

**Supplementary document for the article Product Quality in the Circular Economy:
A systematic review of its definition and contexts in scientific literature**

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Table 1. List of selected articles included in the review and their categorization in relation to the CE contexts and terms referring to quality

Author	Reference	CE contexts and terms associated with quality
Ada et al. [95]	Ada, E., Sagnak, M., Uzel, R. A., & Balcioglu, İ. (2021). Analysis of barriers to circularity for agricultural cooperatives in the digitalization era. <i>International Journal of Productivity and Performance Management</i> . Advance online publication. https://doi.org/10.1108/IJPPM-12-2020-0689	Market Value R-Strategies & Design
Adams et al. [65]	Adams, K. T., Osmani, M., Thorpe, T., & Thornback, J. (2017). Circular economy in construction: Current awareness, challenges and enablers. <i>Proceedings of Institution of Civil Engineers: Waste and Resource Management</i> , 170(1), 15–24. https://doi.org/10.1680/jwarm.16.00011	Market Value Functionality
Agrawal et al. [55]	Agrawal, R., Wankhede, V. A., Kumar, A., & Luthra, S. (2021). Analysing the roadblocks of circular economy adoption in the automobile sector: Reducing waste and environmental perspectives. <i>Business Strategy and the Environment</i> , 30(2), 1051–1066. https://doi.org/10.1002/bse.2669	R-Strategies & Design
Aguilar-Hernandez et al. [178]	Aguilar-Hernandez, G. A., Sigüenza-Sanchez, C. P., Donati, F., Rodrigues, J., & Tukker, A. (2018). Assessing circularity interventions: a review of EEIOA-based studies. <i>Journal of Economic Structures</i> , 7(1). https://doi.org/10.1186/s40008-018-0113-3	R-Strategies & Design
Alhazmi et al. [139]	Alhazmi, H., Shah, S., Anwar, M. K., Raza, A., Ullah, M. K., & Iqbal, F. (2021). Utilization of polymer concrete composites for a circular economy: A comparative review for assessment of recycling and waste utilization. <i>Polymers</i> , 13(13). https://doi.org/10.3390/polym13132135	Technical Attributes

Author	Reference	CE contexts and terms associated with quality
Alhola et al. [161]	Alhola, K., Ryding, S. O., Salmenperä, H., & Busch, N. J. (2019). Exploiting the Potential of Public Procurement: Opportunities for Circular Economy. <i>Journal of Industrial Ecology</i> , 23(1), 96–109. https://doi.org/10.1111/jiec.12770	R-Strategies & Design
Ashby and Vakhitova [164]	Ashby, M., & Vakhitova, T. (2018). Analyzing and Measuring Circularity-Teaching and Industrial Tools by Granta Design. <i>MRS ADVANCES</i> , 3(25), 1379–1386. https://doi.org/10.1557/adv.2018.293	R-Strategies & Design
Baena-Moreno et al. [62]	Baena-Moreno, F. M., Saché, E. L., Hurd Price, C. A., Reina, T. R., & Navarrete, B. (2021). From biogas upgrading to CO2utilization and waste recycling: A novel circular economy approach. <i>Journal of CO2 Utilization</i> , 47. https://doi.org/10.1016/j.jcou.2021.101496	Market Value Technical Attributes R-Strategies & Design
Bai et al. [155]	Bai, C. G., Sarkis, J., Yin, F. F., & Dou, Y. J. (2020). Sustainable supply chain flexibility and its relationship to circular economy-target performance. <i>International Journal of Production Research</i> , 58(19), 5893–5910. https://doi.org/10.1080/00207543.2019.1661532	R-Strategies & Design
Baxter et al. [111]	Baxter, W., Aurisicchio, M., & Childs, P. (2017). Contaminated Interaction: Another Barrier to Circular Material Flows. <i>Journal of Industrial Ecology</i> , 21(3), 507–516. https://doi.org/10.1111/jiec.12612	Customer perspective Functionality R-Strategies & Design
Beylot et al. [128]	Beylot, A., Ardente, F., Sala, S., & Zampori, L. (2021). Mineral resource dissipation in life cycle inventories. <i>The International Journal of Life Cycle Assessment</i> , 26(3), 497–510. https://doi.org/10.1007/s11367-021-01875-4	Functionality
Blomsma et al. [66]	Blomsma, F., Pieroni, M., Kravchenko, M., Pigosso, D. C., Hildenbrand, J., Kristinsdottir, A. R., Kristoffersen, E., Shahbazi, S., Nielsen, K. D., Jonbrink, A. K., Li, J. Y., Wiik, C., & McAloone, T. C. (2019). Developing a circular strategies framework for manufacturing companies to support circular economy-oriented innovation. <i>Journal of Cleaner Production</i> , 241. https://doi.org/10.1016/j.jclepro.2019.118271	Market Value Customer perspective Functionality Longevity
Bocken et al. [46]	Bocken, N., Pauw, I. de, Bakker, C., & van der Grinten, B. (2016). Product design and business model strategies for a circular economy. <i>Journal of Industrial and Production Engineering</i> , 33(5), 308–320. https://doi.org/10.1080/21681015.2016.1172124	R-Strategies & Design
Boyer et al. [56]	Boyer, R. H., Mellquist, A. C., Williander, M., Fallahi, S., Nystrom, T., Linder, M., Alguren, P., Vanacore, E., Hunka, A. D., Rex, E., & Whalen, K. A. (2021). Three-	Market Value Customer perspective Longevity

Author	Reference	CE contexts and terms associated with quality
	dimensional product circularity. <i>Journal of Industrial Ecology</i> , 25(4), 824–833. https://doi.org/10.1111/jiec.13109	R-Strategies & Design
Braakman et al. [104]	Braakman, L., Bhochhibhoya, S., & Graaf, R. de (2021). Exploring the relationship between the level of circularity and the life cycle costs of a one-family house. <i>Resources, Conservation and Recycling</i> , 164. https://doi.org/10.1016/j.resconrec.2020.105149	Customer perspective Technical Attributes R-Strategies & Design
Bressanelli et al. [121]	Bressanelli, G., Saccani, N., Perona, M., & Baccanelli, I. (2020). Towards circular economy in the household appliance industry: An overview of cases. <i>Resources</i> , 9(11), 1–23. https://doi.org/10.3390/resources9110128	Functionality R-Strategies & Design
Brouwer et al. [133]	Brouwer, M. T., van Velzen, E., Ragaert, K [K.], & Klooster, R. T. (2020). Technical limits in circularity for plastic packages. <i>Sustainability (Switzerland)</i> , 12(23), 1–29. https://doi.org/10.3390/su122310021	Technical Attributes R-Strategies & Design
Campbell-Johnston et al. [115]	Campbell-Johnston, K., Friant, M. C., Thapa, K., Lakerveld, D., & Vermeulen, W. J. (2020). How circular is your tyre: Experiences with extended producer responsibility from a circular economy perspective. <i>Journal of Cleaner Production</i> , 270. https://doi.org/10.1016/j.jclepro.2020.122042	Customer perspective R-Strategies & Design
Charnley et al. [130]	Charnley, F., Tiwari, D., Hutabarat, W., Moreno, M., Okorie, O., & Tiwari, A. (2019). Simulation to enable a data-driven circular economy. <i>Sustainability (Switzerland)</i> , 11(12). https://doi.org/10.3390/su10023379	Technical Attributes Quality inclusion in the CE indicators
Chaudhari et al. [79]	Chaudhari, U. S., Lin, Y., Thompson, V. S., Handler, R. M., Pearce, J. M., Caneba, G., Muhuri, P., Watkins, D., & Shonnard, D. R. (2021). Systems Analysis Approach to Polyethylene Terephthalate and Olefin Plastics Supply Chains in the Circular Economy: A Review of Data Sets and Models. <i>ACS Sustainable Chemistry and Engineering</i> , 9(22), 7403–7421. https://doi.org/10.1021/acssuschemeng.0c08622	Market Value
Civancik-Uslu et al. [135]	Civancik-Uslu, D., Puig, R., Ferrer, L., & Fullana-i-Palmer, P. (2019). Influence of end-of-life allocation, credits and other methodological issues in LCA of compounds: An in-company circular economy case study on packaging. <i>Journal of Cleaner Production</i> , 212, 925–940. https://doi.org/10.1016/j.jclepro.2018.12.076	Technical Attributes Quality inclusion in the CE indicators
Cong et al. [67]	Cong, L., Zhao, F., & Sutherland, J. W. (2019). A Design Method to Improve End-of-Use Product Value Recovery for Circular Economy. <i>Journal of Mechanical Design, Transactions of the ASME</i> , 141(4). https://doi.org/10.1115/1.4041574	Market Value Technical Attributes

Author	Reference	CE contexts and terms associated with quality
Corral-Marfil et al. [73]	Corral-Marfil, J. A., Arimany-Serrat, N., Hitchen, E. L., & Viladecans-Riera, C. (2021). Recycling Technology Innovation as a Source of Competitive Advantage: The Sustainable and Circular Business Model of a Bicentennial Company. <i>Sustainability</i> , 13(14). https://doi.org/10.3390/su13147723	Market Value Functionality R-Strategies & Design Environmental aspect
Daou et al. [97]	Daou, A., Mallat, C., Chammas, G., Cerantola, N., Kayed, S., & Saliba, N. A. (2020). The Ecocanvas as a business model canvas for a circular economy. <i>Journal of Cleaner Production</i> , 258. https://doi.org/10.1016/j.jclepro.2020.120938	Market Value Functionality
Desing et al. [116]	Desing, H., Braun, G., & Hischier, R. (2021). Resource pressure – A circular design method. <i>Resources, Conservation and Recycling</i> , 164. https://doi.org/10.1016/j.resconrec.2020.105179	Functionality R-Strategies & Design
Di Maio et al. [84]	Di Maio, F., Rem, P. C., Francesco Di Maio, & Peter Carlo Rem (2015). A Robust Indicator for Promoting Circular Economy through Recycling. <i>Journal of Environmental Protection</i> , 6(10), 1095–1104. https://doi.org/10.4236/jep.2015.610096	Market Value
Dobrota et al. [80]	Dobrota, D., Dobrota, G., Dobrescu, T., & Mohora, C. (2019). The redesigning of tires and the recycling process to maintain an efficient circular economy. <i>Sustainability (Switzerland)</i> , 11(19). https://doi.org/10.3390/su11195204	Market Value
Elzinga et al. [98]	Elzinga, R., Reike, D [D.], Negro, S. O., & Boon, W. P. (2020). Consumer acceptance of circular business models. <i>Journal of Cleaner Production</i> , 254. https://doi.org/10.1016/j.jclepro.2020.119988	Market Value Customer perspective Functionality Environmental aspect
Eriksen et al. [120]	Eriksen, M. K., Damgaard, A., Boldrin, A., & Astrup, T. F. (2019). Quality Assessment and Circularity Potential of Recovery Systems for Household Plastic Waste. <i>Journal of Industrial Ecology</i> , 23(1), 156–168. https://doi.org/10.1111/jiec.12822	Technical Attributes Functionality R-Strategies & Design Quality inclusion in the CE indicators
Eriksen et al. [173]	Eriksen, M. K., Pivnenko, K., Faraca, G., Boldrin, A., & Astrup, T. F. (2020). Dynamic Material Flow Analysis of PET, PE, and PP Flows in Europe: Evaluation of the Potential for Circular Economy. <i>Environmental Science and Technology</i> , 54(24), 16166–16175. https://doi.org/10.1021/acs.est.0c03435	R-Strategies & Design
Formentini et al. [106]	Formentini, M., Secondi, L., Ruini, L., Guidi, M., & Principato, L. (2021). Enablers and barriers to circular supply chain management: a decision-support tool in soft wheat bread production. <i>Journal of Enterprise Information Management</i> . Advance online publication. https://doi.org/10.1108/JEIM-02-2021-0069	Customer perspective

Author	Reference	CE contexts and terms associated with quality
Franco [153]	Franco, M. A. (2019). A system dynamics approach to product design and business model strategies for the circular economy. <i>Journal of Cleaner Production</i> , 241. https://doi.org/10.1016/j.jclepro.2019.118327	R-Strategies & Design Environmental aspect
Franklin-Johnson et al. [149]	Franklin-Johnson, E., Figge, F., & Canning, L. (2016). Resource duration as a managerial indicator for Circular Economy performance. <i>Journal of Cleaner Production</i> , 133, 589–598. https://doi.org/10.1016/j.jclepro.2016.05.023	Longevity Environmental aspect
Gandolfo and Lupi [107]	Gandolfo, A., & Lupi, L. (2021). Circular economy, the transition of an incumbent focal firm: How to successfully reconcile environmental and economic sustainability? <i>Business Strategy and the Environment</i> . Advance online publication. https://doi.org/10.1002/bse.2803	Customer perspective Technical Attributes
Garcia-Barragan et al. [159]	Garcia-Barragan, J. F., Eyckmans, J [J.], & Rousseau, S. (2019). Defining and Measuring the Circular Economy: A Mathematical Approach. <i>Ecological Economics</i> , 157, 369–372. https://doi.org/10.1016/j.ecolecon.2018.12.003	R-Strategies & Design
Glogic et al. [125]	Glogic, E., Sonnemann, G., & Young, S. B. (2021). Environmental trade-offs of downcycling in circular economy: Combining life cycle assessment and material circularity indicator to inform circularity strategies for alkaline batteries. <i>Sustainability (Switzerland)</i> , 13(3), 1–12. https://doi.org/10.3390/su13031040	Functionality R-Strategies & Design
Guerra and Leite [150]	Guerra, B. C., & Leite, F. (2021). Circular economy in the construction industry: An overview of United States stakeholders' awareness, major challenges, and enablers. <i>Resources, Conservation and Recycling</i> , 170. https://doi.org/10.1016/j.resconrec.2021.105617	Longevity R-Strategies & Design
Hagelüken et al. [105]	Hagelüken, C., Lee-Shin, J. U., Carpentier, A., & Heron, C. (2016). The EU circular economy and its relevance to metal recycling. <i>Recycling</i> , 1(2), 242–253. https://doi.org/10.3390/recycling1020242	Customer perspective R-Strategies & Design
Hahladakis and Iacovidou [118]	Hahladakis, J. N., & Iacovidou, E. (2018). Closing the loop on plastic packaging materials: What is quality and how does it affect their circularity? <i>Science of the Total Environment</i> , 630, 1394–1400. https://doi.org/10.1016/j.scitotenv.2018.02.330	Functionality Technical Attributes R-Strategies & Design
Hansen and Revellio [124]	Hansen, E. G., & Revellio, F. (2020). Circular value creation architectures: Make, ally, buy, or laissez-faire. <i>Journal of Industrial Ecology</i> , 24(6), 1250–1273. https://doi.org/10.1111/jiec.13016	Functionality

Author	Reference	CE contexts and terms associated with quality
Hapuwatte and Jawahir [58]	Hapuwatte, B. M., & Jawahir, I. S. (2021). Closed-loop sustainable product design for circular economy. <i>Journal of Industrial Ecology</i> . Advance online publication. https://doi.org/10.1111/jiec.13154	Market Value Longevity
Haupt and Hellweg [174]	Haupt, M., & Hellweg, S. (2019). Measuring the environmental sustainability of a circular economy. <i>Environmental and Sustainability Indicators</i> , 1-2. https://doi.org/10.1016/j.indic.2019.100005	R-Strategies & Design Environmental aspect Quality inclusion in the CE indicators
Hedlund et al. [103]	Hedlund, C., Stenmark, P., Noaksson, E., & Lilja, J. (2020). More value from fewer resources: how to expand value stream mapping with ideas from circular economy. <i>International Journal of Quality and Service Sciences</i> , 12(4), 447–459. https://doi.org/10.1108/IJQSS-05-2019-0070	Customer perspective Functionality R-Strategies & Design
Holappa et al. [165]	Holappa, L., Kekkonen, M., Jokilaakso, A., & Koskinen, J. (2021). A Review of Circular Economy Prospects for Stainless Steelmaking Slags. <i>Journal of Sustainable Metallurgy</i> , 7(3), 806–817. https://doi.org/10.1007/s40831-021-00392-w	R-Strategies & Design
Horodytska et al. [166]	Horodytska, O., Kiritsis, D., & Fullana, A. (2020). Upcycling of printed plastic films: LCA analysis and effects on the circular economy. <i>Journal of Cleaner Production</i> , 268. https://doi.org/10.1016/j.jclepro.2020.122138	R-Strategies & Design
Hussain et al. [145]	Hussain, A., Podgursky, V., Antonov, M., Viljus, M., & Goljandin, D. (2021). TiCN coating tribology for the circular economy of textile industries. <i>Journal of Industrial Textiles</i> . Advance online publication. https://doi.org/10.1177/15280837211025726	Technical Attributes
Huynh [102]	Huynh, P. H. (2021). "Enabling circular business models in the fashion industry: the role of digital innovation". <i>International Journal of Productivity and Performance Management</i> . Advance online publication. https://doi.org/10.1108/IJPPM-12-2020-0683	Market Value Customer perspective
Huysman et al. [54]	Huysman, S., Schaepmeester, J. de, Ragaert, K [K.], Dewulf, J [J.], & Meester, S. de [S.] (2017). Performance indicators for a circular economy: A case study on post-industrial plastic waste. <i>Resources Conservation and Recycling</i> , 120, 46–54. https://doi.org/10.1016/j.resconrec.2017.01.013	Market Value Technical Attributes Quality inclusion in the CE indicators
Hvass and Pedersen [99]	Hvass, K. K., & Pedersen, E. R. (2019). Toward circular economy of fashion Experiences from a brand's product take-back initiative. <i>Journal of Fashion Marketing and Management</i> , 23(3), 345–365. https://doi.org/10.1108/JFMM-04-2018-0059	Market Value Customer perspective R-Strategies & Design

Author	Reference	CE contexts and terms associated with quality
Jansen et al. [78]	Jansen, B. W., van Stijn, A., Gruis, V., & van Bortel, G. (2020). A circular economy life cycle costing model (CE-LCC) for building components. <i>Resources Conservation and Recycling</i> , 161. https://doi.org/10.1016/j.resconrec.2020.104857	Market Value Functionality Longevity R-Strategies & Design
Juan et al. [167]	Juan, R., Paredes, B., García-Muñoz, R. A., & Domínguez, C. (2021). Quantification of PP contamination in recycled PE by TREF analysis for improved the quality and circularity of plastics. <i>Polymer Testing</i> , 100. https://doi.org/10.1016/j.polymertesting.2021.107273	R-Strategies & Design
Kalmykova et al. [117]	Kalmykova, Y., Sadagopan, M., & Rosado, L. (2018). Circular economy - From review of theories and practices to development of implementation tools. <i>Resources, Conservation and Recycling</i> , 135, 190–201. https://doi.org/10.1016/j.resconrec.2017.10.034	Functionality R-Strategies & Design
Kanwal et al. [168]	Kanwal, Q., Li, J., & Zeng, X. (2021). Mapping Recyclability of Industrial Waste for Anthropogenic Circularity: A Circular Economy Approach. <i>ACS Sustainable Chemistry and Engineering</i> . Advance online publication. https://doi.org/10.1021/acssuschemeng.1c04139	R-Strategies & Design
Klavins et al. [141]	Klavins, M., Bisters, V., & Burlakovs, J. (2018). Small Scale Gasification Application and Perspectives in Circular Economy. <i>Environmental and Climate Technologies</i> , 22(1), 42–54. https://doi.org/10.2478/rtuct-2018-0003	Technical Attributes
Kleinhans et al. [172]	Kleinhans, K., Demets, R., Dewulf, J [J.], Ragaert, K [K.], & Meester, S. de [S.] (2021). Non-household end-use plastics: the ‘forgotten’ plastics for the circular economy. <i>Current Opinion in Chemical Engineering</i> , 32. https://doi.org/10.1016/j.coche.2021.100680	R-Strategies & Design
Kral et al. [131]	Kral, U., Morf, L. S., Vyzinkarova, D., & Brunner, P. H. (2019). Cycles and sinks: two key elements of a circular economy. <i>Journal of Material Cycles and Waste Management</i> , 21(1). https://doi.org/10.1007/s10163-018-0786-6	Technical Attributes R-Strategies & Design
Lee [160]	Lee, M. K. (2021). Plastic pollution mitigation-net plastic circularity through a standardized credit system in Asia. <i>Ocean & Coastal Management</i> , 210. https://doi.org/10.1016/j.ocecoaman.2021.105733	R-Strategies & Design
Levänen et al. [175]	Levänen, J., Lyytinen, T., & Gatica, S. (2018). Modelling the Interplay Between Institutions and Circular Economy Business Models: A Case Study of Battery Recycling in Finland and Chile. <i>Ecological Economics</i> , 154, 373–382. https://doi.org/10.1016/j.ecolecon.2018.08.018	R-Strategies & Design

Author	Reference	CE contexts and terms associated with quality
Lin et al. [179]	Lin, K.-P., Yu, C.-M., & Chen, K.-S. (2019). Production data analysis system using novel process capability indices-based circular economy. <i>Industrial Management and Data Systems</i> , 119(8), 1655–1668. https://doi.org/10.1108/IMDS-03-2019-0166	R-Strategies & Design
Linder et al. [47]	Linder, M., Sarasini, S., & van Loon, P. (2017). A Metric for Quantifying Product-Level Circularity. <i>Journal of Industrial Ecology</i> , 21(3), 545–558. https://doi.org/10.1111/jiec.12552	Market Value Customer perspective
Majeed and Luni [158]	Majeed, M. T., & Luni, T. (2020). Renewable Energy, Circular Economy Indicators and Environmental Quality: A Global Evidence of 131 Countries with Heterogeneous Income Groups. <i>Pakistan Journal of Commerce and Social Science</i> , 14(4), 866–912. https://www.scopus.com/inward/record.uri?eid=2-s2.0-85103673297&partnerID=40&md5=4a2a5b9d897f3efb1aa389be62cb4128	R-Strategies & Design
Marke et al. [156]	Marke, A., Chan, C., Taskin, G., & Hacking, T. (2020). Reducing e-waste in China's mobile electronics industry: the application of the innovative circular business models. <i>Asian Education and Development Studies</i> , 9(4), 591–610. https://doi.org/10.1108/AEDS-03-2019-0052	R-Strategies & Design
Martins et al. [123]	Martins, A. V., Godina, R., Azevedo, S. G., & Carvalho, H. (2021). Towards the development of a model for circularity: The circular car as a case study. <i>Sustainable Energy Technologies and Assessments</i> , 45. https://doi.org/10.1016/j.seta.2021.101215	Functionality
Melella et al. [57]	Melella, R., Di Ruocco, G., & Sorvillo, A. (2021). Circular Construction Process: Method for Developing a Selective, Low CO2eq Disassembly and Demolition Plan. <i>SUSTAINABILITY</i> , 13(16). https://doi.org/10.3390/su13168815	Technical Attributes R-Strategies & Design
Mikkilä et al. [81]	Mikkilä, M., Utanun, P., Luhas, J., Horttanainen, M., & Linnanen, L. (2021). Sustainable circular bioeconomy—feasibility of recycled nutrients for biomass production within a pulp and paper integration in indonesia, southeast asia. <i>Sustainability (Switzerland)</i> , 13(18). https://doi.org/10.3390/su131810169	Market Value Functionality R-Strategies & Design Environmental aspect
Milios and Matsumoto [110]	Milios, L., & Matsumoto, M. (2019). Consumer perception of remanufactured automotive parts and policy implications for transitioning to a circular economy in Sweden. <i>Sustainability (Switzerland)</i> , 11(22). https://doi.org/10.3390/su11226264	Customer perspective
Mishra et al. [86]	Mishra, J. L., Hopkinson, P. G., & Tidridge, G. (2018). Value creation from circular economy-led closed loop supply chains: a case study of fast-moving consumer goods. <i>Production Planning & Control</i> , 29(6), 509–521. https://doi.org/10.1080/09537287.2018.1449245	Market Value

Author	Reference	CE contexts and terms associated with quality
Moraga et al. [126]	Moraga, G., Huysveld, S., Meester, S. de [Steven], & Dewulf, J [Jo] (2021). Development of circularity indicators based on the in-use occupation of materials. <i>Journal of Cleaner Production</i> , 279. https://doi.org/10.1016/j.jclepro.2020.123889	Functionality Technical Attributes
Moreno et al. [59]	Moreno, M., los Rios, C. de, Rowe, Z., & Charnley, F. (2016). A conceptual framework for circular design. <i>Sustainability (Switzerland)</i> , 8(9). https://doi.org/10.3390/su8090937	Market Value R-Strategies & Design
Morioka et al. [101]	Morioka SN, Bolis I, Carvalho MM de (2018) From an ideal dream towards reality analysis: Proposing Sustainable Value Exchange Matrix (SVEM) from systematic literature review on sustainable business models and face validation. <i>Journal of Cleaner Production</i> 178:76–88. https://doi.org/10.1016/j.jclepro.2017.12.078	Market Value
Munaro and Tavares [64]	Munaro, M. R., & Tavares, S. F. (2021). Materials passport's review: challenges and opportunities toward a circular economy building sector. <i>Built Environment Project and Asset Management</i> . Advance online publication. https://doi.org/10.1108/BEPAM-02-2020-0027	Market Value
Muñoz et al. [151]	Muñoz, V. G., Muneta, L. M., Carrasco-Gallego, R., Marquez, J. J., & Hidalgo-Carvajal, D. (2020). Evaluation of the circularity of recycled pla filaments for 3D printers. <i>Applied Sciences (Switzerland)</i> , 10(24), 1–12. https://doi.org/10.3390/app10248967	R-Strategies & Design
Nakamura Nakamura and Kondo [138]	Nakamura, S., & Kondo, Y. (2018). Toward an integrated model of the circular economy: Dynamic waste input–output. <i>Resources, Conservation and Recycling</i> , 139, 326–332. https://doi.org/10.1016/j.resconrec.2018.07.016	Technical Attributes R-Strategies & Design
Navare et al. [51]	Navare, K., Muys, B., Vrancken, K. C., & van Acker, K [K.] (2021). Circular economy monitoring – How to make it apt for biological cycles? <i>Resources, Conservation and Recycling</i> , 170. https://doi.org/10.1016/j.resconrec.2021.105563	Market Value Functionality Technical Attributes R-Strategies & Design Environmental aspect
Niero et al. [148]	Niero, M., Hauschild, M. Z., Hoffmeyer, S. B., & Olsen, S. I. (2017). Combining Eco-Efficiency and Eco-Effectiveness for Continuous Loop Beverage Packaging Systems: Lessons from the Carlsberg Circular Community. <i>Journal of Industrial Ecology</i> , 21(3), 742–753. https://doi.org/10.1111/jiec.12554	Technical Attributes R-Strategies & Design
Nussholz [75]	Nussholz, J. L. (2017). Circular Business Models: Defining a Concept and Framing an Emerging Research Field. <i>Sustainability</i> , 9(10). https://doi.org/10.3390/su9101810	Market Value R-Strategies & Design Environmental aspect

Author	Reference	CE contexts and terms associated with quality
Nußholz et al. [74]	Nußholz, J., Nygaard Rasmussen, F., & Milios, L. (2019). Circular building materials: Carbon saving potential and the role of business model innovation and public policy. <i>Resources, Conservation and Recycling</i> , 141, 308–316. https://doi.org/10.1016/j.resconrec.2018.10.036	Market Value Customer perspective
Olofsson and Börjesson [60]	Olofsson, J., & Börjesson, P. (2018). Residual biomass as resource – Life-cycle environmental impact of wastes in circular resource systems. <i>Journal of Cleaner Production</i> , 196, 997–1006. https://doi.org/10.1016/j.jclepro.2018.06.115	Market Value R-Strategies & Design
Ozola et al. [108]	Ozola, Z. U., Vesere, R., Kalnins, S. N., & Blumberga, D. (2019). Paper Waste Recycling. Circular Economy Aspects. <i>Environmental and Climate Technologies</i> , 23(3), 260–273. https://doi.org/10.2478/rtuct-2019-0094	Customer perspective R-Strategies & Design
Paletta et al. [109]	Paletta, A., Leal Filho, W., Balogun, A.-L., Foschi, E., & Bonoli, A. (2019). Barriers and challenges to plastics valorisation in the context of a circular economy: Case studies from Italy. <i>Journal of Cleaner Production</i> , 241. https://doi.org/10.1016/j.jclepro.2019.118149	Customer perspective
Pamminger et al. [52]	Pamminger, R., Glaser, S., & Wimmer, W. (2021). Modelling of different circular end-of-use scenarios for smartphones. <i>International Journal of Life Cycle Assessment</i> , 26(3), 470–482. https://doi.org/10.1007/s11367-021-01869-2	Market Value R-Strategies & Design
Parajuly and Wenzel [68]	Parajuly, K., & Wenzel, H. (2017). Potential for circular economy in household WEEE management. <i>Journal of Cleaner Production</i> , 151, 272–285. https://doi.org/10.1016/j.jclepro.2017.03.045	Market Value
Parchomenko et al. [70]	Parchomenko, A., Nelen, D., Gillabel, J., & Rechberger, H. (2019). Measuring the circular economy - A Multiple Correspondence Analysis of 63 metrics. <i>Journal of Cleaner Production</i> , 210, 200–216. https://doi.org/10.1016/j.jclepro.2018.10.357	Market Value Functionality R-Strategies & Design
Pieratti et al. [53]	Pieratti, E., Paletto, A., Meo, I. de, Fagarazzi, C., & Giovannini, M. (2019). Assessing the forest-wood chain at local level: A multi-criteria decision analysis (MCDA) based on the circular bioeconomy principles. <i>Annals of Forest Research</i> , 62(1), 123–138. https://doi.org/10.15287/afr.2018.1238	Market Value
Pinter et al. [134]	Pinter, E., Welle, F., Mayrhofer, E., Pechhacker, A., Motloch, L., Lahme, V., Grant, A., & Tacker, M. (2021). Circularity study on pet bottle-to-bottle recycling. <i>Sustainability (Switzerland)</i> , 13(13). https://doi.org/10.3390/su13137370	Technical Attributes R-Strategies & Design
Rashid and Shahzad [69]	Rashid, M. I., & Shahzad, K. (2021). Food waste recycling for compost production and its economic and environmental assessment as circular economy indicators of	Market Value Environmental aspect

Author	Reference	CE contexts and terms associated with quality
	solid waste management. <i>Journal of Cleaner Production</i> , 317. https://doi.org/10.1016/j.jclepro.2021.128467	
Rehberger and Hiete [83]	Rehberger, M., & Hiete, M. (2020). Allocation of environmental impacts in circular and cascade use of resources-Incentive-driven allocation as a prerequisite for cascade persistence. <i>Sustainability (Switzerland)</i> , 12(11). https://doi.org/10.3390/su12114366	Market Value
Reike et al. [3]	Reike, D [D.], Vermeulen, W. J., & Witjes, S. (2018). The circular economy: New or Refurbished as CE 3.0? - Exploring Controversies in the Conceptualization of the Circular Economy through a Focus on History and Resource Value Retention Options. <i>Resources Conservation and Recycling</i> , 135, 246–264. https://doi.org/10.1016/j.resconrec.2017.08.027	Functionality
Rodrigo-González et al. [82]	Rodrigo-González, A., Grau-Grau, A., & Bel-Oms, I. (2021). Circular economy and value creation: Sustainable finance with a real options approach. <i>Sustainability (Switzerland)</i> , 13(14). https://doi.org/10.3390/su13147973	Market Value Functionality
Roos [76]	Roos, G. (2014). Business model innovation to create and capture resource value in future circular material chains. <i>Resources</i> , 3(1), 248–274. https://doi.org/10.3390/resources3010248	Market Value Functionality Environmental aspect
Rosa et al. [48]	Rosa, P., Sassanelli, C., & Terzi, S. (2019). Towards Circular Business Models: A systematic literature review on classification frameworks and archetypes. <i>Journal of Cleaner Production</i> , 236. https://doi.org/10.1016/j.jclepro.2019.117696	Market Value Environmental aspect
Saidani et al. [154]	Saidani, M., Yannou, B., Leroy, Y., & Cluzel, F. (2020). Dismantling, remanufacturing and recovering heavy vehicles in a circular economy—Technico-economic and organisational lessons learnt from an industrial pilot study. <i>Resources, Conservation and Recycling</i> , 156. https://doi.org/10.1016/j.resconrec.2020.104684	R-Strategies & Design
Sanchez et al. [77]	Sanchez, F. A., Boudaoud, H., Camargo, M., & Pearce, J. M. (2020). Plastic recycling in additive manufacturing: A systematic literature review and opportunities for the circular economy. <i>Journal of Cleaner Production</i> , 264. https://doi.org/10.1016/j.jclepro.2020.121602	Market Value Technical Attributes R-Strategies & Design
Sandvik and Stubbs [91]	Sandvik, I. M., & Stubbs, W. (2019). Circular fashion supply chain through textile-to-textile recycling. <i>Journal of Fashion Marketing and Management</i> , 23(3), 366–381. https://doi.org/10.1108/JFMM-04-2018-0058	Market Value

Author	Reference	CE contexts and terms associated with quality
Santagata et al. [181]	Santagata, R., Ripa, M., Genovese, A., & Ulgiati, S. (2021). Food waste recovery pathways: Challenges and opportunities for an emerging bio-based circular economy. A systematic review and an assessment. <i>Journal of Cleaner Production</i> , 286. https://doi.org/10.1016/j.jclepro.2020.125490	Environmental aspect
Sassanelli et al. [180]	Sassanelli, C., Rosa, P., Rocca, R., & Terzi, S. (2019). Circular economy performance assessment methods: A systematic literature review. <i>Journal of Cleaner Production</i> , 229, 440–453. https://doi.org/10.1016/j.jclepro.2019.05.019	Environmental aspect
Sauerwein et al. [119]	Sauerwein, M., Doubrovski, E., Balkenende, R., & Bakker, C. (2019). Exploring the potential of additive manufacturing for product design in a circular economy. <i>Journal of Cleaner Production</i> , 226, 1138–1149. https://doi.org/10.1016/j.jclepro.2019.04.108	Functionality R-Strategies & Design Environmental aspect
Sauerwein et al. [147]	Sauerwein, M., Zlopasa, J., Doubrovski, Z., Bakker, C., & Balkenende, R. (2020). Reprintable Paste-Based Materials for Additive Manufacturing in a Circular Economy. <i>Sustainability</i> , 12(19). https://doi.org/10.3390/su12198032	Technical Attributes
Sazdovski et al. [5]	Sazdovski, I., Bala, A., & Fullana-i-Palmer, P. (2021). Linking LCA literature with circular economy value creation: A review on beverage packaging. <i>Science of the Total Environment</i> , 771. https://doi.org/10.1016/j.scitotenv.2021.145322	Technical Attributes R-Strategies & Design Environmental aspect
Schaubroeck et al. [49]	Schaubroeck, T., Gibon, T., Igos, E., & Benetto, E. (2021). Sustainability assessment of circular economy over time: Modelling of finite and variable loops & impact distribution among related products. <i>RESOURCES CONSERVATION and RECYCLING</i> , 168. https://doi.org/10.1016/j.resconrec.2020.105319	Market Value Longevity Quality inclusion in the CE indicators
Scheepens et al. [71]	Scheepens, A. E., Vogtlander, J. G., & Brezet, J. C. (2016). Two life cycle assessment (LCA) based methods to analyse and design complex (regional) circular economy systems. Case: making water tourism more sustainable. <i>Journal of Cleaner Production</i> , 114, 257–268. https://doi.org/10.1016/j.jclepro.2015.05.075	Market Value Customer perspective R-Strategies & Design
Schenkel et al. [85]	Schenkel, M., Caniëls, M. C., Krikke, H., & van der Laan, E. (2015). Understanding value creation in closed loop supply chains – Past findings and future directions. <i>Journal of Manufacturing Systems</i> , 37, 729–745. https://doi.org/10.1016/j.jmsy.2015.04.009	Market Value
Schulte et al. [163]	Schulte, A., Maga, D., & Thonemann, N. (2021). Combining Life Cycle Assessment and Circularity Assessment to Analyze Environmental Impacts of the Medical Remanufacturing of Electrophysiology Catheters. <i>Sustainability</i> , 13(2). https://doi.org/10.3390/su13020898	R-Strategies & Design

Author	Reference	CE contexts and terms associated with quality
Sehnem et al. [92]	Sehnem, S., Campos, L., Julkovski, D. J., & Cazella, C. F. (2019). Circular business models: level of maturity. <i>Management Decision</i> , 57(4), 1043–1066. https://doi.org/10.1108/MD-07-2018-0844	Market Value
Shamsuyeva and Endres [127]	Shamsuyeva, M., & Endres, H.-J. (2021). Plastics in the context of the circular economy and sustainable plastics recycling: Comprehensive review on research development, standardization and market. <i>Composites Part C: Open Access</i> , 6. https://doi.org/10.1016/j.jcomc.2021.100168	Functionality
Sherwood [61]	Sherwood, J. (2020). Closed-Loop Recycling of Polymers Using Solvents Remaking plastics for a circular economy. <i>Johnson Matthey Technology Review</i> , 64(1), 4–15. https://doi.org/10.1595/205651319X15574756736831	Market Value Technical Attributes Environmental aspect
Shevchenko et al. [72]	Shevchenko, T., Kronenberg, J., Danko, Y., & Chovancová, J. (2021). Exploring the circularity potential regarding the multiple use of residual material. <i>Clean Technologies and Environmental Policy</i> , 23(7), 2025–2036. https://doi.org/10.1007/s10098-021-02100-4	Market Value Longevity R-Strategies & Design
Shevchenko et al. [93]	Shevchenko, T., Vavrek, R., Danko, Y., Gubanova, O., Chovancová, J., & Mykhailova, L. (2020). Clarifying a circularity phenomenon in a circular economy under the notion of potential. <i>Problemy Ekorozwoju</i> , 16(1), 79–89. https://www.scopus.com/inward/record.uri?eid=2-s2.0-85097056549&partnerID=40&md5=472808992e25c4348677c8aa14465033	Market Value
Siderius and Poldner [113]	Siderius, T., & Poldner, K. (2021). Reconsidering the Circular Economy Rebound effect: Propositions from a case study of the Dutch Circular Textile Valley. <i>Journal of Cleaner Production</i> , 293. https://doi.org/10.1016/j.jclepro.2021.125996	Customer perspective R-Strategies & Design
Simon [132]	Simon, B. (2019). What are the most significant aspects of supporting the circular economy in the plastic industry? <i>Resources Conservation and Recycling</i> , 141, 299–300. https://doi.org/10.1016/j.resconrec.2018.10.044	Technical Attributes
Spooner et al. [144]	Spooner, S., Davis, C., & Li, Z. (2020). Modelling the cumulative effect of scrap usage within a circular UK steel industry–residual element aggregation. <i>Ironmaking and Steelmaking</i> , 47(10), 1100–1113. https://doi.org/10.1080/03019233.2020.1805276	Technical Attributes R-Strategies & Design
Stegmann et al. [122]	Stegmann, P., Londo, M., & Junginger, M. (2020). The circular bioeconomy: Its elements and role in European bioeconomy clusters. <i>Resources, Conservation and Recycling: X</i> , 6. https://doi.org/10.1016/j.rcrx.2019.100029	Functionality Technical Attributes Environmental aspect

Author	Reference	CE contexts and terms associated with quality
Steinmann et al. [9]	Steinmann, Z. J., Huijbregts, M. A., & Reijnders, L. (2019). How to define the quality of materials in a circular economy? <i>Resources Conservation and Recycling</i> , 141, 362–363. https://doi.org/10.1016/j.resconrec.2018.10.040	Functionality R-Strategies & Design Environmental aspect Quality inclusion in the CE indicators
Stotz et al. [169]	Stotz, P. M., Niero, M., Bey, N., & Paraskevas, D. (2017). Environmental screening of novel technologies to increase material circularity: A case study on aluminium cans. <i>Resources Conservation and Recycling</i> , 127, 96–106. https://doi.org/10.1016/j.resconrec.2017.07.013	R-Strategies & Design
Subramanian et al. [146]	Subramanian, K., Sarkar, M. K., Wang, H. M., Qin, Z. H., Chopra, S. S., Jin, M. S., Kumar, V., Chen, C., Tsang, C. W., & Lin, C. S. (2021). An overview of cotton and polyester, and their blended waste textile valorisation to value-added products: A circular economy approach - research trends, opportunities and challenges. <i>Critical Reviews in Environmental Science and Technology</i> . Advance online publication. https://doi.org/10.1080/10643389.2021.1966254	Technical Attributes
Sun et al. [177]	Sun, L. Y., Wang, Y. X., Hua, G. W., Cheng, T. C., & Dong, J. X. (2020). Virgin or recycled? Optimal pricing of 3D printing platform and material suppliers in a closed-loop competitive circular supply chain. <i>Resources Conservation and Recycling</i> , 162. https://doi.org/10.1016/j.resconrec.2020.105035	R-Strategies & Design
Tanguay et al. [157]	Tanguay, X., Essoua Essoua, G. G., & Amor, B. (2021). Attributional and consequential life cycle assessments in a circular economy with integration of a quality indicator: A case study of cascading wood products. <i>Journal of Industrial Ecology</i> . Advance online publication. https://doi.org/10.1111/jiec.13167	R-Strategies & Design Quality inclusion in the CE indicators
Thakker and Bakshi [90]	Thakker, V., & Bakshi, B. R. (2021). Toward sustainable circular economies: A computational framework for assessment and design. <i>Journal of Cleaner Production</i> , 295. https://doi.org/10.1016/j.jclepro.2021.126353	Market Value
Thorley et al. [112]	Thorley, J., Garza-Reyes, J. A., & Anosike, A. (2019). The circular economy impact on small to medium enterprises. <i>WIT Transactions on Ecology and the Environment</i> , 231, 257–267. https://doi.org/10.2495/WM180241	Customer perspective R-Strategies & Design
Umeda et al. [114]	Umeda, Y., Kitagawa, K., Hirose, Y., Akaho, K., Sakai, Y., & Ohta, M. (2020). Potential Impacts of the European Union's Circular Economy Policy on Japanese Manufacturers. <i>International Journal of Automation Technology</i> , 14(6), 857–866. https://doi.org/10.20965/ijat.2020.p0857	Customer perspective

Author	Reference	CE contexts and terms associated with quality
Urbinati et al. [94]	Urbinati, A., Chiaroni, D., & Chiesa, V. (2017). Towards a new taxonomy of circular economy business models. <i>Journal of Cleaner Production</i> , 168, 487–498. https://doi.org/10.1016/j.jclepro.2017.09.047	Market Value Functionality
Velvizhi et al. [142]	Velvizhi, G., Shanthakumar, S., Das, B., Pugazhendhi, A., Priya, T. S., Ashok, B., Nanthagopal, K., Vignesh, R., & Karthick, C. (2020). Biodegradable and non-biodegradable fraction of municipal solid waste for multifaceted applications through a closed loop integrated refinery platform: Paving a path towards circular economy. <i>Science of the Total Environment</i> , 731. https://doi.org/10.1016/j.scitotenv.2020.138049	Technical Attributes R-Strategies & Design
Vogtlander et al. [89]	Vogtlander, J. G., Scheepens, A. E., Bocken, N., & Peck, D. (2017). Combined analyses of costs, market value and eco-costs in circular business models: eco-efficient value creation in remanufacturing. <i>Journal of Remanufacturing</i> , 7(1). https://doi.org/10.1007/s13243-017-0031-9	Market Value Customer perspective
Wagner et al. [136]	Wagner, F., Peeters, J. R., Keyzer, J. de, Janssens, K., Duflou, J. R., & Dewulf, W. (2019). Towards a more circular economy for WEEE plastics - Part B: Assessment of the technical feasibility of recycling strategies. <i>Waste Management</i> , 96, 206–214. https://doi.org/10.1016/j.wasman.2019.07.035	Technical Attributes
Wagner and Heinzl [100]	Wagner, M. M., & Heinzl, T. (2020). Human Perceptions of Recycled Textiles and Circular Fashion: A Systematic Literature Review. <i>Sustainability</i> , 12(24). https://doi.org/10.3390/su122410599	Market Value Customer perspective
Warrings and Fellner [170]	Warrings, R., & Fellner, J. (2018). Current status of circularity for aluminum from household waste in Austria. <i>Waste Management</i> , 76, 217–224. https://doi.org/10.1016/j.wasman.2018.02.034	R-Strategies & Design
Yang et al. [152]	Yang, M. Y., Smart, P., Kumar, M., Jolly, M., & Evans, S. (2018). Product-service systems business models for circular supply chains. <i>Production Planning & Control</i> , 29(6), 498–508. https://doi.org/10.1080/09537287.2018.1449247	R-Strategies & Design
Yu et al. [140]	Yu, Y., Yazan, D. M., Bhochhibhoya, S., & Volker, L. (2021). Towards Circular Economy through Industrial Symbiosis in the Dutch construction industry: A case of recycled concrete aggregates. <i>Journal of Cleaner Production</i> , 293. https://doi.org/10.1016/j.jclepro.2021.126083	Technical Attributes R-Strategies & Design
Zerbino et al. [171]	Zerbino, P., Stefanini, A., Aloini, D., Dulmin, R., & Mininno, V. (2021). Curling linearity into circularity: The benefits of formal scavenging in closed-loop settings.	R-Strategies & Design

Author	Reference	CE contexts and terms associated with quality
	<i>International Journal of Production Economics</i> , 240. https://doi.org/10.1016/j.ijpe.2021.108246	
Zhao et al. [176]	Zhao, S. X., Schmidt, S., Qin, W., Li, J., Li, G. X., & Zhang, W. F. (2020). Towards the circular nitrogen economy - A global meta-analysis of composting technologies reveals much potential for mitigating nitrogen losses. <i>Science of the Total Environment</i> , 704. https://doi.org/10.1016/j.scitotenv.2019.135401	R-Strategies & Design
Zhou et al. [87]	Zhou, Y., Stanchev, P., Katsou, E., Awad, S., & Fan, M. (2019). A circular economy use of recovered sludge cellulose in wood plastic composite production: Recycling and eco-efficiency assessment. <i>Waste Management</i> , 99, 42–48. https://doi.org/10.1016/j.wasman.2019.08.037	Market Value
Zied et al. [143]	Zied, D. C., Sánchez, J. E., Noble, R., & Pardo-Giménez, A. (2020). Use of spent mushroom substrate in new mushroom crops to promote the transition towards a circular economy. <i>Agronomy</i> , 10(9). https://doi.org/10.3390/agronomy10091239	Technical Attributes