Summary Business Process Mining

The first article explores the role of artificial intelligence (AI) in driving business model innovation (BMI) and digital transformation in industries. It highlights the need for understanding AI and organizational capabilities for successful implementation. Challenges include transparency issues, lack of employee trust, analog processes, and misunderstandings of AI. The article proposes a four-step roadmap for AI implementation: understanding AI and organizational capabilities, understanding the current business model, developing necessary capabilities for AI, and reaching organizational acceptance. The article also explores the impact of AI and machine learning (ML) in the corporate environment, highlighting their capacity to optimise processes, improve decision-making, and stimulate innovation. It examines the fundamental applications of AI and ML, addressing challenges and benefits derived from their adoption. The study highlights the transformative impact of AI and ML on business operations, offering companies a competitive advantage through better efficiency, reduced costs, and improved customer experiences. The research also addresses challenges such as data privacy and workforce reskilling, emphasizing the need for a well-thought-out strategy. It advocates for staying informed about developments to maintain a competitive edge. The research identifies key areas for future exploration, including ethical AI, AI-enhanced decision-making, AI in sustainability, interdisciplinary research, and AI governance and regulation.

The second research paper explores the integration of artificial intelligence (AI) into business models of 162 global startups, focusing on four main archetypes: Deep Tech Researcher, Data Analytics Provider, AI Product/Service Provider, and AI Development Facilitator. The study highlights the innovative value propositions made possible by AI technology, which range from cognitive insights generation to real-time anomaly detection. It also highlights the importance of ongoing learning and the multifaceted applications of AI technology, categorizing them into machine learning, robotics, and natural language processing/computer vision. Data is a key element in the value creation process, with startups using various data sources to train their AI solutions. Hardware provision is also crucial, with startups offering comprehensive platforms with sensors or robotic components. Startups adopt various value delivery mechanisms, including software as a service (SaaS), platform as a service (PaaS), and standalone AI technology offerings. The study also classifies startups based on their target clientele and industry scope.

The third article explores the transformative impact of Artificial Intelligence (AI) and Machine Learning (ML) on industries, highlighting their symbiotic relationship and the challenges and ethical considerations associated with the AI revolution. It highlights the need for skilled professionals in AI and ML, cybersecurity measures, compliance with regulations, and transparent decision-making processes. The research also emphasizes the importance of education, skill development, and balancing innovation with ethical considerations for a sustainable and inclusive AI-driven future. It envisions future perspectives on advanced AI applications, personalized experiences, and inclusive AI, with increased collaboration between humans and AI, ethical considerations in AI development, and the integration of AI in emerging industries. The article concludes by highlighting the ongoing AI revolution's potential for industries moving forward.

The fourth article discusses the significance of Business Process Reengineering (BPR) in improving the processes of medium and large enterprises. It highlights the integration of a process modelling tool called SHAMASH with Artificial Intelligence (AI) planning techniques to generate useful process models. The AI community's expertise in planning and scheduling can offer valuable solutions to improve workflow technologies. The article explores the similarities between AI planning and workflow modelling, emphasizing the importance of collaboration between the two disciplines to enhance business productivity. The article presents a framework for merging the PRODIGY 4.0 planner and SHAMASH workflow modelling tool, demonstrating how they can generate optimized process models automatically. Further improvements to the integration process, such as parallel planning, conditional plans, and optimization procedures using Machine Learning techniques, are suggested.

Another article by Evangelos Katsamakas from Fordham University and Oleg Pavlov from Worcester Polytechnic Institute discusses how AI can enhance strategic feedback loops to improve business models. Business model innovation is crucial for a business's viability, and AI is expected to transform the economy and society. Key concepts include causal loop diagrams (CLD), which represent business models when two variables increase each other. Feedback loops, focusing on platform business models, are driven by the premise that more content, apps, and services attract users, leading to a feedback loop. This loop also includes advertisers, who are attracted by user rates, which raises revenues and profits, leading to better efficiency and processes. AI can enhance, accelerate, or reinforce current feedback loops, influencing behavior and business performance. Two overarching AI-related procedures can be applied to every business model: data accumulation and data exploitation. Data accumulation involves aggregating information from customer interactions and business processes, while data exploitation utilizes AI to enhance platform services, optimize business processes, and elevate the overall quality of the business model. The interdependence of data accumulation and exploitation is crucial, as platforms accumulate more data, leading to a continuous cycle of data accumulation.

A paper, written by scholars from Chaoyang University of Technology, Jindal Global University, and the Indian Institute of Management Kozhikode, explores the potential benefits of ChatGPT in improving customer service, handling multiple inquiries, and saving operational costs. ChatGPT, OpenAI's Generative Pre-Trained Transformer (GPT) language model, is trained to simulate human-like user dialogues, allowing human employees to focus on more complex and strategic responsibilities. However, the software relies on specific training data tailored to the business domain, which can produce inaccurate or ambiguous results. The study uses PSI and CORPRAS techniques to demonstrate how ChatGPT could be used in a business setting. Key takeaways include enhanced customer experience, efficient meeting of customer demands, and personalized customer interactions. The study concludes that ChatGPT can help firms meet customer expectations by offering rapid, informative, and natural solutions to customer inquiries or problems. However, the research emphasizes the importance of a comprehensive examination before incorporating ChatGPT into business operations, considering key factors such as domain-specific training data and potential errors in outcomes.

Aleš Zebec, a scholar at the University of Ljubljana, School of Economics and Business, has written a paper on the impact of cognitive business process management (CBPM) and cognitive computing on business performance. The paper focuses on the role of automation and innovation in business processes and their correlation with corporate performance. The author aims to develop measurement scales for CBPM adoption and Business Process Automation (BPA) and explore the connection between CBPM and corporate performance. The research uses a mixed-method approach, including in-depth interviews, new measures for CBPM adoption and BPA, and a structured questionnaire for the main survey. The sample will consist of participants from EU companies using BPM/iBPM software with integrated AI technology. The study includes a systematic literature review, construct development, examination of AI techniques and algorithms in BPM context, and identification of open issues for resolution.

Chaitanya Krishna Suryadevara, a scholar at Wilmington University, discusses the growing importance of incorporating Artificial Intelligence (AI) and Machine Learning (ML) technologies in enterprises to gain a competitive advantage. The paper explores the integration of AI and ML across various industry sectors, highlighting their potential to improve process efficiency, decision-making, and innovation. AI and ML have vast capabilities, automating routine tasks and analyzing vast datasets. The article explores challenges faced by organizations when implementing AI and ML solutions, such as data privacy, ethics, and workforce reskilling. However, it also highlights the measurable benefits of AI and ML adoption, such as increased efficiency, cost reduction, and improved customer experiences. The study highlights the transformative impact of AI and ML on business operations, offering companies a competitive advantage through better efficiency, reduced costs, and improved customer experiences. It also highlights the need for a well-thought-out strategy and the continuously evolving landscape of AI and ML. The research identifies key areas for future exploration, including ethical AI, AI-enhanced decision-making, AI in sustainability, interdisciplinary research, and AI governance and regulation.

Pinggera et al.'s study on "Styles in Business Process Modeling: “An Exploration and a Model" explores the diverse approaches to business process modelling and the cognitive processes involved in modellers' behaviour. The research identifies three primary styles: functional, semantic, and thematic, each influenced by individual preferences, expertise, and task difficulty. The model takes into account personality traits and task nature, influencing modelling style through cognitive functions like working memory and reflective abilities. It also considers the cognitive load of the task, which influences the association between a person's characteristics and their preferred modelling style. The study emphasises the importance of understanding process modelling in Business Process Management (BPM) and suggests the creation of targeted support tools and instructional materials that align with different modelling strategies. These tools could combine quick development and fine-tuning with layout tasks, while educational programs could be adapted to focus on specific tasks of the modelling approach. The study expands the horizons of business process modelling beyond the outcomes of the modelling procedure, revealing the cognitive and behavioural patterns that determine this procedure. This awareness of PPM provides new ways to improve modelling utilities, model classes, and BPM methods, making them more targeted to the needs of different modellers.

"Business Process Model Abstraction Based on Behavioral Profiles" by Sergey Smirnov, Matthias Weidlich, and Jan Mendling discusses the challenge of simplifying business process models through abstraction. The authors propose a new abstraction technique based on behavioural profiles, which allows for the condensing of fine-level activities into coarser, higher-level representations while preserving behavioural integrity. The behavioural profiles are a series of control flow relations that ensure strict order, exclusiveness, and interleaving of activity pairs. This approach allows innovative activities to be aggregated based on their behaviour characteristics rather than their segment within the model. The authors introduce a complex procedure that includes the derivation of the behavioural profile from the detailed process model, which serves as a basis for identifying and classifying similar activities into more abstract and generalised descriptions. The validation of the conceptual framework ensures that the synthesized high-level model aligns with the initial process's behavioural constraints, ensuring its integrity and usefulness in different organisational environments. The authors' approach bridges a significant gap in Business Process Management (BPM) by introducing a more flexible and behaviorally integrated model of process abstraction, which has significant potential for unburdening process model maintenance and providing clearer representation to stakeholders. This technique can significantly impact organizations' management of documenting, analyzing, and refining business processes, improving process visualization, analysis, and optimization.

Kathrin Figl and Ralf Laue's research on business process models (BPMs) provides a deeper understanding of the cognitive challenges individuals face when interpreting complex relationships within these models. The study, which involved empirical analysis of 199 individuals, mainly students, reveals that different categories of cognitive difficulty are involved in process management based on relational dynamics. The duality highlights that some relational structures in BPMs may require a higher cognitive load, affecting the models' overall interpretability. Figl and Laue's Cognitive Load Theory is a crucial feature in their framework, which draws the boundaries of working memory to understand the universal nature of cognitive processing of BPMs. The study also explores the factors affecting cognitive load, such as relationships between model elements, element interactivity, and element separability. This analysis not only enhances our understanding of how people relate to BPMs but also provides knowledge about potential areas for improving the design of models to enhance understandability. The research has practical implications beyond the academic domain, providing valuable information for practitioners and researchers dealing with BPM modelling. By defining cognitively challenging relational constructions and element interactions, the study has the potential to design and present BPM models that reduce cognitive load and enhance model comprehensibility. Methods such as simplification of complex nesting, shrinking of model structures, and employing visual add-ons like syntax highlighting can make BPMs more approachable and understandable.

The paper by Aldin and de Cesare presents a comparative study of business process modelling approaches, a crucial aspect of organizational communication and understanding improvement. The study introduces a framework based on five criteria: adaptability, simplicity, intelligibility, simulation support, and comprehensiveness. This framework helps identify major paradigmatic differences among the assessed techniques and forms a basis for further analysis and selection procedures. The paper highlights the complexity of business process modelling, with numerous modelling techniques targeting different aspects of business processes. The analysis ranges over seven common methods and grades them by set standards. Techniques like flow charts and Petri nets are simple but differ in their support for simulation and flexibility. Advanced techniques like Business Process Modeling Notation (BPMN) offer a rich semantic framework suitable for simulation and supporting all key elements of business process modelling. The paper calls for both academic and industrial exploitation in a comparative study of business process modelling methodologies, as it helps understand how these approaches are used in the course of MDSD and how efficient modelling is in responding to changing service paradigms. The research contributes to the ongoing debate on optimizing business process management and modelling in the context of organizational change and digital transformation.

The first article presents a new method for discovering Deterministic Finite State Automata (DFSA) from event logs, a breakthrough in business process analysis. The authors emphasise the importance of process mining in uncovering the inner workings of business operations by examining event logs, which are digital trails of process activities. They argue that incorporating model learning, specifically DFSA discovery, can significantly increase the accuracy and applicability of mined models in business process analysis. DFSA represent sequences of events or states in a process, which are deterministic and well-suited for modelling and analysis in business processes. The method involves preprocessing event logs, accurate data quality, advanced algorithms to identify states and transitions, and validation of the discovered automata to ensure their relevance to business processes. The method addresses the complexity and variability of real-world business processes, demonstrating its power through case studies and highly interpretable models. The authors also discuss technical challenges faced during implementation, such as scalability issues, noise in event logs, and handling of parallel activities within processes. The method is compared to existing process mining techniques, demonstrating its superiority in accuracy, efficiency, and granularity. The implications of this research are significant, providing practical tools for organisations to improve their process management practices and advancing research in process mining and model learning.

The article "Predictive Business Process Monitoring with LSTM Neural Networks" by Springer Link explores the use of LSTM neural networks for real-time monitoring and prediction of business process outcomes. It emphasizes the importance of real-time monitoring and prediction capabilities for decision-making and operational performance improvement. The study covers key aspects such as LSTM model architecture, feature selection strategies, customized training methodologies, empirical validation, and practical implications and applications. The LSTM model architecture allows for selective storage and use of information over extended sequences, overcoming the vanishing gradient problem and remembering temporal dependencies. The article also discusses the importance of contextualizing input data with domain-specific knowledge to identify relevant features, boosting the predictive power of the model. The article also provides empirical evidence and experiments to prove the accuracy and performance of LSTM networks in monitoring business processes. It also discusses the practical implications of predictive business process monitoring, highlighting its potential for operational streamlining, resource optimization, and overall efficiency. The article provides a comprehensive approach to LSTM-based predictive modelling in business process management, strengthening predictive analytics capabilities and becoming a credible resource for researchers and practitioners.

The article presents an AI framework for integrating AI into manufacturing business models, emphasizing the importance of AI scaling and innovation. It highlights three AI capabilities: data pipeline, algorithm development, and AI democratization. The data pipeline is crucial for obtaining, cleaning, integrating, validating, and sharing data, providing a stable, sustainable, and scalable infrastructure for AI algorithms. Secure data-sharing policies and efficient data management methods are essential for successful implementation and innovation in digital servitization. Algorithm development focuses on developing predictive models and cognitive tasks suited to a specific business purpose. This involves identifying significant data, designing and training algorithms with high-quality industrial context knowledge, and continually validating and refining the algorithms using real-world performance. The success of this aspect depends on the blend of technical AI skills and domain expertise, enabling manufacturers to derive actionable insights and achieve operational improvements. Al democratization aims to make AI tools and insights available to organizations, enhancing decision-making and operational efficiency. This is achieved through routines for identifying AI use cases, promoting cross-functional collaboration, and providing training and tools that make AI insights understandable and actionable for non-experts. Integrating AI into manufacturing is critical for organizations to stay competitive, as it optimizes operations, improves product quality, and customizes offerings, leading to efficiency and innovation. AI applications, such as predictive maintenance and smart manufacturing processes, can provide solutions at the right time, reducing downtime and costs.

Finally, the last article presents an interactive text mining and visual analytics system designed for business ecosystem intelligence. The system uses text mining and visual analytics to help users explore and analyze unstructured textual data, providing valuable insights into companies, industries, markets, and trends. The system consists of a user interface, a search engine, a continuous downloading option, a visualization panel, filters, and a result panel. The user interface displays different sections, network characteristics, and visualization options, while the search engine retrieves relevant documents using the Northern Light (NL) search engine. The system also implements continuous downloading to manage large volumes of search results. The visualization panel uses network representation to display relationships between entities mentioned in documents, and users can apply network pruning algorithms for readability. The system offers controls for enhanced visualization, allowing users to specify node and edge-level characteristics and time ranges to filter and explore the network. The results panel provides information about the network and a paginated list of retrieved documents. The system can be implemented using d3.js, CSS, and angular.js, utilizing the NorthernLight Millie API.