1 PROCESS MINING IN BRAZIL: FIFTEEN YEARS - LIST OF ARTICLES THAT MAKE UP EACH SLR QUESTION ANSWER

Tabela 1.1: RQ1 - Distribution of articles by contribution group

Group (articles)	Total (%)
Review, presentation, and testing of existing tools and algorithms (VASCONCELOS; BERNARDINI; VITERBO, 2024), (NETO et al., 2021), (M. Valle; A.P. Santos; R. Loures, 2017), (D'CASTRO; OLIVEIRA; TERRA, 2018), (SZIMANSKI et al., 2013), (KALSING et al., 2010)	6 (9,2%)
New tools, algorithms, and approaches for process mining (BARBIERI et al., 2022), (COLONNA et al., 2024), (FANTINATO; PERES; REIJERS, 2023), (de Souza et al., 2023), (FANTINATO; PERES; REIJERS, 2021), (CIRNE et al., 2020a), (GONZáLEZ et al., 2019), (LIAO et al., 2014), (RICHETTI; BAIãO; SANTORO, 2014), (KALSING et al., 2014), (ESPOSITO et al., 2013), (FERREIRA; SZIMANSKI; RALHA, 2013), (KALSING et al., 2013), (KALSING; THOM; IOCHPE, 2010)	14 (21,5%)
New tools, approaches, and methodologies for evaluating results Maita et al. (2024), (MAITA et al., 2023)	2 (3,1%)
Conducting SLR or bibliographic analysis (SOUTHIER et al., 2023a), (IACHECEN et al., 2023), (DALLAGASSA et al., 2022a), (SATO et al., 2021), (ROMERO et al., 2021), (ROMERO et al., 2020), (BIAZUS et al., 2019), (GARCIA et al., 2019b), (FERNANDES et al., 2019), (SILVA, 2018), (MAITA et al., 2018), (YASMIN; BUKHSH; SILVA, 2018), (MAITA et al., 2015)	13 (20%)

Tabela 1.1 – *Continuation of the table from the previous page - RQ1*

Group (articles)	Total (%)
Approaches to solving event log problems (JUNIOR et al., 2023), (SATO et al., 2020), (SCHIRMER et al., 2018), (CERAVOLO et al., 2017), (BRANDãO; SANTORO; AZEVEDO, 2015)	5 (7,7%)
Approaches to detecting anomalous traces (JUNIOR et al., 2021), (TAVARES; JUNIOR, 2021), (NETO et al., 2021), (JUNIOR et al., 2020), (TAVARES et al., 2018), (JUNIOR et al., 2018), (BEZERRA; WAINER, 2013), (BEZERRA; WAINER, 2011)	8 (12,3%)
Approaches to solving concept drift (NETO et al., 2024), (SOUSA et al., 2024), (NETO et al., 2023), (RADUY et al., 2023), (SOUSA et al., 2021), (SOUSA; PERES, 2020), (TAVARES et al., 2019), (JUNIOR et al., 2018)	8 (12,3%)
Specific methodologies for business areas (LOPES et al., 2024), (ARAúJO et al., 2023), (DALLAGASSA et al., 2022b), (SOUZA et al., 2021), (SANTORO et al., 2020), (PEREIRA; SANTOS; MACENO, 2020)	6 (9,2%)
Approaches and algorithms for process prediction (NEUBAUER et al., 2023), (MáRQUEZ-CHAMORRO et al., 2020), (SANTOS et al., 2013)	3 (4,6%)

Source: the author

Tabela 1.2: RQ2 - Techniques used by publication

Article	Discovery	Conf. checking	Enhancement
(VERCOSA et al., 2024)	x	-	-
(LOPES et al., 2024)	x	-	-
(SANTOS; LOURES; SANTOS, 2024)	x	-	-
(SANTOS et al., 2024)	x	-	-

Tabela 1.2 – *Continuation of the table from the previous page - RQ2*

Article	Discovery	Conf. checking	Enhancement
(OLIVEIRA et al., 2024)	x	-	-
(MICOSKY et al., 2024)	x	-	-
(AKHRAMOVICH; SERRAL; CETINA, 2024)	x	-	-
(ANTUNES et al., 2023)	x	-	-
(FANTINATO; PERES; REIJERS, 2023)	x	-	-
(SOUTHIER et al., 2023b)	x	-	-
(PEGORARO et al., 2023)	x	-	x
(de Souza et al., 2023)	-	x	x
(MAITA et al., 2023)	x	-	-
(NETO et al., 2023)	x	-	-
(PRADO et al., 2023)	x	-	-
(ARAúJO et al., 2023)	x	-	-
(CASTRO et al., 2022)	x	-	-
(LEANDRO et al., 2022)	x	-	-
(UNGER et al., 2022)	x	-	-
(DALLAGASSA et al., 2022c)	x	-	-
(NEUBAUER et al., 2022)	x	x	-
(PORTELA; CATAPAN; DESCHAMPS, 2022)	x	-	-
(BORGES et al., 2022)	x	-	-
(BOARETO et al., 2022)	x	-	-
(FERRONATO; SCALABRIN; CARVALHO, 2022)	x	x	-
(ALVES et al., 2022)	x	x	-
(NEUBAUER et al., 2022)	x	-	-
(LUNA et al., 2021)	x	-	-
(MELLO; REVOREDO; SANTORO, 2021)	x	-	-
(CHOUEIRI; Portela Santos, 2021)	x	-	-

Tabela 1.2 – *Continuation of the table from the previous page - RQ2*

Article	Discovery	Conf. checking	Enhan-cement
(REAL; PIMENTEL, 2021)	x	-	-
(NEDOPETALSKI; FREITAS, 2021b)	x	-	-
(CHOUEIRI; SANTOS, 2021)	x	-	-
(FERRONATO; SCALABRIN, 2021)	x	-	-
(RUSCHEL; Rocha Loures; SANTOS, 2021)	x	x	-
(VERçOSA et al., 2021)	x	-	-
(NEDOPETALSKI; FREITAS, 2021a)	x	-	-
(REAL; PIMENTEL; BRAGA, 2021)	x	-	-
(NEUBAUER et al., 2021)	x	x	-
(LEANDRO et al., 2021)	x	-	-
(SOUZA et al., 2021)	x	x	x
(FANTINATO; PERES; REIJERS, 2021)	x	-	-
(KRUGGER et al., 2021)	x	x	-
(UNGER et al., 2021)	x	-	-
(TAVARES; JUNIOR, 2021)	-	x	-
(NETO et al., 2021)	-	x	-
(APUNIKE et al., 2020)	x	-	-
(PIMENTEL et al., 2020)	x	-	-
(SANTORO et al., 2020)	x	x	-
(BARBASTEFANO; CARVALHO; LIPPI, 2020)	x	x	-
(DETRO et al., 2020)	x	-	-
(DUARTE, 2020)	x	x	x
(PEREIRA; SANTOS; MACENO, 2020)	x	x	x
(RUSCHEL; SANTOS; LOURES, 2020)	x	-	-
(CIRNE et al., 2020b)	x	x	-
(CHOUEIRI et al., 2020)	x	-	-
(SATO et al., 2020)	x	x	-
(SATO et al., 2020)	-	x	-

Tabela 1.2 – *Continuation of the table from the previous page - RQ2*

Article	Discovery	Conf. checking	Enhancement
(SANTOS; SOUTHIER; SCALABRIN, 2020)	x	-	x
(JUNIOR et al., 2020)	-	x	-
(CIRNE et al., 2020a)	x	x	-
(MáRQUEZ-CHAMORRO et al., 2020)	x	x	-
(AZEVEDO et al., 2020)	x	-	-
(FLORES et al., 2020)	x	-	-
(MELLO; REVOREDO; SANTORO, 2019)	x	-	-
(ANTUNES et al., 2019)	x	-	-
(NEIRA et al., 2019)	x	-	-
(ROSA; CAMPOS; CAVALCANTI, 2019)	x	-	-
(GONZáLEZ et al., 2019)	x	x	-
(VAKULENKO et al., 2019)	x	x	-
(AMARAL et al., 2019)	x	-	-
(GARCIA et al., 2019a)	x	-	-
(MAIORKI; SANTOS; LOURES, 2019)	x	-	-
(UHLMANN; SANTOS; MENDES, 2019)	x	-	-
(MENDES et al., 2018)	x	-	-
(SANTOS et al., 2018)	x	x	-
(JUNIOR et al., 2018)	x	x	-
(D'CASTRO; OLIVEIRA; TERRA, 2018)	x	-	-
(AMARAL; FANTINATO; PERES, 2018)	x	-	-
(BUKHSH et al., 2018)	x	-	-
(GERHARDT; VALIATI; Canto dos Santos, 2018)	x	-	x
(SCHIRMER et al., 2018)	x	-	-
(TAVARES et al., 2018)	x	x	-
(de Alvarenga et al., 2018)	x	-	-
(VRIES et al., 2017)	-	x	-
(DETRO et al., 2017)	x	-	x

Tabela 1.2 – *Continuation of the table from the previous page - RQ2*

Article	Discovery	Conf. checking	Enhan- cement
(VALERIO et al., 2017)	x	-	-
(RIZ; SANTOS; LOURES, 2017)	x	-	-
(CERAVOLO et al., 2017)	x	-	-
(MEINCHEIM et al., 2017)	x	-	-
(MAITA et al., 2017)	x	x	-
(dos Santos et al., 2017)	x	-	-
(RUSCHEL; SANTOS; LOURES, 2017)	x	-	-
(PIECHNICKI; LOURES; SANTOS, 2017)	x	-	-
(M. Valle; A.P. Santos; R. Loures, 2017)	x	x	-
(RICHETTI et al., 2017)	x	-	-
(RIZ; SANTOS; LOURES, 2016a)	x	x	x
(RIZ; SANTOS; LOURES, 2016b)	x	-	-
(GANDULFO et al., 2016)	x	-	-
(BRANDãO; SANTORO; AZEVEDO, 2015)	x	-	-
(ALVARENGA et al., 2015)	x	-	-
(TRINKENREICH et al., 2015)	x	-	-
(FERREIRA; SZIMANSKI; RALHA, 2014)	-	-	x
(LIAO et al., 2014)	x	-	-
(KALSING et al., 2014)	x	-	-
(GOMES et al., 2014)	x	-	-
(DETRO et al., 2014)	x	-	-
(RICHETTI; BAIãO; SANTORO, 2014)	x	-	-
(BEZERRA; WAINER, 2013)	-	x	-
(FERREIRA; SZIMANSKI; RALHA, 2013)	x	-	-
(ESPOSITO et al., 2013)	x	-	-
(SANTOS et al., 2013)	x	x	-
(SZIMANSKI et al., 2013)	x	-	x
(KALSING et al., 2013)	x	-	-
(BEZERRA; WAINER, 2011)	x	x	-

Tabela 1.2 – *Continuation of the table from the previous page - RQ2*

Article	Discovery	Conf. checking	Enhan-cement
(SZIMANSKI; RALHA; JACOBI, 2011)	x	-	-
(LEMOS et al., 2011)	x	x	-
(KALSING; THOM; IOCHPE, 2010)	x	-	x
(KALSING et al., 2010)	x	-	-
(CORDEIRO et al., 2009)	x	-	-
(CRERIE; BAIãO; SANTORO, 2009)	x	-	-
(BEZERRA; WAINER; AALST, 2009)	x	x	-

Source: the author

Tabela 1.3: RQ3 - Distribution of articles by challenge

Challenge	(Amount) / Article
1. Log quality	(17) (LOPES et al., 2024), (FERNANDES et al., 2023), (PEGORARO et al., 2023), (PRADO et al., 2023), (ARAúJO et al., 2023), (PORTELA; CATAPAN; DESCHAMPS, 2022), (REAL; PIMENTEL; BRAGA, 2021), (SANTORO et al., 2020), (PEREIRA; SANTOS; MACENO, 2020), (RUSCHEL; SANTOS; LOURES, 2020), (GARCIA et al., 2019a), (GERHARDT; VALIATI; Canto dos Santos, 2018), (VRIES et al., 2017), (VALERIO et al., 2017), (MAITA et al., 2017) , (RIZ; SANTOS; LOURES, 2016a), (LEMOS et al., 2011)
2. Log size/complexity	(6) (ARAúJO et al., 2023), (VERCOSA; BASTOS-FILHO; BEZERRA, 2023), (GONZáLEZ et al., 2019), (GARCIA et al., 2019a), (JUNIOR et al., 2018), (VALERIO et al., 2017)
3. Example dataset (benchmark)	(0) there no citations.

Tabela 1.3 – *Continuation of the table from the previous page - RQ3*

Challenge	(Amount) / Article
4. Concept Drift	(0) there no citations.
5. Representational bias	(0) there no citations.
6. Balance between quality criteria	(4) (KRUGGER et al., 2021), (RUSCHEL; SANTOS; LOURES, 2020), (GERHARDT; VALIATI; Canto dos Santos, 2018), (GONCALVES; SANTORO; BAIAO, 2009)
7. Inter-Organization Mining	(1) (DALLAGASSA et al., 2022a),
8. Operational support	(1) (DALLAGASSA et al., 2022a)
9. Combined with other techniques	(0) there no citations.
10. Usability for non-experts	(0) there no citations.
11. Understanding for non-experts	(2) (D'CASTRO; OLIVEIRA; TERRA, 2018), (RIZ; SANTOS; LOURES, 2016a)

Source: the author

REFERÊNCIAS

AKHRAMOVICH, K.; SERRAL, E.; CETINA, C. A systematic literature review on the application of process mining to industry 4.0. **Knowledge and Information Systems**, v. 172, p. 121021, 2024. ISSN 0219-3116. Available from Internet: <https://doi.org/10.1007/s10115-023-02042-x>.

ALVARENGA, S. C. D. et al. Discovering attack strategies using process mining. In: E., B.; T., A. (Ed.). [S.l.]: International Academy, Research and Industry Association, IARIA, 2015. p. 119 – 125. ISBN 978-161208411-4.

ALVES, R. M. et al. Context-aware completion time prediction for business process monitoring. **Lecture Notes in Networks and Systems**, v. 469 LNNS, p. 355 – 365, 2022. ISSN 23673370.

AMARAL, C. A. L. et al. Enhancing completion time prediction through attribute selection. **Lecture Notes in Business Information Processing**, v. 346, p. 3 – 23, 2019. ISSN 18651348.

AMARAL, C. A. L. D.; FANTINATO, M.; PERES, S. M. Attribute selection with filter and wrapper: An application on incident management process. In: M., G. et al. (Ed.). [S.l.]: Institute of Electrical and Electronics Engineers Inc., 2018. p. 679 – 682. ISBN 978-839494197-0.

ANTUNES, B. B. P. et al. A solution framework based on process mining, optimization, and discrete-event simulation to improve queue performance in an emergency department. **Lecture Notes in Business Information Processing**, Springer, v. 362 LNBIP, p. 583 – 594, 2019.

ANTUNES, B. B. P. et al. Antimicrobial consumption and drug utilization patterns among COVID-19 and non-COVID-19 patients. **Journal of Antimicrobial Chemotherapy**, v. 78, n. 3, p. 840–849, 02 2023. ISSN 0305-7453.

APUNIKE, A. C. et al. Analyses of public health databases via clinical pathway modelling: Tbweb. **Lecture Notes in Computer Science (including subseries Lecture Notes in Artificial Intelligence and Lecture Notes in Bioinformatics)**, Springer Science and Business Media Deutschland GmbH, p. 550 – 562, 2020.

ARAúJO, T. D. S. et al. Investigating the Usability and Comprehensibility of Process Mining Tools Within an Application-Specific Context. In: **2023 IEEE International Conference on Systems, Man, and Cybernetics (SMC)**. Honolulu, Oahu, HI, USA: IEEE, 2023. p. 4337–4342. ISBN 9798350337020.

AZEVEDO, L. G. et al. Experiment workbench: A co-agent for assisting data scientists. In: **PROCEEDINGS OF THE 22ND INTERNATIONAL CONFERENCE ON ENTERPRISE INFORMATION SYSTEMS (ICEIS), VOL 1**. [S.l.]: SCITEPRESS, 2020. p. 588–595. ISBN 978-989-758-423-7.

BARBASTEFANO, R. G.; CARVALHO, D. M. de A.; LIPPI, M. C. Process mining classification with a weightless neural network. In: . [S.l.]: Springer, 2020. v. 337, p. 349 – 356. ISBN 978-303056919-8. ISSN 21941009.

BARBIERI, L. et al. A natural language querying interface for process mining. **Journal of Intelligent Information Systems**, v. 61, 11 2022.

BEZERRA, F.; WAINER, J. Fraud detection in process aware systems. **International Journal of Business Process Integration and Management**, n. 2, p. 121 – 129, 2011. ISSN 17418763.

BEZERRA, F.; WAINER, J. Algorithms for anomaly detection of traces in logs of process aware information systems. **Information Systems**, 2013. ISSN 0306-4379.

BEZERRA, F.; WAINER, J.; AALST, W. V. D. Anomaly detection using process mining. **Lecture Notes in Business Information Processing**, p. 149 – 161, 2009.

BIAZUS, M. et al. Software resource recommendation for process execution based on the organization's profile. **Lecture Notes in Computer Science (including subseries Lecture Notes in Artificial Intelligence and Lecture Notes in Bioinformatics)**, v. 11707 LNCS, p. 118 – 128, 2019. ISSN 03029743.

BOARETO, P. A. et al. A hybrid model to support decision making in the stroke clinical pathway. **Simulation Modelling Practice and Theory**, v. 120, p. 102602, 2022. ISSN 1569-190X.

BORGES, R. et al. Use of technology in industrial maintenance management: Simulation framework to aid decision making. **REVISTA GESTAO & TECNOLOGIA-JOURNAL OF MANAGEMENT AND TECHNOLOGY**, v. 22, n. 2, p. 199–226, APR-JUN 2022. ISSN 1677-9479.

BRANDãO, B. C. P.; SANTORO, F. M.; AZEVEDO, L. G. Towards aspects identification in business process through process mining. In: . [S.l.: s.n.], 2015. p. 741 – 748.

BUKHSH, F. A. et al. From traditional to technologically influenced audit: A compliance perspective. In: **2018 International Conference on Frontiers of Information Technology (FIT)**. [S.l.: s.n.], 2018. p. 164–169. ISSN 2334-3141.

CASTRO, M. A. et al. Mineração de processos aplicada à auditoria interna na marinha do brasil. In: **Anais do XXXVII Simpósio Brasileiro de Bancos de Dados**. Porto Alegre, RS, Brasil: SBC, 2022. p. 241–253. ISSN 2763-8979.

CERAVOLO, P. et al. Toward a new generation of log pre-processing methods for process mining. **Lecture Notes in Business Information Processing**, p. 55 – 70, 2017.

CHOUEIRI, A. C.; Portela Santos, E. A. Discovery of path-attribute dependency in manufacturing environments: A process mining approach. **Journal of Manufacturing Systems**, v. 61, p. 54–65, 2021. ISSN 0278-6125.

CHOUEIRI, A. C.; SANTOS, E. A. P. Multi-product scheduling through process mining: bridging optimization and machine process intelligence. **Journal of Intelligent Manufacturing**, v. 32, n. 6, p. 1649–1667, aug. 2021. ISSN 0956-5515, 1572-8145.

CHOUEIRI, A. C. et al. An extended model for remaining time prediction in manufacturing systems using process mining. **Journal of Manufacturing Systems**, v. 56, p. 188–201, 2020. ISSN 0278-6125. Available from Internet: <https://www.sciencedirect.com/science/article/pii/S0278612520300935>.

CIRNE, R. et al. Data mining for process modeling: A clustered process discovery approach. In: **2020 15th Conference on Computer Science and Information Systems (FedCSIS)**. [S.l.: s.n.], 2020. p. 587–590.

CIRNE, R. et al. Data mining for process modeling: A clustered process discovery approach. In: **2020 15th Conference on Computer Science and Information Systems (FedCSIS)**. [S.l.: s.n.], 2020. p. 587–590.

COLONNA, J. G. et al. Process mining embeddings: Learning vector representations for petri nets. **Intelligent Systems with Applications**, v. 23, 2024. Cited by: 0; All Open Access, Gold Open Access.

CORDEIRO, W. L. d. C. et al. Changeminer: A solution for discovering it change templates from past execution traces. In: **2009 IFIP/IEEE International Symposium on Integrated Network Management**. [S.l.: s.n.], 2009. p. 97–104.

CRERIE, R.; BAIãO, F. A.; SANTORO, F. M. Discovering business rules through process mining. **Lecture Notes in Business Information Processing**, Springer Verlag, p. 136 – 148, 2009. ISSN 18651348.

DALLAGASSA, M. R. et al. Opportunities and challenges for applying process mining in healthcare: a systematic mapping study. **Journal of Ambient Intelligence and Humanized Computing**, v. 13, p. 165–182, jan. 2022. ISSN 1868-5137, 1868-5145.

DALLAGASSA, M. R. et al. Applying process mining in health technology assessment. **Health and Technology**, v. 12, n. 5, p. 931–941, sep. 2022. ISSN 2190-7188, 2190-7196.

DALLAGASSA, M. R. et al. Applying process mining in health technology assessment. **Health and Technology**, v. 12, n. 5, p. 931–941, sep. 2022. ISSN 2190-7188, 2190-7196.

D'CASTRO, R. J.; OLIVEIRA, A. L. I.; TERRA, A. H. Process mining discovery techniques in a low-structured process works? In: **2018 7th Brazilian Conference on Intelligent Systems (BRACIS)**. [S.l.: s.n.], 2018. p. 200–205.

de Alvarenga, S. C. et al. Process mining and hierarchical clustering to help intrusion alert visualization. **Computers Security**, p. 474–491, 2018. ISSN 0167-4048.

de Souza, C. P. et al. Trace selection and allocation for log-move audit of business process directly-follows graphs. **Information Systems**, v. 112, p. 102143, 2023. ISSN 0306-4379.

DETRO, S. P. et al. Process mining in healthcare insurance companies: Identifying guidelines and practices. In: . [S.l.]: American Society for Engineering Management, 2014.

DETRO, S. P. et al. Managing business process variability through process mining and semantic reasoning: An application in healthcare. **IFIP Advances in Information and Communication Technology**, p. 333 – 340, 2017.

DETRO, S. P. et al. Applying process mining and semantic reasoning for process model customisation in healthcare. **Enterprise Information Systems**, v. 14, n. 7, p. 983 – 1009, 2020. ISSN 17517575.

dos Santos, C. F. et al. Mapping the conceptual relationship among data analysis, knowledge generation and decision-making in industrial processes. **Procedia Manufacturing**, p. 1751–1758, 2017. ISSN 2351-9789.

DUARTE, C. H. C. On what goes on with goal-oriented healthcare equipment regulations: An exploratory case study on the diagnostic imaging equipment industry in brazil. **IEEE Access**, v. 8, p. 58559–58574, 2020.

ESPOSITO, P. M. et al. Mana: Identifying and mining unstructured business processes. **Lecture Notes in Business Information Processing**, p. 199 – 204, 2013.

FANTINATO, M.; PERES, S. M.; REIJERS, H. A. X-processes: Discovering more accurate business process models with a genetic algorithms method. In: **2021 IEEE 25th International Enterprise Distributed Object Computing Conference (EDOC)**. [S.l.: s.n.], 2021.

FANTINATO, M.; PERES, S. M.; REIJERS, H. A. X-processes: Process model discovery with the best balance among fitness, precision, simplicity, and generalization through a genetic algorithm. **Information Systems**, v. 119, p. 102247, 2023. ISSN 0306-4379.

FERNANDES, A. G. L. et al. Impact of non-fitting cases for remaining time prediction in a multi-attribute process-aware method. In: . [S.l.: s.n.], 2023. v. 3350, p. 33 – 45.

FERNANDES, E. C. et al. Machine learning and process mining applied to process optimization: Bibliometric and systemic analysis. **Procedia Manufacturing**, p. 84–91, 2019. ISSN 2351-9789.

FERREIRA, D. R.; SZIMANSKI, F.; RALHA, C. G. A hierarchical markov model to understand the behaviour of agents in business processes. **Lecture Notes in Business Information Processing**, p. 150 – 161, 2013.

FERREIRA, D. R.; SZIMANSKI, F.; RALHA, C. G. Improving process models by mining mappings of low-level events to high-level activities. **Journal of Intelligent Information Systems**, p. 379–407, 2014.

FERRONATO, J. J.; SCALABRIN, E. E. Pm2sim: The automated creation of a simulation model from process mining. In: **2021 IEEE International Conference on Systems, Man, and Cybernetics (SMC)**. [S.l.: s.n.], 2021. p. 2232–2237.

FERRONATO, J. J.; SCALABRIN, E. E.; CARVALHO, D. R. Pm4sos: low-effort resource allocation optimization in a dynamic environment. In: **2022 IEEE International Conference on Systems, Man, and Cybernetics (SMC)**. [S.l.: s.n.], 2022. p. 1742–1747. ISSN 2577-1655.

FLORES, M. F. et al. Towards a conceptual model for undesired situation detection through process mining. In: **PROCEEDINGS OF THE 22ND INTERNATIONAL CONFERENCE ON ENTERPRISE INFORMATION SYSTEMS (ICEIS), VOL 2**. [S.l.]: SCITEPRESS, 2020. p. 809–816.

GANDULFO, P. et al. Redução de custos nas organizações públicas com método de mineração de processos: um estudo de caso no controle de férias. In: **Anais do XII**

Simpósio Brasileiro de Sistemas de Informação. Porto Alegre, RS, Brasil: SBC, 2016. p. 589–596.

GARCIA, C. d. S. et al. Getting insights to improve business processes with agility: A case study using process mining. In: **2019 IEEE International Conference on Systems, Man and Cybernetics (SMC)**. [S.l.: s.n.], 2019. p. 1336–1343.

GARCIA, C. dos S. et al. Process mining techniques and applications – a systematic mapping study. **Expert Systems with Applications**, p. 260–295, 2019. Available from Internet: <https://www.sciencedirect.com/science/article/pii/S0957417419303161>.

GERHARDT, R.; VALIATI, J. F.; Canto dos Santos, J. V. An investigation to identify factors that lead to delay in healthcare reimbursement process: A brazilian case. **Big Data Research**, v. 13, p. 11–20, 2018. ISSN 2214-5796. Big Medical/Healthcare Data Analytics.

GOMES, T. L. et al. Mining reuse processes. In: . [S.l.: s.n.], 2014. p. 179 – 191.

GONCALVES, J. C. d. A.; SANTORO, F. M.; BAIAO, F. A. Business process mining from group stories. In: **2009 13th International Conference on Computer Supported Cooperative Work in Design**. [S.l.: s.n.], 2009. p. 161–166.

GONZáLEZ, S. F. et al. Visual filtering tools and analysis of case groups for process discovery. **Lecture Notes in Business Information Processing**, v. 363, p. 303 – 323, 2019. ISSN 18651348.

IACHECEN, F. et al. Is it possible to automate the discovery of process maps for the time-driven activity-based costing method? A systematic review. **BMC Health Serv Res**, v. 23, n. 1, p. 1408, dec. 2023. ISSN 1472-6963.

JUNIOR, E. R. F. et al. Clustering analysis and frequent pattern mining for process profile analysis: An exploratory study for object-centric event logs. **Lecture Notes in Business Information Processing**, v. 468 LNBIP, p. 269 – 281, 2023.

JUNIOR, S. B. et al. Anomaly detection on event logs with a scarcity of labels. In: **2020 2nd International Conference on Process Mining (ICPM)**. [S.l.: s.n.], 2020. p. 161–168.

JUNIOR, S. B. et al. Evaluating trace encoding methods in process mining. **Lecture Notes in Computer Science (including subseries Lecture Notes in Artificial Intelligence and Lecture Notes in Bioinformatics)**, v. 12611 LNCS, p. 174 – 189, 2021. ISSN 03029743.

JUNIOR, S. B. et al. A framework for human-in-the-loop monitoring of concept-drift detection in event log stream. In: **Companion Proceedings of the The Web Conference 2018**. Republic and Canton of Geneva, CHE: International World Wide Web Conferences Steering Committee, 2018. p. 319–326.

KALSING, A.; THOM, L. H.; IOCHPE, C. An incremental process mining algorithm. In: . [S.l.: s.n.], 2010. v. 1 DISI, p. 263 – 268. ISBN 978-989842504-1.

KALSING, A. C. et al. Evolutionary learning of business process models from legacy systems using incremental process mining. In: . [S.l.: s.n.], 2013. p. 58 – 69.

KALSING, A. C. et al. Re-learning of business process models from legacy system using incremental process mining. **Lecture Notes in Business Information Processing**, 2014. ISSN 18651348.

KALSING, A. C. et al. An incremental process mining approach to extract knowledge from legacy systems. In: **2010 14th IEEE International Enterprise Distributed Object Computing Conference**. [S.l.: s.n.], 2010. ISSN 1541-7719.

KRUGGER, E. M. et al. Business process analysis based on anomaly detection in event logs: A study on an incident management case. In: . [S.l.: s.n.], 2021. p. 1071 – 1080. ISBN 978-099813314-0. ISSN 15301605.

LEANDRO, G. D. S. et al. Analysis of stroke assistance in covid-19 pandemic by process mining techniques. **Studies in Health Technology and Informatics**, v. 294, p. 48 – 52, 2022. ISSN 09269630.

LEANDRO, G. dos S. et al. Process mining leveraging the analysis of patient journey and outcomes: Stroke assistance during the covid-19 pandemic. **Knowledge Management and E-Learning**, v. 13, n. 4, p. 421 – 437, 2021.

LEMOS, A. M. et al. Using process mining in software development process management: A case study. In: **2011 IEEE International Conference on Systems, Man, and Cybernetics**. [S.l.: s.n.], 2011. p. 1181–1186.

LIAO, Y.-X. et al. The proposition of a framework for semantic process mining. **Advanced Materials Research**, v. 1051, p. 995 – 999, 2014. ISSN 10226680.

LOPES, P. V. et al. Process mining and production routing fast profiling for data-driven digital twins. In: D., G. et al. (Ed.). [S.l.]: European Council for Modelling and Simulation, 2024. v. 38, n. 1, p. 171 – 177. ISSN 25222414.

LUNA, M. et al. Vector space models for trace clustering: a comparative study. In: **Anais do XVIII Encontro Nacional de Inteligência Artificial e Computacional**. Porto Alegre, RS, Brasil: SBC, 2021. p. 446–457. ISSN 2763-9061.

M. Valle, A.; A.P. Santos, E.; R. Loures, E. Applying process mining techniques in software process appraisals. **Information and Software Technology**, v. 87, p. 19–31, 2017.

MAIORKI, H. G.; SANTOS, E. A. P.; LOURES, E. de F. R. Multi-level log xes format: A rami4.0 perspective. In: **2019 IEEE International Conference on Systems, Man and Cybernetics (SMC)**. [S.l.: s.n.], 2019. p. 1614–1620. ISSN 2577-1655.

MAITA, A. R. C. et al. Mining unstructured processes: An exploratory study on a distance learning domain. In: **2017 International Joint Conference on Neural Networks (IJCNN)**. [S.l.: s.n.], 2017. p. 3240–3247.

MAITA, A. R. C. et al. Towards a business-oriented approach to visualization-supported interpretability of prediction results in process mining. In: J., F. et al. (Ed.). [S.l.: s.n.], 2023. p. 395 – 406. ISBN 978-989758648-4.

MAITA, A. R. C. et al. Supporting interpretability in predictive process monitoring using process maps. **Lecture Notes in Business Information Processing**, v. 518 LNBIP, p. 230 – 246, 2024.

MAITA, A. R. C. et al. Process mining through artificial neural networks and support vector machines: A systematic literature review. **Business Process Management Journal**, 2015. ISSN 14637154.

MAITA, A. R. C. et al. A systematic mapping study of process mining. **Enterprise Information Systems**, v. 12, p. 505 – 549, 2018.

MEINCHEIM, A. et al. Combining process mining with trace clustering: Manufacturing shop floor process - an applied case. In: **2017 IEEE 29th International Conference on Tools with Artificial Intelligence (ICTAI)**. [S.l.: s.n.], 2017.

MELLO, P. O. T.; REVOREDO, K.; SANTORO, F. Business process failure prediction: a case study. In: **Anais do VII Symposium on Knowledge Discovery, Mining and Learning**. Porto Alegre, RS, Brasil: SBC, 2019. p. 89–96. ISSN 2763-8944.

MELLO, P. O. T.; REVOREDO, K.; SANTORO, F. M. It incident solving domain experiment on business process failure prediction. **Journal of Information and Data Management**, v. 11, n. 1, Feb. 2021.

MENDES, V. et al. Kanban and process mining in the task management. In: **Anais do XVII Simpósio Brasileiro de Qualidade de Software**. Porto Alegre, RS, Brasil: SBC, 2018. p. 269–278.

MICOSKY, A. L. et al. Process mining and topsis analysis for identifying the most complex combination vehicle model and paint color – a case study. **Lecture Notes in Mechanical Engineering**, p. 509 – 516, 2024.

MáRQUEZ-CHAMORRO, A. E. et al. Context-aware process performance indicator prediction. **IEEE Access**, v. 8, p. 222050–222063, 2020. ISSN 2169-3536.

NEDOPETALSKI, F.; FREITAS, J. C. J. de. Process mining and simulation for a p-time petri net model with hybrid resources. In: **2021 Systems and Information Engineering Design Symposium (SIEDS)**. [S.l.: s.n.], 2021. p. 1–6.

NEDOPETALSKI, F.; FREITAS, J. C. Jeske de. Event logs generated fromsimulation of different scenarios and analysed with process mining. **REVISTA BRASILEIRA DE COMPUTACAO APLICADA**, v. 13, n. 2, p. 73–82, JUL 2021. ISSN 2176-6649.

NEIRA, R. A. Q. et al. Analysis and optimization of a sepsis clinical pathway using process mining. **Lecture Notes in Business Information Processing**, 2019. ISSN 18651348.

NETO, A. C. M. et al. Revisiting the Transition Matrix-Based Concept Drift Approach: Improving the Detection Task Reliability Through Additional Experimentation. **SN COMPUT. SCI.**, v. 5, n. 1, p. 188, jan. 2024. ISSN 2661-8907.

NETO, A. C. M. et al. Towards a transition matrix-based concept drift approach: Experiments on the detection task. In: J., F. et al. (Ed.). [S.l.]: Science and Technology Publications, Lda, 2023. ISBN 978-989758648-4.

NETO, R. V. et al. On the use of online clustering for anomaly detection in trace streams. In: **Anais do XVII Simpósio Brasileiro de Sistemas de Informação**. Porto Alegre, RS, Brasil: SBC, 2021.

NEUBAUER, T. et al. Transparency promoted by process mining: an exploratory study in a public health product management process. In: **Anais do X Workshop de Computação Aplicada em Governo Eletrônico**. Porto Alegre, RS, Brasil: SBC, 2022. p. 37–48. ISSN 2763-8723.

NEUBAUER, T. R. et al. Interactive trace clustering to enhance incident completion time prediction in process mining. In: . [S.l.]: CEUR-WS, 2023. v. 3350, p. 8 – 20.

NEUBAUER, T. R. et al. Resource allocation optimization in business processes supported by reinforcement learning and process mining. **Lecture Notes in Computer Science (including subseries Lecture Notes in Artificial Intelligence and Lecture Notes in Bioinformatics)**, v. 13653 LNAI, p. 580 – 595, 2022. ISSN 03029743.

NEUBAUER, T. R. et al. Visualization for enabling human-in-the-loop in trace clustering-based process mining tasks. In: **2021 IEEE International Conference on Big Data (Big Data)**. [S.l.: s.n.], 2021. p. 3548–3556.

OLIVEIRA, A. B. de et al. A hybrid model to support decision making in manufacturing. **Lecture Notes in Mechanical Engineering**, p. 651 – 658, 2024.

PEGORARO, F. et al. Integrating process mining and simulation to support patient flow management in emergency departments. **REVISTA DE GESTAO E SECRETARIADO-GESEC**, v. 14, n. 4, p. 6260–6274, 2023. ISSN 2178-9010.

PEREIRA, G. B.; SANTOS, E. A. P.; MACENO, M. M. C. Correction to: Process mining project methodology in healthcare: a case study in a tertiary hospital. **Network Modeling Analysis in Health Informatics and Bioinformatics**, dec. 2020. ISSN 2192-6662, 2192-6670.

PIECHNICKI, F.; LOURES, E.; SANTOS, E. A conceptual framework of knowledge conciliation to decision making support in rcm deployment. **Procedia Manufacturing**, 2017.

PIMENTEL, E. et al. Análise dos resultados de insucesso escolar com o suporte de mineração de processos educacionais. In: **Anais do XXXI Simpósio Brasileiro de Informática na Educação**. Porto Alegre, RS, Brasil: SBC, 2020. p. 132–141.

PORTELA, W.; CATAPAN, M. F.; DESCHAMPS, F. Process mining in automotive dealerships: Case study, analysis and business; [mineraÇÃo de processos em concessionarias da indÚstria automotiva: Estudo de caso, anÁlise e negÓcio]. **International Journal of Professional Business Review**, 2022. ISSN 25253654.

PRADO, R. R. D. et al. Agile dmaic cycle: incorporating process mining and support decision. **INTERNATIONAL JOURNAL OF LEAN SIX SIGMA**, 2023 OCT 3 2023. ISSN 2040-4166.

RADUY, C. et al. A benchmark of process drift detection tools: Experimental protocol and statistical analysis. In: **ARTIFICIAL INTELLIGENCE AND SOFT**

COMPUTING, ICAISC 2022, PT II. [S.l.]: SPRINGER INTERNATIONAL PUBLISHING AG, 2023. (Lecture Notes in Artificial Intelligence, v. 13589), p. 141–151. ISBN 978-3-031-23479-8; 978-3-031-23480-4. ISSN 2945-9133.

REAL, E. M.; PIMENTEL, E. P. Guidelines for data collection planning in virtual learning environments for application of educational process mining. In: **2021 XVI Latin American Conference on Learning Technologies (LACLO)**. [S.l.: s.n.], 2021. p. 123–129.

REAL, E. M.; PIMENTEL, E. P.; BRAGA, J. C. Analysis of learning behavior in a programming course using process mining and sequential pattern mining. In: **2021 IEEE Frontiers in Education Conference (FIE)**. [S.l.: s.n.], 2021. p. 1–9.

RICHETTI, P. H. P.; BAIãO, F. A.; SANTORO, F. M. Declarative process mining: Reducing discovered models complexity by pre-processing event logs. **Lecture Notes in Computer Science (including subseries Lecture Notes in Artificial Intelligence and Lecture Notes in Bioinformatics)**, 2014.

RICHETTI, P. H. P. et al. Analysis of knowledge-intensive processes focused on the communication perspective. **Lecture Notes in Computer Science (including subseries Lecture Notes in Artificial Intelligence and Lecture Notes in Bioinformatics)**, Springer Verlag, v. 10445 LNCS, p. 269 – 285, 2017. ISSN 03029743.

RIZ, G.; SANTOS, E.; LOURES, E. Análise de conformidade na Área de saúde com o suporte da mineração de processos. In: **Anais do XII Simpósio Brasileiro de Sistemas de Informação**. Porto Alegre, RS, Brasil: SBC, 2016. p. 052–059.

RIZ, G.; SANTOS, E. A. P.; LOURES, E. D. F. R. Process mining to knowledge discovery in healthcare processes. In: . [S.l.: s.n.], 2016.

RIZ, G.; SANTOS, E. A. P.; LOURES, E. de F. R. Interoperability assessment in health systems based on process mining and mcda methods. **Advances in Intelligent Systems and Computing**, v. 569, 2017.

ROMERO, M. et al. A bibliographical survey on enterprise architecture with togaf and process mining to support organizational change in information technology projects; [um levantamento bibliográfico sobre arquitetura corporativa com togaf e mineração de processos no apoio à mudança organizacional em projetos de tecnologia da informação]. **RISTI - Revista Iberica de Sistemas e Tecnologias de Informacao**, v. 2020, p. 579 – 591, 2020.

ROMERO, M. et al. Literature review of methods applied in intelligent mapping and redesign processes; [revisão da literatura dos métodos aplicados no mapeamento e redesenho inteligente de processos]. **RISTI - Revista Iberica de Sistemas e Tecnologias de Informacao**, Associacao Iberica de Sistemas e Tecnologias de Informacao, 2021.

ROSA, N. S.; CAMPOS, G. M.; CAVALCANTI, D. J. Lightweight formalisation of adaptive middleware. **Journal of Systems Architecture**, v. 97, p. 54–64, 2019. ISSN 1383-7621.

RUSCHEL, E.; Rocha Loures, E. de F.; SANTOS, E. A. P. Performance analysis and time prediction in manufacturing systems. **Computers Industrial Engineering**, v. 151, p. 106972, 2021. ISSN 0360-8352.

RUSCHEL, E.; SANTOS, E. A. P.; LOURES, E. D. F. R. Establishment of maintenance inspection intervals: an application of process mining techniques in manufacturing. **Journal of Intelligent Manufacturing**, jan. 2020.

RUSCHEL, E.; SANTOS, E. A. P.; LOURES, E. de F. R. Mining shop-floor data for preventive maintenance management: Integrating probabilistic and predictive models. **Procedia Manufacturing**, v. 11, p. 1127–1134, 2017. ISSN 2351-9789. Available from Internet: <https://www.sciencedirect.com/science/article/pii/S2351978917304420>.

SANTORO, F. M. et al. Process mining techniques in internal auditing: A stepwise case study. **iSys - Brazilian Journal of Information Systems**, v. 13, n. 4, p. 48–76, Jul. 2020.

SANTOS, C. F. D.; LOURES, E. D. F. R.; SANTOS, E. A. P. A smart framework to perform a criticality analysis in industrial maintenance using combined MCDM methods and process mining techniques. **Int J Adv Manuf Technol**, feb. 2024. ISSN 0268-3768, 1433-3015.

SANTOS, C. F. D. et al. Alarm management according to isa sp 18.2 standard based on process mining and multi-criteria decision making methods. In: . [S.l.]: IOS Press BV, 2018. p. 633 – 642. ISBN 978-161499439-8.

SANTOS, C. F. dos et al. Using process mining as a tool for process' digital twin to perform strategic maintenance decisions. **Lecture Notes in Mechanical Engineering**, p. 44 – 51, 2024.

SANTOS, E. A. P. et al. Supervisory control service for supporting flexible processes. **Industrial Management and Data Systems**, p. 1007 – 1024, 2013.

SANTOS, G. A. dos; SOUTHIER, L. F. P.; SCALABRIN, E. E. Method to reduce lead-time of business process discovered. In: **2020 13th International Congress on Image and Signal Processing, BioMedical Engineering and Informatics (CISP-BMEI)**. [S.l.: s.n.], 2020. p. 840–845.

SATO, D. M. et al. Ischemic stroke: Process perspective, clinical and profile characteristics, and external factors. **Journal of Biomedical Informatics**, p. 103582, 2020. ISSN 1532-0464. Available from Internet: <https://www.sciencedirect.com/science/article/pii/S1532046420302100>.

SATO, D. M. V. et al. A survey on concept drift in process mining. **ACM Comput. Surv.**, Association for Computing Machinery, New York, NY, USA, v. 54, n. 9, oct 2021. ISSN 0360-0300. Available from Internet: <https://doi.org/10.1145/3472752>.

SATO, D. M. V. et al. Conformance checking with different levels of granularity : A case study on bariatric surgery. In: **2020 13th International Congress on Image and Signal Processing, BioMedical Engineering and Informatics (CISP-BMEI)**. [S.l.: s.n.], 2020. p. 820–826.

SCHIRMER, L. et al. Visual support to filtering cases for process discovery. In: . [S.l.: s.n.], 2018.

SILVA, F. A. R. Analytical intelligence in processes: Data science for business. **IEEE Latin America Transactions**, n. 8, p. 2240 – 2247, 2018. ISSN 15480992.

SOUSA, R. de; PERES, S. Online concept drift detection, localization and characterization using trace clustering. In: **Anais Estendidos do XVI Simpósio Brasileiro de Sistemas de Informação**. Porto Alegre, RS, Brasil: SBC, 2020. p. 35–39. ISSN 0000-0000.

SOUSA, R. G. de et al. Integrated detection and localization of concept drifts in process mining with batch and stream trace clustering support. **DATA & KNOWLEDGE ENGINEERING**, v. 149, JAN 2024. ISSN 0169-023X.

SOUSA, R. G. de et al. Concept drift detection and localization in process mining: An integrated and efficient approach enabled by trace clustering. In: **Proceedings of the 36th Annual ACM Symposium on Applied Computing**. New York, NY, USA: Association for Computing Machinery, 2021. p. 364–373. ISBN 9781450381048.

SOUTHIER, L. F. P. et al. Systematic mapping review on log preparation for process mining. In: **2023 26th International Conference on Computer Supported Cooperative Work in Design (CSCWD)**. [S.l.: s.n.], 2023. p. 1619–1624.

SOUTHIER, L. F. P. et al. Process mining and root cause analysis for detecting inefficiencies in business processes: an applied case in a brazilian telecommunications provider. In: **2023 26th International Conference on Computer Supported Cooperative Work in Design (CSCWD)**. [S.l.: s.n.], 2023. p. 53–58.

SOUZA, L. P. de et al. Proposta de agente autônomo utilizando as técnicas de mineração de processos em uma arquitetura virtual baseada em sistemas multiagentes. In: **2021 14th IEEE International Conference on Industry Applications (INDUSCON)**. [S.l.: s.n.], 2021. p. 702–709.

SZIMANSKI, F.; RALHA, C.; JACOBI, R. Uma abordagem de integração de simulação baseada em agentes e mineração de processos. In: **Anais do VII Simpósio Brasileiro de Sistemas de Informação**. Porto Alegre, RS, Brasil: SBC, 2011. p. 238–249.

SZIMANSKI, F. et al. Improving business process models with agent-based simulation and process mining. **Lecture Notes in Business Information Processing**, p. 124 – 138, 2013.

TAVARES, G. M. et al. Overlapping analytic stages in online process mining. In: **2019 IEEE International Conference on Services Computing (SCC)**. [S.l.: s.n.], 2019. p. 167–175.

TAVARES, G. M. et al. Anomaly detection in business process based on data stream mining. In: **Proceedings of the XIV Brazilian Symposium on Information Systems**. New York, NY, USA: Association for Computing Machinery, 2018.

TAVARES, G. M.; JUNIOR, S. B. Process mining encoding via meta-learning for an enhanced anomaly detection. **Communications in Computer and Information Science**, Springer Science and Business Media Deutschland GmbH, v. 1450 CCIS, p. 157 – 168, 2021.

TRINKENREICH, B. et al. Toward using business process intelligence to support incident management metrics selection and service improvement. In: . [S.l.]: Knowledge Systems Institute Graduate School, 2015. v. 2015-January, p. 522 – 527. ISBN 1891706373. ISSN 23259000.

UHLMANN, T. S.; SANTOS, E. A. P.; MENDES, L. A. Process mining applied to player interaction and decision taking analysis in educational remote games. **Lecture Notes in Networks and Systems**, Springer, v. 47, p. 425 – 434, 2019. ISSN 23673370.

UNGER, A. et al. Análise da trajetória de aprendizagem do aluno no ensino a distância por meio da mineração de processos. In: **Anais do XXXIII Simpósio Brasileiro de Informática na Educação**. Porto Alegre, RS, Brasil: SBC, 2022. p. 1163–1172. ISSN 0000-0000.

UNGER, A. J. et al. Process mining-enabled jurimetrics: Analysis of a brazilian court's judicial performance in the business law processing. In: **Proceedings of the Eighteenth International Conference on Artificial Intelligence and Law**. [S.l.: s.n.], 2021.

VAKULENKO, S. et al. Qrfa: A data-driven model of information-seeking dialogues. **Lecture Notes in Computer Science (including subseries Lecture Notes in Artificial Intelligence and Lecture Notes in Bioinformatics)**, v. 11437 LNCS, p. 541 – 557, 2019. ISSN 03029743.

VALERIO, D. et al. Application of process mining in after-sales on an automotive industry. In: . [S.l.: s.n.], 2017. p. 354 – 360.

VASCONCELOS, G. S. de; BERNARDINI, F.; VITERBO, J. A comparison between the most used process mining tools in the market and in academia: Identifying the main features based on a qualitative analysis. **Lecture Notes in Networks and Systems**, p. 218 – 228, 2024.

VERCOSA, L.; BASTOS-FILHO, C.; BEZERRA, B. An Approach for Analysing Law Processes based on Hierarchical Activities and Clustering. In: **2023 IEEE Latin American Conference on Computational Intelligence (LA-CCI)**. Recife-Pe, Brazil: IEEE, 2023. p. 1–6. ISBN 9798350348071.

VERCOSA, L. et al. Investigation of lawsuit process duration using machine learning and process mining. **Discov Anal**, 2024.

VERçOSA, L. F. V. et al. Identifying process graphs properties with network science metrics. In: **2021 IEEE Latin American Conference on Computational Intelligence (LA-CCI)**. [S.l.: s.n.], 2021. p. 1–6.

VRIES, G.-J. D. et al. Towards process mining of emr data case study for sepsis management. In: . [S.l.: s.n.], 2017. v. 5. ISBN 978-989758213-4.

YASMIN, F. A.; BUKHSH, F. A.; SILVA, P. D. A. Process enhancement in process mining: A literature review. In: M.T.G., L.; M., V. K.; P., C. (Ed.). [S.l.]: CEUR-WS, 2018. v. 2270, p. 65 – 72.