

BAB VI. KESIMPULAN

Proses perancangan pada penelitian ini masih merupakan tahap awal dari seluruh proses perancangan produk Modul tambahan EMs berdasarkan alur proses perancangan dan pengembangan produk / aktifitas *front-end* yang ditunjukan ada Gambar 1[40]. Proses identifikasi kebutuhan pengguna dan penentuan target spesifikasi produk telah dilakukan pada penelitian ini hingga diperoleh 30 kebutuhan pengguna dengan persentase tingkat kepentingan (prioritas) dari setiap kebutuhan (Tabel 5 dan Gambar 4) dan berdasarkan kebutuhan pengguna tersebut telah diterjemahkan menjadi 24 metrik dengan nilai ideal dan marginal sebagai target spesifikasi produk serta persentase tingkat kepentingan dari setiap metrik (Tabel 9). Hasil kedua proses tersebut dapat dijadikan sebagai dasar proses perancangan selanjutnya yaitu proses pembuatan konsep-konsep produk, pemilihan konsep produk, dan pengetesan konsep produk terpilih pada penelitian selanjutnya.



DAFTAR PUSTAKA

- [1] T. Eccarius and C. C. Lu, “Powered two-wheelers for sustainable mobility: A review of consumer adoption of electric motorcycles,” *Int. J. Sustain. Transp.*, vol. 14, no. 3, pp. 215–231, 2020, doi: 10.1080/15568318.2018.1540735.
- [2] Badan Pusat Statistik, “Perkembangan Jumlah Kendaraan Bermotor Menurut Jenis (Unit),” 2021. <https://www.bps.go.id/indicator/17/57/3/perkembangan-jumlah-kendaraan-bermotor-menurut-jenis.html> (accessed Jul. 03, 2023).
- [3] M. Adnan, “Passenger car equivalent factors in heterogenous traffic environment-are we using the right numbers?,” *Procedia Eng.*, vol. 77, pp. 106–113, 2014, doi: 10.1016/j.proeng.2014.07.004.
- [4] J. S. Yeung, Y. D. Wong, and J. R. Secadiningrat, “Lane-harmonised passenger car equivalents for heterogeneous expressway traffic,” *Transp. Res. Part A Policy Pract.*, vol. 78, pp. 361–370, 2015, doi: 10.1016/j.tra.2015.06.001.
- [5] H. S. L. Fan, “Passenger car equivalents for vehicles on Singapore expressways,” *Transp. Res. Part A Gen.*, vol. 24, no. 5, pp. 391–396, 1990, doi: 10.1016/0191-2607(90)90051-7.
- [6] R. Bentley and Y. Bentley, “Explaining the price of oil 1971-2014 : The need to use reliable data on oil discovery and to account for ‘mid-point’ peak,” *Energy Policy*, vol. 86, pp. 880–890, 2015, doi: 10.1016/j.enpol.2015.04.028.
- [7] H. Wachtmeister, P. Henke, and M. Höök, “Oil projections in retrospect: Revisions, accuracy and current uncertainty,” *Appl. Energy*, vol. 220, no. September 2017, pp. 138–153, 2018, doi: 10.1016/j.apenergy.2018.03.013.
- [8] GIZ, “International Fuel Prices 2018/19,” no. November, pp. 1–8, 2019.
- [9] M. Amann, Z. Klimont, and F. Wagner, “Regional and global emissions of air pollutants: Recent trends and future scenarios,” *Annu. Rev. Environ. Resour.*, vol. 38, pp. 31–55, 2013, doi: 10.1146/annurev-environ-052912-173303.
- [10] worldometer, “Global Fossil Carbon Dioxide emissions by Year,” 2018. <https://www.worldometers.info/co2-emissions/co2-emissions-by-year/> (accessed Jun. 26, 2023).
- [11] E. Union, *Statistical Pocketbook 2021 - EU Transport in figures*. 2021. doi: 10.2832/27610.
- [12] M. Millikin, “IDTechEx: Sales of electric motorcycles in Europe grew 50% y-o-y in 2020,” *Congress, Green Car*, 2021. <https://www.greencarcongress.com/2021/02/20210219-electricmotorcycles.html> (accessed Mar. 03, 2023).
- [13] V. A. Desiawan, “Target Produksi 2 Juta Motor Listrik di 2025,” *INDUSTRY, ASSOCIATION OF INDONESIA MOTORCYCLE*, 2023. <https://www.aisi.or.id/target-produksi-2-juta-motor-listrik-di-2025/> (accessed Mar. 03, 2023).
- [14] V. A. Desiawan, “Perkembangan Sepeda Motor Listrik di Indonesia,” *ASSOCIATION OF INDONESIA MOTORCYCLE INDUSTRY*, 2022. <https://www.aisi.or.id/perkembangan-sepeda-motor-listrik-di-indonesia/> (accessed Mar. 03, 2023).
- [15] S. Kaleg, A. Hapid, and M. R. Kurnia, “Electric vehicle conversion based on distance, speed and cost requirements,” *Energy Procedia*, vol. 68, pp. 446–454, 2015, doi: 10.1016/j.egypro.2015.03.276.
- [16] ESDM, “Permen ESDM Nomor 3 Tahun 2020.” 2015. [Online]. Available: <https://peraturan.bpk.go.id/Home/Details/141253/permen-esdm-no-3-tahun-2020>
- [17] Permenperin, “tentang Organisasi dan Tata Kerja Kementerian Bantuan Pemerintah untuk Pembelian Kendaraan,” 2023.

- [18] D. Chen, X. Yue, X. Li, X. Wu, and Y. Zhou, “Research progress of cathode materials for Lithium-Selenium batteries,” *Wuli Huaxue Xuebao/ Acta Phys. - Chim. Sin.*, vol. 35, no. 7, pp. 667–683, 2019, doi: 10.3866/PKU.WHXB201806062.
- [19] J. Lau, R. H. DeBlock, D. M. Butts, D. S. Ashby, C. S. Choi, and B. S. Dunn, “Sulfide Solid Electrolytes for Lithium Battery Applications,” *Adv. Energy Mater.*, vol. 8, no. 27, pp. 1–24, 2018, doi: 10.1002/aenm.201800933.
- [20] W. Sutopo, I. Kurniyati, and R. Zakaria, “Markov Chain and Techno-Economic Analysis to Identify the Commercial Potential of New Technology: A Case Study of Motorcycle in Surakarta, Indonesia,” *Technologies*, vol. 6, no. 3, p. 73, 2018, doi: 10.3390/technologies6030073.
- [21] A. Spanu, F. Stoenescu, M. Lorenzi, and M. Avram, “Analysis of three wheeled electric vehicle with increased stability on the road,” *IOP Conf. Ser. Mater. Sci. Eng.*, vol. 444, no. 4, 2018, doi: 10.1088/1757-899X/444/4/042010.
- [22] M. N. A. Jodinesa, W. Sutopo, and R. Zakaria, “Markov chain analysis to identify the market share prediction of new technology: A case study of electric conversion motorcycle in Surakarta, Indonesia,” *AIP Conf. Proc.*, vol. 2217, 2020, doi: 10.1063/5.0000817.
- [23] WIKA, “Produk Motor Gesit,” *PT. WIKA INDUSTRI MANUFAKTUR* 2022, 2023. <https://gesitsmotors.com/>
- [24] gridoto, “Biaya Konversi Motor Listrik di BRT, Modal Rp 15 Jutaan Sudah Termasuk Urus Surat,” 2022. <https://www.gridoto.com/read/223581892/biaya-konversi-motor-listrik-di-brt-modal-rp-15-jutaan-sudah-termasuk-urus-surat> (accessed Mar. 04, 2023).
- [25] A. Aggarwal and V. K. Chawla, “A sustainable process for conversion of petrol engine vehicle to battery electric vehicle: A case study,” *Mater. Today Proc.*, vol. 38, no. xxxx, pp. 432–437, 2020, doi: 10.1016/j.matpr.2020.07.617.
- [26] A. Habibie and W. Sutopo, “A Literature Review: Commercialization Study of Electric Motorcycle Conversion in Indonesia,” *IOP Conf. Ser. Mater. Sci. Eng.*, vol. 943, no. 1, 2020, doi: 10.1088/1757-899X/943/1/012048.
- [27] KEMENHUB, “Peraturan Menteri Perhubungan Republik Indonesia Nomor PM 65 Tahun 2020 Tentang Konversi Sepeda Motor Dengan Penggerak Motor Bakar Menjadi Sepeda Motor Listrik Berbasis Baterai,” vol. 65, pp. 0–38, 2020, [Online]. Available: <https://peraturan.bpk.go.id/Home/Details/169075/permehub-no-65-tahun-2020#:~:text=Permehub%20No.%2065%20Tahun%2020,Berbasis%20Baterai%20%5BJDIH%20BPK%20RI%5D>
- [28] A. Habibie, W. Sutopo, and M. Hisjam, “A manufacturer opening decision of electric motorcycle conversion kit due to tax reduction policy: A case study,” *Proc. Int. Conf. Ind. Eng. Oper. Manag.*, no. August, pp. 940–950, 2020.
- [29] T. S. Rahmawati, Yuniaristanto, W. Sutopo, and M. Hisjam, “Automotive Experiences,” *Automot. Exp.*, vol. 2, no. 2, pp. 41–46, 2019.
- [30] W. Sierzchula, S. Bakker, K. Maat, and B. Van Wee, “The influence of financial incentives and other socio-economic factors on electric vehicle adoption,” *Energy Policy*, vol. 68, pp. 183–194, 2014, doi: 10.1016/j.enpol.2014.01.043.
- [31] “How Should Barriers to Alternative Fuels and Vehicles be Classified and Abstract”.
- [32] O. Egbue and S. Long, “Barriers to widespread adoption of electric vehicles: An analysis of consumer attitudes and perceptions,” *Energy Policy*, vol. 48, no. 2012, pp. 717–729, 2012, doi: 10.1016/j.enpol.2012.06.009.
- [33] S. Y. Kim *et al.*, “Updating the Institutional Collective Action Framework,” *Policy Stud. J.*, vol. 50, no. 1, pp. 9–34, 2022, doi: 10.1111/psj.12392.
- [34] B. K. Sovacool and R. F. Hirsh, “Beyond batteries: An examination of the benefits and barriers to plug-in hybrid electric vehicles (PHEVs) and a vehicle-to-grid (V2G) transition,” *Energy Policy*, vol. 37, no. 3, pp. 1095–1103, 2009, doi:

- 10.1016/j.enpol.2008.10.005.
- [35] X. Zhang, K. Wang, Y. Hao, J. L. Fan, and Y. M. Wei, “The impact of government policy on preference for NEVs: The evidence from China,” *Energy Policy*, vol. 61, no. 2013, pp. 382–393, 2013, doi: 10.1016/j.enpol.2013.06.114.
- [36] E. Graham-Rowe *et al.*, “Mainstream consumers driving plug-in battery-electric and plug-in hybrid electric cars: A qualitative analysis of responses and evaluations,” *Transp. Res. Part A Policy Pract.*, vol. 46, no. 1, pp. 140–153, 2012, doi: 10.1016/j.tra.2011.09.008.
- [37] A. Habibie, M. Hisjam, W. Sutopo, and M. Nizam, “Sustainability evaluation of internal combustion engine motorcycle to electric motorcycle conversion,” *Evergreen*, vol. 8, no. 2, pp. 469–476, 2021, doi: 10.5109/4480731.
- [38] L. W. O. Haryanto, I. D. Djati, and D. Larasati, “Pengembangan desain becak listrik sebagai upaya pelestarian transportasi becak di kota Yogyakarta,” *J. Sosioteknologi*, vol. 19, no. 2, pp. 226–236, 2020, doi: 10.5614/sostek.itbj.2020.19.2.7.
- [39] P. T. Chen, D. J. Shen, C. J. Yang, and K. D. Huang, “Development of a hybrid electric motorcycle that accords energy efficiency and controllability via an inverse differential gear and power mode switching control,” *Appl. Sci.*, vol. 9, no. 9, pp. 1–17, 2019, doi: 10.3390/app9091787.
- [40] S. D. Ulrich, Karl T. Eppinger, *The Product Design and Development Process*. 2012. doi: 10.1201/b12511-5.
- [41] L. L. Di Stasi, D. Contreras, A. Cándido, J. J. Cañas, and A. Catena, “Behavioral and eye-movement measures to track improvements in driving skills of vulnerable road users: First-time motorcycle riders,” *Transp. Res. Part F Traffic Psychol. Behav.*, vol. 14, no. 1, pp. 26–35, 2011, doi: 10.1016/j.trf.2010.09.003.
- [42] O. R. Keil, “Voice of the customer,” *J. Clin. Eng.*, vol. 35, no. 3, pp. 116–117, 2010, doi: 10.1097/JCE.0b013e3181e6262a.
- [43] C. Sakashita, T. Senserrick, S. Boufous, L. De Rome, J. Elkington, and R. Ivers, “The Use of Self-Report Exposure Measures Among Novice Motorcyclists: Appropriateness and Best Practice Recommendations,” *Traffic Inj. Prev.*, vol. 15, no. 5, pp. 491–500, 2014, doi: 10.1080/15389588.2013.837576.
- [44] I. Ghazali, “Aplikasi analisis multivariete SPSS 25.” Semarang: Universitas Diponegoro, 2018.
- [45] E. Istiyono, *Pengembangan Instrumen Penilaian dan Analisis Hasil Belajar Fisika dengan Teori Klasik dan Modern*, Kedua. Yogyakarta: UNY Press, 2020.
- [46] D. Maritan, *Quality Function Deployment (QFD): Definitions, History and Models*. 2015. doi: 10.1007/978-3-319-08521-0_1.
- [47] Kemenhub RI, “Peraturan Menteri Perhubungan Republik Indonesia Nomor PM 65 Tahun 2020,” no. 1124, 2020.
- [48] CNN Indonesia, “Asosiasi: Belum Ada Produsen Jual Motor Listrik Subsidi Rp7 Juta,” 2023. <https://www.cnnindonesia.com/otomotif/20230428153906-603-943137/asosiasi-belum-ada-produsen-jual-motor-listrik-subsidi-rp7-juta>