areas we can surely say that the e-bike is indeed on the rise, and the e-bike is here to stay.

Reference:

Thole, H. (2019, 22 augustus). De e-bike heeft de hele fietsbranche op z'n kop gezet – 7 grafieken over de razendsnelle opmars van de elektrische fiets. Geraadpleegd van <https://www.businessinsider.nl/e-bike-elektrische-fiets-verkoop-rai-vereniging-bovag/>

APPENDIX C: COMPETITIVE PRODUCTS

To gain insight in this competition, the main competitors are analysed. From this, requirements can be found to which the Mokumono e-bike must comply. Moreover, opportunities in the market for Mokumono to exploit can be identified. In this analysis, only bicycles with integrated battery systems are included.

Qwic urban series

Retail price from €1.699
Smartphone connection possible
Action radius: up to 180 km.
Removeable battery
Weight: 23,3 kg
Front wheel motor



Cowboy

Integrated light
Retail price from €1.990
Smartphone connection possible
Action radius: up to 70 km.
Removeable battery
Weight: 16,1 kg
Rear wheel motor



Van Moof Electrified S2

Integrated light and display
Retail price from €2.798
Smartphone connection possible
Action radius: up to 150 km.
Removeable battery
Weight: 19 kg
Front wheel motor



Watt

Display on the bicycle
Retail price from €1.350
Action radius: up to 60 km.
Battery integrated in frame, non removeable
Weight: 17 kg
Rear wheel motor



APPENDIX D: ALTERNATIVE E-BIKE MOTORS

Bosch

Bosch is a key player in the e-bike world. They provide many different types of e-bike systems, fitted for different groups. They have competitive, high speed units. But they also sell strong, high torque units for cargo bicycles. Many e-bikes are fitted with Bosch motors.

Performance line

Dynamic acceleration
Minimal pedalling resistance
Quiet
Compact and lightweight
Enough power for longer distances
Weight: 3.2 kg



Figure 1: Bosch Performance line

Active line

Compact design
Compatible with derailleur and rear hub gearing systems
Gearing identification makes sure of less wear in the system.
High compatibility
Weight: 2.9 kg



Figure 2: Bosch Active line

Bafang

While Bafang might be lesser known than Bosch or Shimano, they still are used in many e-bikes today. They gained a foothold in the market with their front wheel motors, they produce some of the strongest front wheel motors available. Nowadays, Bafang designs great middle motors as well. The motors of bafang have a lot of power, but because of this, the system makes more noise than their counterparts by other companies.

M420 system

Weight: 3.6 kg
Low drag, the motor disengaged when a speed of 25 km/h is reached.
Pairable application
240 W
80 Nm



Figure 3 Bafang M420 System

M400 series

Light, powerful and durable
250 W
3.9 kg.
80Nm torque



Figure 4: Bafang M400 System

Shimano Steps

Weight: 2.88 kg
Small Q factor for a traditional bicycling experience.
Small integrated design
Automatic gearing



Figure 5: Shimano Steps

TQ e-mobility systems

TQ is a German company that hold on strongly to a few aspects of electric motors. Their motors have a high torque, are compact and are very efficient. TQ motors are already used in e-mountainbiking,

TQ HPR 120S

These motors are high-performance motors
There is an integrated sensor system
250 W
120 Nm torque
3.9 Kg
146 mm shaft length



Figure 6: TQ HPR 120S

Fazua

Fazua is a company that creates modular drivesystems for hybrid e-bikes.

The Fazua Evation system is a fully integrated e-bike system. The motor, engine, sensors and battery are all integrated into one product.

Above 25km/h a freewheel disengages the motor from bottom bracket, thus giving no resistance.

Fazua Evation

Light
Compact
Integrated
Total weight 4.6 kg.
Fazua rider app

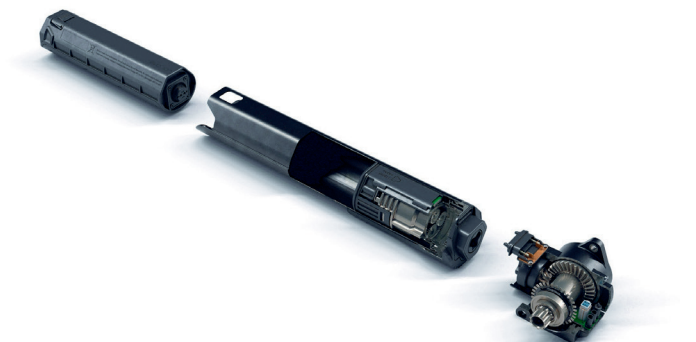


Figure 7: Fazua Evation