INTEGRATION OF MAHALANOBIS-TAGUCHI SYSTEM AND TIME-DRIVEN ACTIVITY-BASED COSTING IN PRODUCTION ENVIRONMENT

FILZAH LINA BINTI MOHD SAFEIEE

DOCTOR OF PHILOSOPHY

UNIVERSITI MALAYSIA PAHANG
AL-SULTAN ABDULLAH

SUPERVISOR'S DECLARATION

I hereby declare that I have checked this thesis and in my opinion, this thesis is adequate in terms of scope and quality for the award of the degree of Doctor ofPhilosophy.

____

(Supervisor's Signature)

Full Name: Dr. Mohd Yazid bin

AbuPosition: Senior Lecturer

Date: 21st November 2023

اونيۏرسيتي مليسيا ڤهڠ السلطان عبد الله
UNIVERSITI MALAYSIA PAHANG
AL-SULTAN ABDULLAH

STUDENT'S DECLARATION

I hereby declare that the work in this thesis is based on my original work except for quotations and citations which have been duly acknowledged. I also declare that it has not been previously or concurrently submitted for any other degree at Universiti Malaysia Pahang Al-Sultan Abdullah or any other institutions.

____

(Student's Signature)

Full Name: Filzah Lina binti Mohd

SafeieeID Number: PFO18001

Date: 21st November 2023

INTEGRATION OF MAHALANOBIS-TAGUCHI SYSTEM AND TIME-DRIVEN ACTIVITY-BASED COSTING IN PRODUCTION ENVIRONMENT

FILZAH LINA BINTI MOHD SAFEIEE

Thesis submitted in fulfillment of the requirements
for the award of the degree of
Doctor of Philosophy

Faculty of Manufacturing and Mechatronic
Engineering Technology
UNIVERSITI MALAYSIA PAHANG AL-SULTAN ABDULLAH

NOVEMBER 2023

ACKNOWLEDGEMENTS

Firstly, I would like to express my gratitude to Allah for all the blessing so that I finally able to complete this research. I would like also to express my gratitude to supervisor, Dr. Mohd Yazid bin Abu for all his time, guidance and support towards finishing this research. He keeps on furnished me with his experience and knowledge all the way to the end.

A special dedicated appreciation to my husband, Muhamad Helmy Syafiq bin Shadan, my parents, Hj. Mohd Safeiee bin Tarmidi and Hjh. Ramisah binti Md. Bakhtiar for their continuous motivation to keep me focus and give my best. Unforgetful to my parents-in-law Hj. Shadan bin Bahri and Hjh. Hanita binti Senin for understanding and positive words throughout the years. Special thanks to my daughters, my strength, my love and my soul Nur Hasya Sofia, Nur Safwa Humaira and Nur Hannah Soraya. Their prayer and patience have inspired me to give all my best to finish the thesis. Additionally, flying kiss to my family member, Fariza, Mohd Fadzri, Farhani and Muhammad Fathuddin Adli for their supportive and big smile, to my brothers and sisters in-law member, Abang Faisal, KakJue, Fira and always in our memory Allahyarham Abang Ali bin Ab. Aziz for their supportive and kind to me. Only Allah can repay all the kindness.

All my friends should not be left behind to have my acknowledgement. They are always there to share thoughts, giving precious inputs and encouragement towards my thesis completeness.

Finally, I would like to give token of appreciation to Universiti Malaysia Pahang Al-Sultan Abdullah for theopportunity given for myself to pursue my study at the higher level. I would like also to express gratefulness to all the people that contributed directly or indirectly to complete this study.

ABSTRAK

Dalam persekitaran pengeluaran, proses dianggap stabil apabila punca yang boleh diagihkan telah dihapuskan daripada proses dan justeru, parameter proses disimpulkan penting kepada output. Dengan bergantung terhadap carta kawalan untuk membuat kesimpulan bahawa parameter adalah penting semestinya tidak wajar juga tahap sumbangannya adalah samar-samar. Sementara itu, struktur kos dalam persekitaran pengeluaran adalah berdasarkan aktiviti yang digunakan. Walaupun struktur pengekosan adalah sesuai, ia tidak memberikan pandangan bersepadu tentang peluang keuntungan seluruh perusahaan dan tidak boleh dikemas kini dengan mudah untuk menampung keadaan yang berubah-ubah. Terdapat banyak rangka kerja yang berkaitan dengan penyepaduan sistem seperti pendekatan ramalan hayat berguna yang tinggal berdasarkan penilaian risiko dan pekali keadaan degradasi ke dalam jarak Mahalanobis, dan model kos untuk mengambil kira ketidakpastian dan kebolehubahan dalam pengiraan kos produk secara stokastik. Ini membuktikan daripada literatur bahawa kajian baharu diperlukan untuk membangunkan rangka kerja menyepadukan antarakualiti dan kos untuk pengekosan produk yang lebih baik. Tujuan utama kerja ini adalahuntuk mengintegrasikan sistem Mahalanobis-Taguchi (MTS) dan pengekosan berasaskan aktiviti dipacu masa (TDABC) dalam persekitaran pengeluaran. Data diperolehi daripada sebuah syarikat yang terletak di Kuantan, Pahang. MTS menganalisis tahap sumbangan parameter sementara TDABC menganalisis penggunaan kapasiti di dalam persekitaran pengeluaran. Hasil daripada tahap sumbangan, kumpulan sihat dan tidak sihat telah diplotkan dalam rajah serakan untuk menunjukkan jarak komponen yang ditolak ke komponen yang diterima. Kedua-dua kumpulan tidak sama dan mempunyai korelasi positif. Untuk mendapatkan jarak Mahalanobis yang lebih rendah yang lebih dekat dengan kumpulan sihat, tahap sumbangan positif perlu dikurangkan manakala tahap sumbangan negatif perlu ditingkatkan. Hasil daripada penggunaan kapasiti, 3 kluster telah dikenalpasti seperti Jenis I iaitu stesen kerja terlalu menggunakan pembahagian yang disediakan, Jenis II iaitu stesen kerja menggunakan sebahagian kecil pembahagian yang disediakan dan Jenis III yang kebanyakannya stesen kerja. menggunakan pembahagian yang disediakan. Jelas sekali, Jenis III paling menonjol kerana pihak pengurusan sentiasa merancang perbelanjaan untuk mencapai pengeluaran tahunan. Dengan mengetahui kapasiti masa dan kos yang tidak digunakan, pihak pengurusan juga boleh meramalkan sumber dan perbelanjaan mereka pada masa hadapan dengan lebih tepat. Hasil daripada rangka kerja penyepaduan sistem, 4 jenis penyepaduan dibincangkan seperti Integrasi A (konvensional-ABC), Integrasi B (konvensional-TDABC), Integrasi C (MTS-ABC) dan Integrasi D (MTS-TDABC). Hasil daripada pengesahan, Integrasi D adalah yang terbaik berbanding yang lain dalam persekitaran pengeluaran kerana MTS mempertimbangkan tahap sumbangan bagi setiap parameter yang mempengaruhi kenaikan atau penurunan kepada kos akhir dan TDABC membangunkan kadar kos kapasiti daripada kos yang dibekalkan dan persamaan masa dengan fleksibiliti tinggi untuk menyerap kerumitan produk. Oleh itu, penyepaduan antara MTS dan TDABC bermakna tahap sumbangan parameter yang berbeza akan mempengaruhi persamaan masa dan kadar kos kapasiti untuk menghasilkan kos produk yang lebih baik dalam persekitaran pengeluaran.

ABSTRACT

In the production environment, the process is considered stable when the assignable causes have been eliminated from the process and then, the process parameters are concluded significant to the output. By solely depending on the control chart to conclude the significant parameter is not well justified yet the degree of contribution is vague. Meanwhile, the costing structure in the production environment is mainly based on the consumed activities. Although the costing structure is appropriate, it does not provide an integrated view of enterprise-wide profitability opportunities and could not be easily updated to accommodate changing circumstances. There are a lot of frameworks related to system integration such as an approach of remaining useful life prediction based on risk assessment and degradation state coefficient into the Mahalanobis distance, and a cost model to take into consideration uncertainty and variability in the computation of product cost stochastically. It proves from the literature that a new study is needed to develop a new framework to integrate between the quality and cost for better product costing in the production environment. The main objective of this work is to integrate the Mahalanobis-Taguchi system (MTS) and time- driven activity-based costing (TDABC) in the production environment. The collection data is obtained from a company located in Kuantan, Pahang. MTS analyses the degree of contribution of parameters while TDABC analyses the capacity utilization in production environment. As a result of degree of contribution, healthy and unhealthy groups have been plotted in the scatter diagram to indicate the distance of rejected components to the accepted components. Fortunately, both groups are not identical and have positive correlation. In order to obtain lower Mahalanobis distance which closer to healthy group, positive degree of contribution should be decreased while negative degree of contribution should be increased. As a result of capacity utilization, 3 clusters are found for capacity utilization such as Type I which is the workstation is over- utilized the provided apportionment, Type II which is the workstation utilized a small portion of provided apportionment and Type III which the workstation largely utilized the provided apportionment. Obviously, Type III is most prominent because the management always set the expenditure to achieve certain annual production. By knowing the unused capacity of time and cost, management also can forecast their resources and expenses in the future more accurately to reduce any wastes. As a result of frameworks of system integration, 4 types of integration are discussed such as Integration A (conventional-ABC), Integration B (conventional-TDABC), Integration C (MTS-ABC) and Integration D (MTS-TDABC). As a result of validation, Integration D is the best compared the others in the production environment because MTS considers degree of contribution for each parameter which influence to the increment or decrement to the final cost and the TDABC develops capacity cost rate from the related cost of capacity supplied and time equations with high flexibility to absorb the complexity of the product. Therefore, integration between MTS and TDABC means different degree of contributions of parameters will affect the time equations and capacity cost rate to produce better cost of product in production environment.

TABLE OF CONTENT

REFERENCES

Adane, K., Abiy, Z., & Desta, K. (2015). The revenue generated from clinical chemistry and hematology laboratory services as determined using activity-based costing (ABC) model. Cost Effectiveness and Resource Allocation, 13(1). https://doi.org/10.1186/s12962-015-0047-7

Afonso, P., & Santana, A. (2016). Application of the TDABC model in the logistics process using different capacity cost rates. Journal of Industrial Engineering and Management, 9(5), 1003–1019. https://doi.org/10.3926/jiem.2086

Ahn, J., Park, M., Lee, H.-S., Ahn, S. J., Ji, S.-H., Song, K., & Son, B.-S. (2017).
Covariance effect analysis of similarity measurement methods for early construction cost estimation using case-based reasoning. Automation in Construction, 81, 254-266. doi:10.1016/j.autcon.2017.04.009

Akhavan, S., Ward, L., & Bozic, K. J. (2016). Time-driven Activity-based Costing More Accurately Reflects Costs in Arthroplasty Surgery. Clinical Orthopaedics and Related Research, 474(1), 8–15. https://doi.org/10.1007/s11999-015-4214-0

Akhavan, S., Ward, L., & Bozic, K. J. (2016). Time-driven Activity-based Costing More Accurately Reflects Costs in Arthroplasty Surgery. Clinical Orthopaedics and Related Research, 474(1), 8–15. https://doi.org/10.1007/s11999-015-4214-0

Alaoui, S. el, & Lindefors, N. (2016). Combining time-driven activity-based costing with clinical outcome in cost-effectiveness analysis to measure value in treatment of depression. PLoS ONE, 11(10). https://doi.org/10.1371/journal.pone.0165389

Alaoui, S. el, & Lindefors, N. (2016). Combining time-driven activity-based costing with clinical outcome in cost-effectiveness analysis to measure value in treatment of depression. PLoS ONE, 11(10). https://doi.org/10.1371/journal.pone.0165389

Allain, E., & Laurin, C. (2018). Explaining implementation difficulties associated with activity-based costing through system uses. Journal of Applied Accounting Research, 19(1), 181–198. https://doi.org/10.1108/JAAR-11-2014-0120

Almeida, A., & Cunha, J. (2017). The implementation of an Activity-Based Costing(ABC) system in a manufacturing company. Procedia Manufacturing, 13, 932–939. https://doi.org/10.1016/j.promfg.2017.09.162

Alsmadi, M., Almani, A., & Khan, Z. (2014). Quality paper implementing an integrated ABC and TOC approach to enhance decision making in a lean context a case study. International Journal of Quality and Reliability Management, 31(8), 906–920.https://doi.org/10.1108/IJQRM-04-2013-0063

Andreasen, S. E., Holm, H. B., Jørgensen, M., Gromov, K., Kjærsgaard-Andersen, P., &Husted, H. (2017). Time-driven Activity-based Cost of Fast-Track Total Hip and Knee

Arthroplasty. Journalof Arthroplasty, 32(6),1747–1755. https://doi.org/10.1016/j.arth.2016.12.040

Anzai, Y., Heilbrun, M. E., Haas, D., Boi, L., Moshre, K., Minoshima, S., Kaplan, R., & Lee, V. S. (2017). Dissecting Costs of CT Study: Application of TDABC (Time-driven Activity-based Costing) in a Tertiary Academic Center. Academic Radiology, 24(2), 200–208. https://doi.org/10.1016/j.acra.2016.11.001

Anzai, Y., Heilbrun, M. E., Haas, D., Boi, L., Moshre, K., Minoshima, S., Kaplan, R., & Lee, V. S. (2017). Dissecting Costs of CT Study: Application of TDABC (Time-driven Activity-based Costing) in a Tertiary Academic Center. Academic Radiology, 24(2), 200–208. https://doi.org/10.1016/j.acra.2016.11.001

Azar, N., Leblond, V., Ouzegdouh, M., & Button, P. (2017). A transition from using multi-step procedures to a fully integrated system for performing extracorporeal photopheresis: A comparison of costs and efficiencies. Journal of Clinical Apheresis, 32(6), 474–478. https://doi.org/10.1002/jca.21542

Baena, F., Guarin, A., Mora, J., Sauza, J., & Retat, S. (2017). Learning Factory: The Path to Industry 4.0. Procedia Manufacturing, 9, 73–80. https://doi.org/10.1016/j.promfg.2017.04.022

Bagherpour, M., Nia, A. K., Sharifian, M., & Mazdeh, M. M. (2013). Time-driven activity-based costing in a production planning environment. Proceedings of the Institution of Mechanical Engineers, Part B: Journal of Engineering Manufacture, 227(2), 333–337. https://doi.org/10.1177/0954405412464484

Bagherpour, M., Nia, A. K., Sharifian, M., & Mazdeh, M. M. (2013). Time-driven activity-based costing in a production planning environment. Proceedings of the Institution of Mechanical Engineers, Part B: Journal of Engineering Manufacture, 227(2), 333–337. https://doi.org/10.1177/0954405412464484

Barros, R. S., & da Costa Ferreira, A. M. D. S. (2017). Time-driven activity-based costing : Designing a model in a Portuguese production environment. Qualitative Research in Accounting and Management, 14(1), 2–20. https://doi.org/10.1108/QRAM- 10-2015-0095

Bauer-Nilsen, K., Hill, C., Trifiletti, D. M., Libby, B., Lash, D. H., Lain, M., Christodoulou, D., Hodge, C., & Showalter, T. N. (2018). Evaluation of Delivery Costs for External Beam Radiation Therapy and Brachytherapy for Locally Advanced Cervical Cancer Using Time-Driven Activity-Based Costing. International Journal of Radiation OncologyBiologyPhysics,100(1), 88–94. https://doi.org/10.1016/j.ijrobp.2017.09.004

Beriwal, S., & Chino, J. (2018). Time-Driven Activity-Based Costing in Oncology: A Step in the Right Direction. In International Journal of Radiation Oncology Biology Physics (Vol. 100,Issue1,pp.95–96).Elsevier Inc. https://doi.org/10.1016/j.ijro017.10.017

Beshah, B. (2014). The effect of aggregating multivariate performance parameters in a quality award process. International Journal of Quality and Reliability Management, 31(6), 618–628. https://doi.org/10.1108/IJQRM-07-2012-0104

Bilbao-Ubillos, J., Camino-Beldarrain, V., Intxaurburu-Clemente, G. & Velasco-Balmaseda, E. (2023). Industry 4.0 and potential for reshoring: A typology of technology profiles of manufacturing firms. Computers in Industry. 148, 1-11.

Bodar, Y.J.L., Srinivasan, A.K., Shah, A.S., Kawal, T. & Shukla, A.R. (2020). Time- Driven activity-based costing identifies opportunities for process efficiency and cost optimization for robot-assisted laparoscopic pyeloplasty. Journal of Pediatric Urology. 16(4), 1-10.

Bourke, J., & Roper, S. (2017). Innovation, quality management and learning: Short-term and longer-term effects. *Research Policy*, *46*(8), 1505–1518. https://doi.org/10.1016/j.respol.2017.07.005

Burnett, L., Wilson, R., Pfeffer, S., Lowry, J., & Bipac. (2012). Benchmarking in pathology: Development of an activity-based costing model. Pathology, 44(7), 644– 653. https://doi.org/10.1097/PAT.0b013e32835a9ec4

Campanale, C., Cinquini, L., & Tenucci, A. (2014). Time-driven activity-based costing to improve transparency and decision making in healthcare A case study. Qualitative Research in Accounting and Management, 11(2), 165–186. https://doi.org/10.1108/QRAM-04-2014-0036

Campora, U., Cravero, C., & Zaccone, R. (2018). Marine gas turbine monitoring and diagnostics by simulation and pattern recognition. International Journal of Naval Architecture and Ocean Engineering, 10(5), 617–628.https://doi.org/10.1016/j.ijnaoe.2017.09.012

Cannavacciuolo, L., Iandoli, L., Ponsiglione, C., & Zollo, G. (2012). An analytical framework based on AHP and activity-based costing to assess the value of competencies in production processes. International Journal of Production Research, 50(17), 4877–4888. https://doi.org/10.1080/00207543.2012.657974

Cannavacciuolo, L., Illario, M., Ippolito, A., & Ponsiglione, C. (2015). An activity-based costing approach for detecting inefficiencies of healthcare processes. Business Process Management Journal, 21(1), 55–79. https://doi.org/10.1108/BPMJ-11-2013-0144

Carli, G., & Canavari, M. (2013). Introducing Direct Costing and Activity based Costing in a Farm Management System: A Conceptual Model. Procedia Technology, 8, 397–405. https://doi.org/10.1016/j.protcy.2013.11.052

Cassettari, L., Mosca, M., Mosca, R., Rolando, F., Costa, M., & Pisaturo, V. (2016). IVF cycle cost estimation using Activity Based Costing and Monte Carlo simulation. Health Care Management Science, 19(1), 20–30. https://doi.org/10.1007/s10729-014-9282-2

Chen, A., Sabharwal, S., Akhtar, K., Makaram, N., & Gupte, C. M. (2015). Time-driven activity based costing of total knee replacement surgery at a London teaching hospital. Knee, 22(6), 640–645. https://doi.org/10.1016/j.knee.2015.07.006

Chen, J., Cheng, L., Yu, H., & Hu, S. (2018). Rolling bearing fault diagnosis and health assessment using EEMD and the adjustment Mahalanobis–Taguchi system. International Journal of Systems Science, 49(1), 147–159. https://doi.org/10.1080/00207721.2017.1397804

Cheng, L., Yaghoubi, V., Paepegem, W.V. & Kersemans, M. (2021). Mahalanobis classification system (MCS) integrated with binary particle swarm optimization for robust quality classification of complex metallic turbine blades. Mechanical Systems and Signal Processing. 146, 1-21.

Chouhan, V., Soral, G., & Chandra, B. (2017). Activity based costing model for inventory valuation. Management Science Letters, 7(3), 135–144.https://doi.org/10.5267/j.msl.2016.12.003

Crott, R., Lawson, G., Nollevaux, M. C., Castiaux, A., & Krug, B. (2016). Comprehensive cost analysis of sentinel node biopsy in solid head and neck tumors using a time-driven activity-based costing approach. European Archives of Oto-Rhino-Laryngology, 273(9), 2621–2628. https://doi.org/10.1007/s00405-016-4089-z

Cudney, E. A., Hong, J., Jugulum, R., Paryani, K., Ragsdell, K. M., & Taguchi, G. (2007). An Evaluation of Mahalanobis-Taguchi System and Neural Network for Multivariate Pattern Recognition. In Journal of Industrial and Systems Engineering (Vol. 1, Issue 2).

Cugini, A., Michelon, G., & Pilonato, S. (2013). Innovating cost accounting practices in rail transport companies. Journal of Applied Accounting Research, 14(2), 147–164. https://doi.org/10.1108/09675421311291892

Da Silva Medeiros, H., Santana, A. F. B., & da Silva Guimarães, L. (2017). The use of costing methods in Lean Manufacturing industries: A literature review. In Gestao e Producao (Vol. 24, Issue 2, pp. 395–406). Brazilian Institute for Information in Science and Technology. https://doi.org/10.1590/0104-530X2183-16

Dalenogare, L. S., Benitez, G. B., Ayala, N. F., & Frank, A. G. (2018). The expected contribution of Industry 4.0 technologies for industrial performance. International JournalofProductionEconomics, 204, 383–394. https://doi.org/10.1016/j.ijpe.2018.08.019

Das, P., & Datta, S. (2012). Developing an unsupervised classification algorithm for characterization of steel properties. International Journal of Quality & Reliability Management, 29(4), 368–383. https://doi.org/10.1108/02656711211224839

Deepa, N., & Ganesan, K. (2016). Mahalanobis Taguchi system based criteria selection tool for agriculture crops. Sadhana - Academy Proceedings in Engineering Sciences, 41(12), 1407–1414. https://doi.org/10.1007/s12046-09-5Deraemaeker, A., & Worden, K. (2018). A comparison of linear approaches to filter out environmental effects in structural health monitoring. Mechanical Systems and Signal Processing, 105, 1–15. https://doi.org/10.1016/j.ymssp.2017.11.045

Dessureault, S., & Benito, R. O. (2012). Data mining and activity based costing for equipment replacement decisions: Part 1 - Establishing the information infrastructure. Transactions of the Institutions of Mining and Metallurgy, Section A: Mining Technology, 121(2), 73–82. https://doi.org/10.1179/1743286312Y.0000000003

Devji, T. F., Madenci, A. L., Carpino, E., Leahy, I. C., Samnaliev, M., Dearden, J. L., Weil, B. R., Weldon, C. B., & Cravero, J. (2016). Safety and cost-effectiveness of port removal outside of the operating room among pediatric patients. Journal of Pediatric Surgery, 51(11), 1891–1895. https://doi.org/10.1016/j.jpedsurg.2016.07.017

Dilberoglu, U. M., Gharehpapagh, B., Yaman, U., & Dolen, M. (2017). The Role of Additive Manufacturing in the Era of Industry 4.0. Procedia Manufacturing, 11, 545– 554. https://doi.org/10.1016/j.promfg.2017.07.148

Ding, Y., Chen, K., Wei, X. & Yang, Y. (2022). A novel cost-management system for container terminals using a time-driven Activity-Based Costing approach. Ocean & Coastal Management. 217, 1-10.

Dombrowski, U., & Wagner, T. (2014). Mental strain as field of action in the 4th industrial revolution. Procedia CIRP, 17, 100–105.https://doi.org/10.1016/j.procir.2014.01.077

Dong, S. O., Jin, H. J., & Jang, E. (2014). Can the Mahalanobis Taguchi system be applied to Sasang constitution classifications by using body shape information? Journal of Industrial and Production Engineering, 31(7), 433–440. https://doi.org/10.1080/21681015.2014.978824

E. Zubizarreta, J. Van Dyk, Y. Lievens,Analysis of Global Radiotherapy Needs and Costs by Geographic Region and Income Level,Clinical Oncology,Volume 29, Issue 2, 2017, Pages 84-92, ISSN 0936-6555,

El-Banna, M. (2015). A novel approach for classifying imbalance welding data: Mahalanobis genetic algorithm (MGA). International Journal of Advanced Manufacturing Technology, 77(1–4), 407–425. https://doi.org/10.1007/s00170-014-6428-9

El-Banna, M. (2017). Modified Mahalanobis Taguchi System for Imbalance Data Classification. Computational Intelligence and Neuroscience, 2017. https://doi.org/10.1155/2017/5874896

Erhun, F., Mistry, B., Platchek, T., Milstein, A., Narayanan, V. G., & Kaplan, R. S. (2015). Time-driven activity-based costing of multivessel coronary artery bypass grafting across national boundaries to identify improvement opportunities: study protocol. BMJ Open, 5, 8765. https://doi.org/10.1136/bmjopen-2015

Erol, S., Jäger, A., Hold, P., Ott, K., & Sihn, W. (2016). Tangible Industry 4.0: A Scenario-Based Approach to Learning for the Future of Production. Procedia CIRP, 54, 13–18. https://doi.org/10.1016/j.procir.2016.03.162

Esmalifalak, H., Albin, M. S., & Behzadpoor, M. (2015). A comparative study on the activity based costing systems: Traditional, fuzzy and Monte Carlo approaches. Health Policy and Technology, 4(1), 58–67. https://doi.org/10.1016/j.hlpt.2014.10.010

European Parliament (2016) https://www.europarl.europa.eu/RegData/etudes/STUD/2016/570007/IPOL_STU(2016)570007_EN.pdf

Faller, C., & Feldmúller, D. (2015). Industry 4.0 learning factory for regional SMEs.
Procedia CIRP, 32, 88–91. https://doi.org/10.1016/j.procir.2015.02.117

Fang, C.J., Mazzocco, J.C., Sun, D.C., Shaker, J.M., Talmo, C.T., Mattingly, D.A. & Smith, E.L. (2022). Total Knee Arthroplasty Hospital Costs by Time-Driven Activity- Based Costing: Robotic vs Conventional. Arthroplasty Today. 13, 43-47.

Fang, Y., & Ng, S. T. (2011). Applying activity-based costing approach for construction logistics cost analysis. Construction Innovation, 11(3), 259–281. https://doi.org/10.1108/14714171111149007

Feng, S., & Ho, C. Y. (2016). The real option approach to adoption or discontinuation of a management accounting innovation: the case of activity-based costing. Review of Quantitative Finance and Accounting, 47(3), 835–856. https://doi.org/10.1007/s11156- 015-0522-4

Fito, M. A., Llobet, J., & Cuguero, N. (2018). The activity-based costing model trajectory: A path of lights and shadows. Intangible Capital, 14(1), 146–161. https://doi.org/10.3926/ic.1107

Forge, S., & Srivastava, L. (2018). ITU cost model and methodology to assist national regulatory authorities to engage with international mobile roaming. Digital Policy, Regulation and Governance , 20(2), 125–148. https://doi.org/10.1108/DPRG-06-2017- 0033

French, K. E., Albright, H. W., Frenzel, J. C., Incalcaterra, J. R., Rubio, A. C., Jones, J. F., & Feeley, T. W. (2013). Measuring the value of process improvement initiatives in a preoperative assessment center using time-driven activity-based costing. Healthcare, 1(3–4), 136–142. https://doi.org/10.1016/j.hjdsi.2013.07.007

French, K. E., Albright, H. W., Frenzel, J. C., Incalcaterra, J. R., Rubio, A. C., Jones, J. F., & Feeley, T. W. (2013). Measuring the value of process improvement initiatives in a preoperative assessment center using time-driven activity-based costing. Healthcare, 1(3–4), 136–142. https://doi.org/10.1016/j.hjdsi.2013.07.007

French, K. E., Guzman, A. B., Rubio, A. C., Frenzel, J. C., & Feeley, T. W. (2016). Value based care and bundled payments: Anesthesia care costs for outpatient oncology surgery using time-driven activity-based costing. Healthcare, 4(3), 173–180. https://doi.org/10.1016/j.hjdsi.2015.08.007

Gaitonde, G., Malik, R.D. & Zimmern, P.E. (2019). Financial Burden of Recurrent Urinary Tract Infections in Women: A Time-driven Activity-based Cost Analysis.Urology. 128, 47-54.

Gao, Z. Y., Wang, R. X., Jiang, H. Q., Gao, J. M., & Dong, R. G. (2017). Coupling analysis-based false monitoring information identification of production system in process industry. Science China Technological Sciences, 60(6), 807–817. https://doi.org/10.1007/s11431-016-9032-7

Geissbauer, R., Schrauf, S., Koch V. & Kuge, S. (2014). Industry 4.0-Opportunities and Challenges of the Industrial Internet. 1-52.

Ghasemi, E., Aaghaie, A., & Cudney, E. A. (2015). Mahalanobis Taguchi system: A review. In International Journal of Quality and Reliability Management (Vol. 32, Issue 3, pp. 291–307). Emerald Group Holdings Ltd. https://doi.org/10.1108/IJQRM-02- 2014-0024

Goense, L., van Dijk, W. A., Govaert, J. A., van Rossum, P. S. N., Ruurda, J. P., & van Hillegersberg, R. (2017). Hospital costs of complications after esophagectomy for cancer. European Journal of Surgical Oncology, 43(4), 696–702. https://doi.org/10.1016/j.ejso.2016.11.013

Gonzalez, M., Nachtmann, H., & Pohl, E. (2017). Time-driven activity-based costing for health care provider supply chains. Engineering Economist, 62(2), 161–179. https://doi.org/10.1080/0013791X.2016.1264035

Gora, R., Vodopivec, R., Angel, D., Angelov, G., & Stanković, L. (n.d.). Ministry ofScience and Technological Development of the Republic of Serbia.

Govaert, J. A., van Dijk, W. A., Fiocco, M., Scheffer, A. C., Gietelink, L., Wouters, M. W.
J. M., & Tollenaar, R. A. E. M. (2016). Nationwide Outcomes Measurement in Colorectal Cancer Surgery: Improving Quality and Reducing Costs Presented at the European Society of Surgical Oncology 34th Congress, Liverpool, United Kingdom, October 2014. Journal of the American College of Surgeons, 222(1), 19-29.e2. https://doi.org/10.1016/j.jamcollsurg.2015.09.020

Grant, P. (2015). How much does a diabetes out-patient appointment actually cost? An argument for PLICS. Journal of Health Organization and Management, 29(2), 154–169.https://doi.org/10.1108/JHOM-01-2012-0005

Greasley, A., & Smith, C. M. (2017). Using activity-based costing and simulation toreduce cost at a police communications centre. Policing, 40(2), 426–441. https://doi.org/10.1108/PIJPSM-03-2016-0044

Gregório, J., Russo, G., & Lapão, L. V. (2016). Pharmaceutical services cost analysis using time-driven activity-based costing: A contribution to improve community pharmacies' management. Research in Social and Administrative Pharmacy, 12(3), 475–485. https://doi.org/10.1016/j.sapharm.2015.08.004

Gregorio, L. T. di, & Soares, C. A. P. (2013). Comparison between the Mix-Based Costing and the Activity-Based Costing Methods in the Costing of Construction Projects. Journal of Cost Analysis and Parametrics, 6(2), 77–95. https://doi.org/10.1080/1941658x.2013.843418

Gunasekaran, A., Subramanian, N., & Ngai, W. T. E. (2019). Quality management in the 21st century enterprises: Research pathway towards Industry 4.0. In International Journal of Production Economics (Vol. 207, pp. 125–129). Elsevier B.V. https://doi.org/10.1016/j.ijpe.2018.09.005

Gupta, N. S., Devika, D., & Panpaliya, V. (2014). Some clarifications on the use of Mahalanobis distance for the machine-part cell formation problem. International Journal of Advanced Manufacturing Technology, 73(5–8), 783–794. https://doi.org/10.1007/s00170-014-5854-z

Hamed Sabahno, Amirhossein Amiri, New statistical and machine learning based control charts with variable parameters for monitoring generalized linear model profiles,Computers & Industrial Engineering,Volume 184,2023,109562,ISSN 0360-8352, https://doi.org/10.1016/j.cie.2023.109562.

Haas, D. A., & Kaplan, R. S. (2017). Variation in the cost of care for primary total knee arthroplasties. ArthroplastyToday,3(1),33–37. https://doi.org/10.1016/j.artd.2016.08.001

Hadighi, S. A., Sahebjamnia, N., Mahdavi, I., Asadollahpour, H., & Shafieian, H. (2013). Mahalanobis-Taguchi System-based criteria selection for strategy formulation: a case in a training institution. Journal of Industrial Engineering International, 9(1). https://doi.org/10.1186/2251-712X-9-26

Hajoary, P.K. (2023). Industry 4.0 Maturity and Readiness- A case of a Steel Manufacturing Organization. Procedia Computer Science. 217, 614-619.

Haldar, N. A. H., Khan, F. A., Ali, A., & Abbas, H. (2017). Arrhythmia classification using Mahalanobis distance based improved Fuzzy C-Means clustering for mobile health monitoring systems. Neurocomputing, 220, 221–235.https://doi.org/10.1016/j.neucom.2016.08.042

Hamid, K. S., Matson, A. P., Nwachukwu, B. U., Scott, D. J., Mather, R. C., & Deorio, J.
K. (2017). Determining the Cost-Savings Threshold and Alignment Accuracy of Patient-Specific Instrumentation in Total Ankle Replacements. Foot and Ankle International, 38(1), 49–57. https://doi.org/10.1177/1071100716667505

Han, Y-J, He, Z. & Peng, Y-F. (2023). Potential causes analysis of abnormal observations diagnosed by improved Mahalanobis-Taguchi system. Expert Systems with Applications. 229, 1-10.

Haroun, A. E. (2015). Maintenance cost estimation: Application of activity-based costing as a fair estimate method. Journal of Quality in Maintenance Engineering, 21(3), 258– 270. https://doi.org/10.1108/JQME-04-2015-0015

Harudin, N., Jamaludin, K. R., Nabil Muhtazaruddin, M., Ramlie, F., & Muhamad, W. Z.
A. W. (2018). A feasibility study in adapting Shamos Bickel and Hodges Lehman estimator into T-Method for normalization. IOP Conference Series: Materials Science and Engineering, 319(1). https://doi.org/10.1088/1757-899X/319/1/012033

Hedman, R., Sundkvist, R., Almström, P., & Kinnander, A. (2013). Object-oriented modeling of manufacturing resources using work study inputs. Procedia CIRP, 7, 443– 448. https://doi.org/10.1016/j.procir.2013.06.013

Helmers, R. A., Dilling, J. A., Chaffee, C. R., Larson, M. v., Narr, B. J., Haas, D. A., & Kaplan, R. S. (2017). Overall Cost Comparison of Gastrointestinal Endoscopic Procedures With Endoscopist- or Anesthesia-Supported Sedation by Activity-Based Costing Techniques. Mayo Clinic Proceedings: Innovations, Quality & Outcomes, 1(3), 234–241. https://doi.org/10.1016/j.mayocpiqo.2017.10.002

Ho, L. H., Chang, P. Y., & Yen, T. M. (2016). Using modified IPA to define quality improvement strategies: A study of air-conditioning industry in Taiwan. TQM Journal, 28(2), 180–194. https://doi.org/10.1108/TQM-04-2014-0039

Hofmann, E., & Bosshard, J. (2017). Supply chain management and activity-basedcosting: Current status and directions for the future. In International Journal of PhysicalDistribution and Logistics Management (Vol. 47, Issue 8, pp. 712–735). Emerald GroupPublishing Ltd. https://doi.org/10.1108/IJPDLM-04-2017-0158 https://doi.org/10.1016/j.clon.2016.11.011.

Hu, J., Zhang, L., & Liang, W. (2013). Dynamic degradation observer for bearing fault by MTS-SOM system. Mechanical Systems and Signal Processing, 36(2), 385–400. https://doi.org/10.1016/j.ymssp.2012.10.006

Huang, J., & Li, S. (2011). The research of environmental costs based on activity based cost. Procedia Environmental Sciences, 10(PART A), 147–151. https://doi.org/10.1016/j.proenv.2011.09.026

Husby, K. R., Tolstrup, C. K., Lose, G., & Klarskov, N. (2018). Manchester–Fothergill procedure versus vaginal hysterectomy with uterosacral ligament suspension: an activity-based costing analysis. International Urogynecology Journal, 29(8), 1161– 1171. https://doi.org/10.1007/s00192-018-3575-9

Ibrahim, R., Nur, A. M., Hassan, N. H., Am, H., & Aljunid, S. M. (2014). The cost of radiological procedures at Universiti Kebangsaan Malaysia Medical Centre: applying activity based costing methodology. BMC Public Health, 14(S1). https://doi.org/10.1186/1471-2458-14-s1-o21

Intakhan, P. (2014). ABC success: Evidence from ISO 9000 certified companies in Thailand. Asian Review of Accounting, 22(3), 287–303. https://doi.org/10.1108/ARA- 06-2013-0044

Iquebal, A. S., Pal, A., Ceglarek, D., & Tiwari, M. K. (2014). Enhancement of Mahalanobis-Taguchi System via Rough Sets based Feature Selection. Expert Systems with Applications, 41(17), 8003–8015. https://doi.org/10.1016/j.eswa.2014.06.019

J. Qin, Y. Liu, R. Grosvenor, in:, Procedia CIRP, 2016, pp. 173–178.

Jin, X., & Chow, T. W. S. (2013). Anomaly detection of cooling fan and fault classification of induction motor using Mahalanobis-Taguchi system. Expert Systems with Applications, 40(15), 5787–5795. https://doi.org/10.1016/j.eswa.2013.04.024

Jobi-Taiwo, A. A., & Cudney, E. A. (2015). Mahalanobis-Taguchi system for multiclass classification of steel plates fault. In Int. J. Quality Engineering and Technology (Vol. 5, Issue 1).

John, B. (2014). Application of Mahalanobis-Taguchi system and design of experiments toreduce the field failures of splined shafts. International Journal of Quality and Reliability Management, 31(6), 681–697. https://doi.org/10.1108/IJQRM-10-2012-0134

Kaplan, A. L., Agarwal, N., Setlur, N. P., Tan, H. J., Niedzwiecki, D., McLaughlin, N., Burke, M. A., Steinberg, K., Chamie, K., & Saigal, C. S. (2015). Measuring the cost of care in benign prostatic hyperplasia using time-driven activity-based costing (TDABC). Healthcare, 3(1), 43–48. https://doi.org/10.1016/j.hjdsi.2014.09.007

Kaplan, R. S., & Haas, D. (2018). Defining, measuring, and improving value in spine care.
Seminars in Spine Surgery, 30(2), 80–83. https://doi.org/10.1053/j.semss.2017.11.001

Keel, G., Savage, C., Rafiq, M., & Mazzocato, P. (2017). Time-driven activity-based costing in health care: A systematic review of the literature. In Health Policy (Vol. 121, Issue 7, pp. 755–763). Elsevier Ireland Ltd.https://doi.org/10.1016/j.healthpol.2017.04.013

Ken Lee, K. H., Matthew Austin, J., & Pronovost, P. J. (2016). Developing a Measure of Value in Health Care. Value in Health, 19(4), 323–325. https://doi.org/10.1016/j.jval.2014.12.009

Ketkar, M., & Vaidya, O. S. (2014). Evaluating and Ranking Candidates for MBA Program: Mahalanobis Taguchi System Approach. Procedia Economics and Finance, 11, 654–664. https://doi.org/10.1016/s2212-5671(14)00231-7

Khataie, A. H., & Bulgak, A. A. (2013). A cost of quality decision support model for leanmanufacturing: Activity-based costing application. International Journal of Quality and Reliability Management, 30(7), 751–764. https://doi.org/10.1108/IJQRM-Jan-2011-0016

Khataie, A. H., Bulgak, A. A., & Segovia, J. J. (2011). Activity-Based Costing and Management applied in a hybrid Decision Support System for order management. Decision Support Systems, 52(1), 142–156. https://doi.org/10.1016/j.dss.2011.06.003

Kolberg, D., & Zühlke, D. (2015). Lean Automation enabled by Industry 4.0 Technologies. IFAC-PapersOnLine, 28(3), 1870–1875. https://doi.org/10.1016/j.ifacol.2015.06.359

Kont, K. R. (2011). New cost accounting models in measuring of library employees' performance. In Library Management (Vol. 33, Issues 1–2, pp. 50–65).https://doi.org/10.1108/01435121211203310

Kont, K. R. (2011). New cost accounting models in measuring of library employees' performance. In Library Management (Vol. 33, Issues 1–2, pp. 50–65).https://doi.org/10.1108/01435121211203310

Kont, K. R. (2015). How to optimize the cost and time of the acquisitions process?
Collection Building, 34(2), 41–50. https://doi.org/10.1108/CB-01-2015-0003

Kont, K. R. (2015). How to optimize the cost and time of the acquisitions process? Collection Building, 34(2), 41–50. https://doi.org/10.1108/CB-01-2015-0003

Kont, K. R. (2015). What do acquisition activities really cost? A case study in Estonian university libraries. Library Management, 36(6–7), 511–534. https://doi.org/10.1108/LM-12-2014-0137

Kont, K. R. (2015). What do acquisition activities really cost? A case study in Estonian university libraries. Library Management, 36(6–7), 511–534. https://doi.org/10.1108/LM-12-2014-0137

Kont, K.-R., & Jantson, S. (2011). Evidence Based Library and Information Practice 2011,
6.4 Evidence Based Library and Information Practice (Vol. 6, Issue 4).

Kostakis, H., Boskou, G., & Palisidis, G. (2011). Modelling activity-based costing in restaurants. Journal of Modelling in Management, 6(3), 243–257. https://doi.org/10.1108/17465661111183676

Kuo, H. K., & Yang, C. (2014). An intellectual structure of activity-based costing: A co- citation analysis. Electronic Library, 32(1), 31–46. https://doi.org/10.1108/EL-03-2012-0027

Laonapaporn, B., & Phanthunane, P. (2014). Activity based costing system of continuous ambulatory peritoneal dialysis under the Universal Coverage Scheme in Thailand. BMC Public Health, 14(S1). https://doi.org/10.1186/1471-2458-14-s1-p7

Lau, H., Nakandala, D., Samaranayake, P., & Shum, P. (2016). A hybrid multi-criteria decision model for supporting customerfocused profitability analysis. Industrial Management and Data Systems, 116(6), 1105–1130. https://doi.org/10.1108/IMDS-10- 2015-0410

Laviana, A. A., Ilg, A. M., Veruttipong, D., Tan, H. J., Burke, M. A., Niedzwiecki, D. R., Kupelian, P. A., King, C. R., Steinberg, M. L., Kundavaram, C. R., Kamrava, M., Kaplan, A. L., Moriarity, A. K., Hsu, W., Margolis, D. J. A., Hu, J. C., & Saigal, C. S. (2016). Utilizing time-driven activity-based costing to understand the short- and long- term costs of treating localized, low-risk prostate cancer. Cancer, 122(3), 447–455. https://doi.org/10.1002/cncr.29743

Lee, J., Bagheri, B., & Kao, H. A. (2015). A Cyber-Physical Systems architecture for Industry 4.0-based manufacturing systems. Manufacturing Letters, 3, 18–23. https://doi.org/10.1016/j.mfglet.2014.12.001

Lee, J., Kao, H. A., & Yang, S. (2014). Service innovation and smart analytics for Industry 4.0 and big data environment. Procedia CIRP, 16, 3–8.https://doi.org/10.1016/j.procir.2014.02.001

Li, G., Reimann, M., & Zhang, W. (2018). When remanufacturing meets product quality improvement: The impact of production cost. *European Journal of Operational Research*, *271*(3), 913–925. https://doi.org/10.1016/j.ejor.2018.05.060

Li, Q., Yan, C., Chen, G., Wang, H., Li, H. & Wu, L. (2022). Remaining Useful Life prediction of rolling bearings based on risk assessment and degradation state coefficient. ISA Transactions. 129, 413-428.

Lin, W. C. (2012). Financial performance and customer service: An examination using activity-based costing of 38 international airlines. Journal of Air Transport Management, 19(1), 13–15. https://doi.org/10.1016/j.jairtraman.2011.12.002

Linassi, R., Alberton, A., & Marinho, S. V. (2016). Menu engineering and activity-based costing: An improved method of menu planning. International Journal of Contemporary Hospitality Management, 28(7), 1417–1440. https://doi.org/10.1108/IJCHM-09-2014-0438

Liparas, D., Angelis, L., & Feldt, R. (2012). Applying the Mahalanobis-Taguchi strategy for software defect diagnosis. Automated Software Engineering, 19(2), 141–165. https://doi.org/10.1007/s10515-011-0091-2

Liparas, D., Dimitriadis, S. I., Laskaris, N. A., Tzelepi, A., Charalambous, K., & Angelis, L. (2014). Exploiting the temporal patterning of transient VEP signals: A statistical single-trial methodology with implications to brain-computer interfaces (BCIs). Journal of Neuroscience Methods, 232, 189–198.https://doi.org/10.1016/j.jneumeth.2014.04.032

Liparas, D., Laskaris, N., & Angelis, L. (2013). Incorporating resting state dynamics in the analysis of encephalographic responses by means of the Mahalanobis-Taguchi strategy. Expert Systems with Applications, 40(7), 2621–2630. https://doi.org/10.1016/j.eswa.2012.11.014

Lu, T. Y., Wang, S. L., Wu, M. F., & Cheng, F. T. (2017). Competitive Price Strategy with Activity-Based Costing - Case Study of Bicycle Part Company. Procedia CIRP, 63, 14–20. https://doi.org/10.1016/j.procir.2017.03.102

Lu, Y. (2017). Industry 4.0: A survey on technologies, applications and open research issues. In Journal of Industrial Information Integration (Vol. 6, pp. 1–10). Elsevier B.V. https://doi.org/10.1016/j.jii.2017.04.005

M. Pourmehdi, M. Paydar, Pezhman Ghadimi, A. H. Azadnia, Analysis and evaluation of challenges in the integration of Industry 4.0 and sustainable steel reverse logistics network,Computers & Industrial Engineering,Volume 163,2022,

Ma, L., Mao, J., & Fan, H. (2016). Key Quality Characteristics Identification Method for Mechanical Product. Procedia CIRP, 56, 50–54. https://doi.org/10.1016/j.procir.2016.10.015

Ma, L., Mao, J., & Fan, H. (2016). Key Quality Characteristics Identification Method for Mechanical Product. Procedia CIRP, 56,50–54.https://doi.org/10.1016/j.procir.2016.10.015

Maiga, A. S. (2014). Assessing self-selection and endogeneity issues in the relation between activity-based costing and performance. Advances in Accounting, 30(2), 251– 262. https://doi.org/10.1016/j.adiac.2014.09.009

Maiga, A. S., Nilsson, A., & Jacobs, F. A. (2014). Assessing the impact of budgetary participation on budgetary outcomes: the role of information technology for enhanced communication and activity-based costing. Journal of Management Control, 25(1), 5– 32. https://doi.org/10.1007/s00187-014-0191-9

Mandigo, M., O'Neill, K., Mistry, B., Mundy, B., Millien, C., Nazaire, Y., Damuse, Pierre, C., Mugunga, J. C., Gillies, R., Lucien, F., Bertrand, K., Luo, E., Costas, A., Greenberg, S. L. M., Meara, J. G., & Kaplan, R. (2015). A time-driven activity-based costing model to improve health-care resource use in Mirebalais, Haiti. The Lancet, 385, S22. https://doi.org/10.1016/s0140-6736(15)60817-0

Mao, T., Chen, W., Fu, L., Yao, Q. & Cheng, L. (2023). Fault diagnosis of complex hydraulic system based on fast Mahalanobis classification system with high-dimensional imbalanced data. Measurement. 214, 1-19.

Marjanović, V., Gavrilović, J., & Stanić, N. (2011). Us American Versus German Activity-Based Costing. Effects on Business Decisions Management in Theautomotive Industry. Economic Research-Ekonomska Istraživanja, 24(2), 99–111. https://doi.org/10.1080/1331677x.2011.11517459

Martino, M., Console, G., Russo, L., Meliado, A., Meliambro, N., Moscato, T., Irrera, G., Messina, G., Pontari, A., & Morabito, F. (2017). Autologous Stem Cell Transplantation in Patients With Multiple Myeloma: An Activity-based Costing Analysis, Comparing a Total Inpatient Model Versus an Early Discharge Model. Clinical Lymphoma, Myeloma and Leukemia, 17(8), 506–512. https://doi.org/10.1016/j.clml.2017.05.018

McBain, R. K., Jerome, G., Leandre, F., Browning, M., Warsh, J., Shah, M., Mistry, B.,
Faure, P. A. I., Pierre, C., Fang, A. P., Mugunga, J. C., Gottlieb, G., Rhatigan, J., & Kaplan, R. (2018). Activity-based costing of health-care delivery, Haiti. Bulletin of the World Health Organization, 96(1), 10–17. https://doi.org/10.2471/BLT.17.198663

Medianeira Stefano, N., & Casarotto Filho, N. (2013). Activity-based costing in services:literature bibliometric review. http://www.springerplus.com/content/2/1/80

Merguerian, P. A., Grady, R., Waldhausen, J., Libby, A., Murphy, W., Melzer, L., & Avansino, J. (2015). Optimizing value utilizing Toyota Kata methodology in a multidisciplinary clinic. Journal of Pediatric Urology, 11(4), 228.e1-228.e6. https://doi.org/10.1016/j.jpurol.2015.05.010

Mortaji, S. T. H., Bagherpour, M., & Mazdeh, M. M. (2013). Fuzzy time-driven activity- based costing. EMJ - Engineering Management Journal, 25(3), 63–73. https://doi.org/10.1080/10429247.2013.11431983

Mota-Gutiérrez, C. G., Reséndiz-Flores, E. O., & Reyes-Carlos, Y. I. (2018). Mahalanobis-Taguchi system: state of the art. In International Journal of Quality and Reliability Management (Vol. 35, Issue 3, pp. 596–613). Emerald Group PublishingLtd. https://doi.org/10.1108/IJQRM-10-2016-0174

Muto, H., Tani, Y., Suzuki, S., Yokooka, Y., Abe, T., Sase, Y., Terashita, T., & Ogasawara, K. (2011). Filmless versus film-based systems in radiographic examination costs: An activity-based costing method. BMC Health Services Research, 11. https://doi.org/10.1186/1472-6963-11-246

Mwaikambo, E., Rajabifard, A., & Hagai, M. (2015). Modelling cost estimation for accessing spatial data using fuzzy logic and time-driven activity based costing in the context of an NSDI. In Journal of Spatial Science (Vol. 60, Issue 1, pp. 137–151). Mapping Sciences Institute Australia. https://doi.org/10.1080/14498596.2014.915768

Nassar, M., Al-Khadash, H. A., & Sangster, A. (2011). The diffusion of activity-based costing in Jordanian industrial companies. Qualitative Research in Accounting and Management, 8(2), 180–200. https://doi.org/10.1108/11766091111137573

Nassar, M., Al-Khadash, H. A., Sangster, A., & Mah'D, O. (2013). Factors that catalyse, facilitate and motivate the decision to implement activity-based costing in Jordanian industrial companies. Journal of Applied Accounting Research, 14(1), 18–36. https://doi.org/10.1108/09675421311282522

Noain, A., Garcia-Cardenas, V., Gastelurrutia, M. A., Malet-Larrea, A., Martinez- Martinez, F., Sabater-Hernandez, D., & Benrimoj, S. I. (2017). Cost analysis for the implementation of a medication review with follow-up service in Spain. International Journal of Clinical Pharmacy, 39(4), 750–758. https://doi.org/10.1007/s11096-017- 0454-2

Novak, D. D., Paulos, A., & Clair, G. S. (2011). Data-driven budget reductions: A casestudy. Bottom Line, 24(1), 24–34. https://doi.org/10.1108/08880451111142015

Nowak, C., & Linder, C. (2016). Do you know how much your expatriate costs? An activity-based cost analysis of expatriation. Journal of Global Mobility, 4(1), 88–107. https://doi.org/10.1108/JGM-10-2015-0043

Orji, I., & Wei, S. (2016). A detailed calculation model for costing of green manufacturing. Industrial Management and Data Systems, 116(1), 65–86. https://doi.org/10.1108/IMDS-04-2015-0140

Ostadi, B., Daloie, R.M. & Sepehri, M.M. (2019). A combined modelling of fuzzy logic and Time-Driven Activity-based Costing (TDABC) for hospital services costing under uncertainty. Journal of Biomedical Informatics. 89, 11-28.

Ozyapici, H., & Tanis, V. N. (2016). Improving health care costing with resource consumption accounting. International Journal of Health Care Quality Assurance, 29(6),646–663. https://doi.org/10.1108/IJHCQA-04-2015-0045

Özyürek, H. (2014). TIME-DRIVEN ACTIVITY BASED COSTING. In INTERNATIONAL JOURNAL OF BUSINESS AND MANAGEMENT STUDIES
(Vol. 6, Issue 1). Online.

Palaiologk, A. S., Economides, A. A., Tjalsma, H. D., & Sesink, L. B. (2012). An activity-based costing model for long-term preservation and dissemination of digital research data: The case of DANS. International Journal on Digital Libraries, 12(4), 195–214. https://doi.org/10.1007/s00799-012-0092-1

Paravizo, E., Chaim, O. C., Braatz, D., Muschard, B., & Rozenfeld, H. (2018). Exploring gamification to support manufacturing education on industry 4.0 as an enabler forinnovation and sustainability. Procedia Manufacturing, 21, 438–445. https://doi.org/10.1016/j.promfg.2018.02.142

Pashkevich, N., Schéele, F.V. & Haftor, D.M. (3023). Accounting for cognitive time in activity-based costing: A technology for the management of digital economy. Technological Forecasting and Social Change. 186, 1-8.

Peng, C. F., Ho, L. H., Tsai, S. B., Hsiao, Y. C., Zhai, Y., Chen, Q., Chang, L. C., & Shang, Z. (2017). Applying the Mahalanobis-Taguchi System to improve tablet PC production processes. Sustainability (Switzerland), 9(9).https://doi.org/10.3390/su9091557

Phan, T. N., Baird, K., & Su, S. (2018). Environmental activity management: its use and impact on environmental performance. Accounting, Auditing and Accountability Journal, 31(2), 651–673. https://doi.org/10.1108/AAAJ-08-2016-2686

Pike, R. H., Tayles, M. E., & Mansor, N. N. A. (2011). Activity-based costing user satisfaction and type of system: A research note. British Accounting Review, 43(1), 65–72. https://doi.org/10.1016/j.bar.2010.12.001

Qingge, Z. (2012). A New Activity-Based Financial Cost Management Method. PhysicsProcedia, 33, 1906–1912. https://doi.org/10.1016/j.phpro.2012.05.301

Quinn, M., Elafi, O., & Mulgrew, M. (2017). Reasons for not changing to activity-based costing: a survey of Irish firms. PSU Research Review, 1(1), 63–70. https://doi.org/10.1108/prr-12-2016-0017

Rahman M.S., Ghosh, T., Aurna, N.F., Kaiser, M.S., Anannya, M., Hosen, A.S.M.S., Machine learning and internet of things in industry 4.0: A review. Measurement: Sensors. 28, 1-19.

Reddy, K., Venter, H. S., & Olivier, M. S. (2012). Using time-driven activity-based costing to manage digital forensic readiness in large organisations. Information Systems Frontiers, 14(5), 1061–1077. https://doi.org/10.1007/s10796-011-9333-x

Reischauer, G. (2018). Industry 4.0 as policy-driven discourse to institutionalize innovation systems in manufacturing. Technological Forecasting and Social Change, 132, 26–33. https://doi.org/10.1016/j.techfore.2018.02.012

Reséndiz, E., & Rull-Flores, C. A. (2013). Mahalanobis-Taguchi system applied to variable selection in automotive pedals components using Gompertz binary particle swarm optimization. Expert Systems with Applications, 40(7), 2361–2365.https://doi.org/10.1016/j.eswa.2012.10.049

Reséndiz, E., Moncayo-Martínez, L. A., & Solís, G. (2013). Binary ant colony optimization applied to variable screening in the Mahalanobis-Taguchi System. Expert Systems with Applications, 40(2), 634–637. https://doi.org/10.1016/j.eswa.2012.07.058

Reséndiz, E., Moncayo-Martínez, L. A., & Solís, G. (2013). Binary ant colony optimization applied to variable screening in the Mahalanobis-Taguchi System. Expert Systems with Applications, 40(2), 634–637. https://doi.org/10.1016/j.eswa.2012.07.058

Reséndiz-Flores, E. O., & López-Quintero, M. E. (2017). Optimal identification of impact variables in a welding process for automobile seats mechanism by MTS-GBPSO approach. International Journal of Advanced Manufacturing Technology, 90(1–4), 437–443. https://doi.org/10.1007/s00170-016-9395-5

Reséndiz-Flores, E. O., Navarro-Acosta, J. A., Mota-Gutiérrez, C. G., & Reyes-Carlos, Y. (2018). Fault detection and optimal feature selection in automobilemotor-head machining process. International Journal of Advanced Manufacturing Technology, 94(5–8), 2613–2622. https://doi.org/10.1007/s00170-017-1136-x

Sarokolaei, M. A., Saviz, M., Moradloo, M. F., & Dahaj, N. S. (2013). Time Driven Activity based Costing by Using Fuzzy Logics. Procedia - Social and Behavioral Sciences, 75, 338–345. https://doi.org/10.1016/j.sbspro.2013.04.038

Sauer, O. (2014). Information technology for the factory of the future - State of the art and need for action. Procedia CIRP, 25(C), 293–296. https://doi.org/10.1016/j.procir.2014.10.041

Schoute, M. (2011). The relationship between product diversity, usage of advanced manufacturing technologies and activity-based costing adoption. British Accounting Review, 43(2), 120–134. https://doi.org/10.1016/j.bar.2011.02.002

Schuh, G., Gartzen, T., Rodenhauser, T., & Marks, A. (2015). Promoting work-based learning through industry 4.0. Procedia CIRP, 32, 82–87. https://doi.org/10.1016/j.procir.2015.02.213

Schuh, G., Potente, T., Varandani, R., & Schmitz, T. (2014). Global Footprint Design based on genetic algorithms - An “industry 4.0” perspective. CIRP Annals - Manufacturing Technology, 63(1), 433–436. https://doi.org/10.1016/j.cirp.2014.03.121

Schuh, G., Potente, T., Wesch-Potente, C., Weber, A. R., & Prote, J. P. (2014). Collaboration mechanisms to increase productivity in the context of industrie 4.0. Procedia CIRP, 19(C), 51–56. https://doi.org/10.1016/j.procir.2014.05.016

Schulze, M., Seuring, S., & Ewering, C. (2012). Applying activity-based costing in a supply chain environment. International Journal of Production Economics, 135(2), 716– 725. https://doi.org/10.1016/j.ijpe.2011.10.005

Seiringer, W., & Bauer, W. (2016). Improving PSS Costing Based on Customer Integration. Procedia CIRP, 47, 36–41. https://doi.org/10.1016/j.procir.2016.03.081

Sembiring, M. T., Wahyuni, D., Sinaga, T. S., & Silaban, A. (2018). Study of activity based costing implementation for palm oil production using value-Added and non- value-Added activity consideration in PT XYZ palm oil mill. IOP Conference Series: Materials Science and Engineering, 309(1). https://doi.org/10.1088/1757- 899X/309/1/012059

Shakya, P., Kulkarni, M. S., & Darpe, A. K. (2014). A novel methodology for online detection of bearing health status for naturally progressing defect. Journal of Sound and Vibration, 333(21), 5614–5629. https://doi.org/10.1016/j.jsv.2014.04.058

Shakya, P., Kulkarni, M. S., & Darpe, A. K. (2015). Bearing diagnosis based on Mahalanobis-Taguchi-Gram-Schmidt method. Journal of Sound and Vibration, 337, 342–362. https://doi.org/10.1016/j.jsv.2014.10.034

Shengqiang, F., Hiroyuki, O., Hidennori, T., Yuichi, K., & Shengsun, H. (2011). Qualitative and quantitative analysis of GMAW welding fault based on Mahalanobis

Shigaev, A. (2015). Accounting Entries for Activity-Based Costing System: The Case of a Distribution Company. Procedia Economics and Finance, 24, 625–633. https://doi.org/10.1016/s2212-5671(15)00652-8

Siguenza-Guzman, L., Auquilla, A., van den Abbeele, A., & Cattrysse, D. (2016). Using Time-Driven Activity-Based Costing to Identify Best Practices in Academic Libraries. Journal of Academic Librarianship, 42(3), 232–246. https://doi.org/10.1016/j.acalib.2016.01.005

Siguenza-Guzman, L., van den Abbeele, A., & Cattrysse, D. (2014). Time-Driven Activity-Based Costing Systems for Cataloguing Processes: A Case Study. Liber Quarterly, 23(3), 2014. http://liber.library.uu.nl/

Sikder, S., Mukherjee, I. & Panja, S.C. (2020). A synergistic Mahalanobis–Taguchi system and support vector regression based predictive multivariate manufacturing process quality control approach. Journal of Manufacturing Systems. 57, 323-337.

Sikder, S., Panja, S. C., & Mukherjee, I. (2017). An integrated approach for multivariate statistical process control using Mahalanobis-Taguchi System and Andrews function. International Journal of Quality and Reliability Management, 34(8), 1186–1208. https://doi.org/10.1108/IJQRM-11-2015-0163

Sinitò, D., Santarcangelo, V., Stanco, F. & Giacalone, M. (2023). Industry 4.0: Machinery integration with supply chain and logistics in compliance with Italian regulations. MethodsX. 11, 1-15.

Somapa, S., Cools, M., & Dullaert, W. (2012). Unlocking the potential of time-driven activity-based costing for small logistics companies. International Journal of Logistics Research and Applications, 15(5), 303–322. https://doi.org/10.1080/13675567.2012.742043

Sorros, J., Karagiorgos, A., & Mpelesis, N. (2017). Adoption of Activity-Based Costing: A Survey of the Education Sector of Greece. International Advances in Economic Research, 23(3), 309–320. https://doi.org/10.1007/s11294-017-9640-1

Stock, T., & Seliger, G. (2016). Opportunities of Sustainable Manufacturing in Industry 4.0. Procedia CIRP, 40, 536–541. https://doi.org/10.1016/j.procir.2016.01.129

Sung, T. K. (2018). Industry 4.0: A Korea perspective. Technological Forecasting and Social Change, 132, 40–45. https://doi.org/10.1016/j.techfore.2017.11.005

Suthummanon, S., Ratanamanee, W., Boonyanuwat, N., & Saritprit, P. (2011). Applying activity-based costing (ABC) to a parawood furniture factory. Engineering Economist, 56(1), 80–93. https://doi.org/10.1080/0013791X.2010.549936

Tang, Y.M., Kuo, W.T. & C.K.M. Lee. (2023). Real-time Mixed Reality (MR) and Artificial Intelligence (AI) object recognition integration for digital twin in Industry 4.0. Internet of Things. 23, 1-16.

The European Files (2017). https://www.europeanfiles.eu/wp-content/uploads/2017/05/The-European-Files-Industry-4.0-Issue-45-january-2017.pdf

Thoben, K.-D., Busse, M., Denkena, B., & Gausemeier, J. (2014). Editorial: System-integrated Intelligence – New Challenges for Product and Production Engineering in the Context of Industry 4.0. Procedia Technology, 15, 1–4. https://doi.org/10.1016/j.protcy.2014.09.028

Tibesku, C. O., Hofer, P., Portegies, W., Ruys, C. J. M., & Fennema, P. (2013). Benefits of using customized instrumentation in total knee arthroplasty: Results from an activity- based costing model. Archives of Orthopaedic and Trauma Surgery, 133(3), 405–411. https://doi.org/10.1007/s00402-012-1667-4

Tjahjono, B., Esplugues, C., Ares, E., & Pelaez, G. (2017). What does Industry 4.0 mean to Supply Chain? Procedia Manufacturing, 13, 1175–1182. https://doi.org/10.1016/j.promfg.2017.09.191

Toro, C., Barandiaran, I., & Posada, J. (2015). A perspective on knowledge based and intelligent systems implementation in industrie 4.0. Procedia Computer Science, 60(1), 362–370. https://doi.org/10.1016/j.procs.2015.08.143

Tsai, W. H., Chang, J. C., Hsieh, C. L., Tsaur, T. S., & Wang, C. W. (2016). Sustainability concept in decision-making: Carbon tax consideration for joint product mix decision. Sustainability (Switzerland), 8(12). https://doi.org/10.3390/su8121232

Tsai, W. H., Chen, H. C., Leu, J. der, Chang, Y. C., & Lin, T. W. (2013). A product-mix decision model using green manufacturing technologies under activity-based costing. Journal of Cleaner Production, 57, 178–187. https://doi.org/10.1016/j.jclepro.2013.04.011

Tsai, W. H., Lee, K. C., Liu, J. Y., Lin, H. L., Chou, Y. W., & Lin, S. J. (2012). A mixed activity-based costing decision model for green airline fleet planning under the constraints of the European Union Emissions Trading Scheme. Energy, 39(1), 218–226. https://doi.org/10.1016/j.energy.2012.01.027

Tsai, W. H., Yang, C. H., Chang, J. C., & Lee, H. L. (2014). An Activity-Based Costing decision model for life cycle assessment in green building projects. European Journal of Operational Research, 238(2), 607–619. https://doi.org/10.1016/j.ejor.2014.03.024

Tsaia, W. H., Chena, H. C., Liub, J. Y., Chena, S. P., & Shena, Y. S. (2011). Using activity-based costing to evaluate capital investments for green manufacturing systems. International Journal of Production Research, 49(24), 7275–7292. https://doi.org/10.1080/00207543.2010.537389

Tupa, J., Simota, J., & Steiner, F. (2017). Aspects of Risk Management Implementation for Industry 4.0. Procedia Manufacturing, 11, 1223–1230. https://doi.org/10.1016/j.promfg.2017.07.248

Upadhyay, A., Balodi, K.C., Naz, F., Nardo, M.D. & Jraisat, L. (2023). Implementing industry 4.0 in the manufacturing sector: Circular economy as a societal solution. Computers & Industrial Engineering. 177, 1-10.

Ussahawanitchakit, P. (2017). Activity-based costing of canned and processed foods businesses in Thailand: Effects on organizational development, business competitiveness and corporate success. Business: Theory and Practice, 18, 215–225. https://doi.org/10.3846/btp.2017.023

van der Linden, Y. T. K., Govaert, J. A., Fiocco, M., van Dijk, W. A., Lips, D. J., & Prins,
H. A. (2017). Single center cost analysis of single-port and conventional laparoscopic surgical treatment in colorectal malignant diseases. International Journal of Colorectal Disease, 32(2), 233–239. https://doi.org/10.1007/s00384-016-2692-5

van Dyk, J., Zubizarreta, E., & Lievens, Y. (2017). Cost evaluation to optimise radiation therapy implementation in different income settings: A time-driven activity-based analysis. Radiotherapy and Oncology, 125(2), 178–185. https://doi.org/10.1016/j.radonc.2017.08.021

Vij, M. (2012). A survey of factors influencing cost structures in the Indian hotel sector. Worldwide Hospitality and Tourism Themes, 4(5), 449–462. https://doi.org/10.1108/17554211211277888

Villarmois, O. D. la, & Levant, Y. (2011). From adoption to use of a management control tool: Case study evidence of a costing method. In Journal of Applied Accounting Research (Vol. 12, Issue 3, pp. 234–259). https://doi.org/10.1108/09675421111187683

Vyas, V., Afonso, P., Silva, S. & Boris, B. (2022). A Stochastic Costing Model for Manufacturing Management and Control. IFAC-PapersOnLine. 55(10), 1116-1121.

Wagner, T., Herrmann, C., & Thiede, S. (2017). Industry 4.0 Impacts on Lean Production Systems. Procedia CIRP, 63, 125–131. https://doi.org/10.1016/j.procir.2017.02.041

Wang, P. C., Su, C. T., Chen, K. H., & Chen, N. H. (2011). The application of rough set and Mahalanobis distance to enhance the quality of OSA diagnosis. Expert Systems with Applications, 38(6), 7828–7836. https://doi.org/10.1016/j.eswa.2010.12.122

Wang, Y., Li, L. & Wang, K. (2021). An online operating performance evaluation approach using probabilistic fuzzy theory for chemical processes with uncertainties. Computers & Chemical Engineering. 144, 1-13.

Waters, P. M. (n.d.). Value in Pediatric Orthopaedic Surgery Health Care: the Role of Time-driven Activity-based Cost Accounting (TDABC) and Standardized Clinical Assessment and Management Plans (SCAMPs). In J Pediatr Orthop (Vol. 35, Issue 5). www.pedorthopaedics.com|S45

Weyer, S., Schmitt, M., Ohmer, M., & Gorecky, D. (2015). Towards industry 4.0 - Standardization as the crucial challenge for highly modular, multi-vendor production systems. IFAC-PapersOnLine, 28(3), 579–584. https://doi.org/10.1016/j.ifacol.2015.06.143

Widhiarso, W., & Sumintono, B. (2016). Examining response aberrance as a cause of outliers in statistical analysis. Personality and Individual Differences, 98, 11–15. https://doi.org/10.1016/j.paid.2016.03.099

Woschank M., Steinwiedder, D., Kaiblinger, A., Miklautsch, P., Pacher, C. & Zsifkovits, H. (2022)The Integration of Smart Systems in the Context of Industrial Logistics in Manufacturing Enterprises. Procedia Computer Science. 200, 727-737.

Wouters, M., & Stecher, J. (2017). Development of real-time product cost measurement: A case study in a medium-sized manufacturing company. International Journal of Production Economics, 183, 235–244. https://doi.org/10.1016/j.ijpe.2016.10.018

Wu, S. I., & Chen, J. H. (2012). The performance evaluation and comparison based on enterprises passed or not passed with ISO accreditation: An appliance of BSC and ABC methods. International Journal of Quality and Reliability Management, 29(3), 295–319. https://doi.org/10.1108/02656711211216153

Xu B., Wang, H. & Li, J. (2023). Evaluation of operation cost and energy consumption of ports: comparative study on different container terminal layouts. Simulation Modelling Practice and Theory. 127, 1-29.

Xue, L., Wu, H., Zheng, H. & He, Z. (2023). Control chart pattern recognition for imbalanced data based on multi-feature fusion using convolutional neural network. Computers & Industrial Engineering. 182, 1-13.

Yamashita, C.T., Yamashita, S., Mabuchi, Y., Teramae, A., Matsuyama, T., Taguchi, Y., Mushika, T., Wada, Y., Novasari, S.F., Ikeda, J. & Ohya, Y. (2022). Sex determination of Japanese rhinoceros beetles, Trypoxylus dichotomus (Coleoptera: Scarabaeidae), based on their dropping shape. Advanced Powder Technology. 33(5), 1-7

Yang, C. H. (2018). An optimization portfolio decision model of life cycle activity-based costing with carbon footprint constraints for hybrid green power strategies. Computers and Operations Research, 96, 256–271. https://doi.org/10.1016/j.cor.2018.03.003

Yang, C. H., Lee, K. C., & Chen, H. C. (2016). Incorporating carbon footprint with activity-based costing constraints into sustainable public transport infrastructure project decisions. Journal of Cleaner Production, 133, 1154–1166. https://doi.org/10.1016/j.jclepro.2016.06.014

Yazid, A. M., Rijal, J. K., Awaluddin, M. S., & Sari, E. (2015). Pattern recognition on remanufacturing automotive component as support decision making using Mahalanobis-Taguchi system. Procedia CIRP, 26, 258–263. https://doi.org/10.1016/j.procir.2014.07.025

Yu, Y. R., Abbas, P. I., Smith, C. M., Carberry, K. E., Ren, H., Patel, B., Nuchtern, J. G., & Lopez, M. E. (2016). Time-driven activity-based costing to identify opportunities for cost reduction in pediatric appendectomy. Journal of Pediatric Surgery, 51(12), 1962– 1966. https://doi.org/10.1016/j.jpedsurg.2016.09.019

Yu, Y. R., Abbas, P. I., Smith, C. M., Carberry, K. E., Ren, H., Patel, B., Nuchtern, J. G., & Lopez, M. E. (2017). Time-driven activity-based costing: A dynamic value assessment model in pediatric appendicitis. Journal of Pediatric Surgery, 52(6), 1045– 1049. https://doi.org/10.1016/j.jpedsurg.2017.03.032

Yun, B. J., Prabhakar, A. M., Warsh, J., Kaplan, R., Brennan, J., Dempsey, K. E., & Raja, A. S. (2016). Time-Driven Activity-Based Costing in Emergency Medicine. Annals of Emergency Medicine, 67(6), 765–772. https://doi.org/10.1016/j.annemergmed.2015.08.004

.

Zezulka, F., Marcon, P., Vesely, I., & Sajdl, O. (2016). Industry 4.0 – An Introduction in thephenomenon. IFAC-PapersOnLine, 49(25), 8–12. https://doi.org/10.1016/j.ifacol.2016.12.002

Zhang, X., Lee, C. K. M., & Chen, S. (2012). Supplier evaluation and selection: A hybrid model based on DEAHP and ABC. International Journal of Production Research, 50(7), 1877–1889. https://doi.org/10.1080/00207543.2011.560908

Zhong, R. Y., Xu, X., Klotz, E., & Newman, S. T. (2017). Intelligent Manufacturing in the Context of Industry 4.0: A Review. Engineering, 3(5), 616–630. https://doi.org/10.1016/J.ENG.2017.05.015

Zhou, J., Xiahou, T. & Liu, Y. (2021). Multi-objective optimization-based TOPSIS method for sustainable product design under epistemic uncertainty. Applied Soft Computing. 98, 1-13.

Zhuang, Z. Y., & Chang, S. C. (2017). Deciding product mix based on time-driven activity-based costing by mixed integer programming. Journal of Intelligent Manufacturing, 28(4), 959–974. https://doi.org/10.1007/s10845-014-1032-2