

International Journal of Industrial Engineering and Management



Improving service business of industrial companies through data: conceptualization and application

A. Janković^{a*}, F. Adrodegari^b, N. Saccani^b, N. Simeunović^a

^a University of Novi Sad, Faculty of Technical Sciences, Department of Industrial Engineering and Engineering Management, Novi Sad, Serbia;

^b University of Brescia, Department of Industrial and Mechanical Engineering, Brescia, Italy

References

- O. K. Mont, "Clarifying the concept of product-service system," J. Clean. Prod., vol. 10, pp. 237–245, 2002, doi: 10.1109/ ACIIDS.2009.18.
- [2] S. Vandermerwe and J. Rada, "Servitization of Business: Adding Value by Adding Services Sandra," Eur. Manag. J., vol. 6, no. 4, pp. 314–324, 1988, doi: 10.1097/JOM.0b013e318161786f.
- [3] J. Rowley, "The wisdom hierarchy: Representations of the DIKW hierarchy," J. Inf. Sci., vol. 33, no. 2, pp. 163–180, 2007, doi: 10.1177/0165551506070706.
- [4] T. Paschou, M. Rapaccini, F. Adrodegari, and N. Saccani, "Digital servitization in manufacturing: A systematic literature review and research agenda," Ind. Mark. Manag., no. November 2019, pp. 0–1, 2020, doi: 10.1016/j.indmarman.2020.02.012.
- [5] C. Suppatvech, J. Godsell, and S. Day, "The roles of internet of things technology in enabling servitized business models: A systematic literature review," Ind. Mark. Manag., vol. 82, no. February, pp. 70–86, 2019, doi: 10.1016/j.indmarman.2019.02.016.
- [6] E. Manzini, C. Vezzoli, and G. Clark, "Product-Service Systems. Using an Existing Concept as a New Approach to Sustainability," J. Des. Res., vol. 1, no. 2, p. 0, 2001, doi: 10.1504/jdr.2001.009811.
- [7] D. Opresnik and M. Taisch, "The value of big data in servitization," Int. J. Prod. Econ., vol. 165, pp. 174–184, 2015, doi: 10.1016/j.ijpe.2014.12.036.
- [8] T. S. Baines, H. W. Lightfoot, O. Benedettini, and J. M. Kay, "The servitization of manufacturing: A review of literature and reflection on future challenges," J. Manuf. Technol. Manag., vol. 20, no. 5, pp. 547–567, 2009, doi: 10.1108/17410380910960984.
- [9] D. Kindström, "Towards a service-based business model Key aspects for future competitive advantage," Eur. Manag. J., vol. 28, no. 6, pp. 479–490, 2010, doi: 10.1016/j.emj.2010.07.002.
- [10] H. Chesbrough, "The role of the business model in capturing value from innovation: evidence from Xerox Corporation's technology spin-off companies," Ind. Corp. Chang., vol. 11, no. 3, pp. 529–555, 2002, doi: 10.1093/icc/11.3.529.
- [11] A. Urbinati, M. Bogers, V. Chiesa, and F. Frattini, "Creating and capturing value from Big Data: A multiple-case study analysis of provider companies," Technovation, vol. 84–85, no. January, pp. 21–36, 2019, doi: 10.1016/j.technovation.2018.07.004.
- [12] W. Coreynen, P. Matthyssens, and W. Van Bockhaven, "Boosting servitization through digitization: Pathways and dynamic resource configurations for manufacturers," Ind. Mark. Manag., vol. 60, pp. 42–53, 2017, doi: 10.1016/j.indmarman.2016.04.012.
- [13] A. Valencia, R. Mugge, J. P. L. Schoormans, and H. N. J. Schifferstein, "The design of smart product-service systems (PSSs): An exploration of design characteristics," Int. J. Des., vol. 9, no. 1, pp. 13–28, 2015.
- [14] Y. Zhang et al., "The 'Internet of Things' enabled real-time scheduling for remanufacturing of automobile engines," J. Clean. Prod., vol. 185, pp. 562–575, 2018, doi: 10.1016/j.jclepro.2018.02.061.
- [15] F. Adrodegari, A. Alghisi, M. Ardolino, and N. Saccani, "From ownership to service-oriented business models: A survey in capital goods companies and a PSS typology," Procedia CIRP, vol. 30, pp. 245–250, 2015, doi: 10.1016/j.procir.2015.02.105.
- [16] M. Ardolino, M. Rapaccini, N. Saccani, P. Gaiardelli, G. Crespi, and C. Ruggeri, "The role of digital technologies for the service transformation of industrial companies," Int. J. Prod. Res., vol. 56, no. 6, pp. 2116–2132, 2018, doi: 10.1080/00207543.2017.1324224.
- [17] M. Paiola, F. Schiavone, R. Grandinetti, and J. Chen, "Digital servitization and sustainability through networking: Some evidences from IoT-based business models," J. Bus. Res., vol. 132, no. November 2020, pp. 507-516, 2021, doi: 10.1016/j. jbusres.2021.04.047.

- [18] M. Paiola and H. Gebauer, "Internet of things technologies, digital servitization and business model innovation in BtoB manufacturing firms," Ind. Mark. Manag., vol. 89, no. March 2019, pp. 245–264, 2020, doi: 10.1016/j.indmarman.2020.03.009.
- [19] H. Demirkan, C. Bess, J. Spohrer, A. Rayes, D. Allen, and Y. Moghaddam, "Innovations with smart service systems: Analytics, big data, cognitive assistance, and the internet of everything," Commun. Assoc. Inf. Syst., vol. 37, no. 1, pp. 733–752, 2015, doi: 10.17705/1cais.03735.
- [20] J. Lee, H. A. Kao, and S. Yang, "Service innovation and smart analytics for Industry 4.0 and big data environment," Procedia CIRP, vol. 16, pp. 3–8, 2014, doi: 10.1016/j.procir.2014.02.001.
- [21] L. S. Dalenogare, G. B. Benitez, N. F. Ayala, and A. G. Frank, "The expected contribution of Industry 4.0 technologies for industrial performance," Int. J. Prod. Econ., vol. 204, no. December 2017, pp. 383–394, 2018, doi: 10.1016/j.ijpe.2018.08.019.
- [22] H. Kagermann, W. Wahlster, and J. Helbig, "Securing the future of German manufacturing industry: Recommendations for implementing the strategic initiative INDUSTRIE 4.0," Final Rep. Ind. 4.0 Work. Gr., no. April, pp. 1–84, 2013.
- [23] I. Spasojević, S. Havzi, D. Stefanović, S. Ristić, and U. Marjanović, "Research Trends and Topics in IJIEM from 2010 to 2020: A Statistical History," Int. J. Ind. Eng. Manag., vol. 12, no. 4, pp. 228–242, 2021, doi: 10.24867/jjiem-2021-4-290.
- [24] P. M. Hartmann, M. Zaki, N. Feldmann, and A. Neely, "Capturing value from big data a taxonomy of data-driven business models used by start-up firms," Int. J. Oper. Prod. Manag., vol. 36, no. 10, pp. 1382–1406, 2016, doi: 10.1108/IJOPM-02-2014-0098.
- [25] C. Lim, K. H. Kim, M. J. Kim, J. Y. Heo, K. J. Kim, and P. P. Maglio, "From data to value: A nine-factor framework for databased value creation in information-intensive services," Int. J. Inf. Manage., vol. 39, no. December 2017, pp. 121–135, 2018, doi: 10.1016/j.ijinfomgt.2017.12.007.
- [26] A. Rizk, B. Bergvall-Kåreborn, and A. Elragal, "Towards a taxonomy of data-driven digital services," Proc. Annu. Hawaii Int. Conf. Syst. Sci., vol. 2018-January, no. May, pp. 1076–1085, 2018, doi: 10.24251/hicss.2018.135.
- [27] A. G. Frank, G. H. S. Mendes, N. F. Ayala, and A. Ghezzi, "Servitization and Industry 4.0 convergence in the digital transformation of product firms: A business model innovation perspective," Technol. Forecast. Soc. Change, vol. 141, no. January, pp. 341–351, 2019, doi: 10.1016/j.techfore.2019.01.014.
- [28] M. Zambetti, F. Adrodegari, G. Pezzotta, R. Pinto, M. Rapaccini, and C. Barbieri, "From data to value: conceptualising datadriven product service system," Prod. Plan. Control, vol. 0, no. 0, pp. 1–17, 2021, doi: 10.1080/09537287.2021.1903113.
- [29] M. Rapaccini and F. Adrodegari, "Conceptualizing customer value in data-driven services and smart PSS," Comput. Ind., vol. 137, p. 103607, 2022, doi: 10.1016/j.compind.2022.103607.
- [30] F. Adrodegari and N. Saccani, "Business models for the service transformation of industrial firms," Serv. Ind. J., vol. 37, no. 1, pp. 57–83, 2017, doi: 10.1080/02642069.2017.1289514.
- [31] C. Voss, N. Tsikriktsis, and M. Frohlich, "Case research in operations management," Int. J. Oper. Prod. Manag., vol. 22, no. 2, pp. 195–219, 2002, doi: 10.1108/01443570210414329.
- [32] R. K. Yin, "Case study research: Design and methods," Can. J. Action Res., 2009, doi: 10.33524/cjar.v14i1.73.
- [33] R. L. Nolan and C. F. Gibson, "Managing the Four Stages of EDP Growth," Harv. Bus. Rev., no. January 1974, p. 76ff, 1974.