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Developments in Information & Knowledge Management for Business Applications

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Preface

In contemporary unstable time, enterprises/businesses deal with various challenges—such as large-scale competitions, high levels of uncertainty and risk, rush technological advancements, and increasing customer requirements. Thus, businesses work continually on improving efficiency of their operations and resources toward enabling sustainable solutions based on the knowledge and information accumulated previously. Consequently, this third volume of our subline persists to highlight different approaches of handling enterprise knowledge/information management directing to the importance of unceasing progress of structural management for the steady growth. We look forward that the works of this volume can encourage and initiate further research on this topic.

Hence, the starting chapter "Creating a System Based on CRM Solutions that Will Manage the Supplier Base" authored by Żabicki et al. describes a solution supporting the management of the company's IT clients. The work presents the technology of creating the solution, its functional requirements, technical documentation, and complete instructions for using the website. The aim of the project was to increase the functionality of the solution supporting the management of the company's clients at low costs for the creation and operation of the system.

The next chapter presents a study on the "Voucher 4.0—Digitisation Potential in Voucher Sales from the Works Council's Point of View." It deals with the digitization potential in the distribution of vouchers in Austrian companies from the perspective of the works council, which is an important, if not the most important, multiplier in the distribution of these vouchers. It begins with the literature on digitization, Industry 4.0, and its integration in the value chain discussed in order to provide a basis for the subsequent survey and to underline the relevance of the topic. The digitization potential in value voucher sales has been determined by means of a systematic collection of empirical facts by means of an online survey. The insights gained were evaluated and analyzed in the subsequent step and serve to ascertain the initial situation. The evaluation showed that there are some problems in the current voucher distribution which can be solved with the help of the digitized form of the value voucher distribution "Voucher 4.0." The advantages of digitizing this distribution system for the works councils and also for the employees were presented in detail in the course of the work.

In the next work titled "Use of E-service Analytics in Slovakia," the authors outline the current state of analytics use in the companies providing electronic services in Slovakia. Service analytics provides companies with many advantages. On the other hand, companies face various challenges that arise from the use of service analytics. The research is focused on companies providing e-services in Slovakia, their perception of and approach to service analytics as well as key issues they face.

The subsequent chapter "Managing Quality of Human-Based Electronic Services" explores that with globalization and technology, it is possible to allocate work to workers across the globe and save time, costs, and resources for a company. Human-based electronic services provide different options for the outsourcing of tasks that cannot be purely automated. Managing quality is one of the most important elements in this field as low-quality solutions might lead to delays in delivery, exceeding budget, and overall dissatisfaction. Various types of human-based electronic services have been analyzed and examined potential threads in quality management, as well as described workflows to improve the quality assurance while their usage. By selecting the right type and approach and combining different services with outsourcing might be optimized the result in terms of either time or quality or budget.

The chapter authored by Šepeľová et al. "Sustainability Drives of the Sharing Economy" investigates the impact of informational services on the driving forces of the sharing economy that have resulted in the expansion of sharing platforms, specifically on the example of ride sharing platform Uber and accommodation sharing platform Airbnb. The methodology is based on the analyzing of the existing literature from developed and developing countries focusing on the model of four contributing drivers. As the result, the study will reveal the most important factors that have prompted the development of the sharing economy. Understanding these concepts as potential driving forces for participation in the sharing economy is necessary due to exploring the consumers' needs that motivate them to the participation in the sharing economy.

The work entitled "Sentiment Analysis for Diagnostic Purposes," and authored by Urszula Krzeszewska and Joanna Ochelska-Mierzejewska, focuses on the analysis of emotional attitudes in the texts that are the statements of centuries old computer science at the Technical University of Lodz. Due to the free style of expression, the created application is a good basis for automatic analyses under the diagnostic angle, as an aid for psychologists, educators, or sociologists. The bag-of-words and n-gram methods were used to vectorize the text, while for the classification of sentiments, k-nn and NBC were used.

In the next study on the "SZZ Unleashed-RA-C: An Improved Implementation of the SZZ Algorithm and Empirical Comparison with Existing Open Source Solutions," the authors claim that the SZZ algorithm is one of the most important algorithms in mining software defects as it allows to create datasets for the sake of software defect prediction. Further, the authors explore that still very few open-source implementations of this algorithm were created. In recent years, two interesting open-source implementations of SZZ algorithm have been created, which are SZZ Unleashed and OpenSZZ. Thus, in this study, they compare how well these implementations perform as well as propose an improved implementation named SZZ

Unleashed-RA-C. The most important features of the proposed algorithm and implementation include ability to identify and handle refactoring changes when tracing bug-introducing changes (RA functionality), discarding comments and files based on a regular expression, and last but not least the ability of using GitHub as the issue tracker.

In the chapter "Which Static Code Metrics Can Help to Predict Test Case Effectiveness? New Metrics and Their Empirical Evaluation on Projects Assessed for Industrial Relevance," the authors tested possibility of predicting test case effectiveness, strictly on a basis of static code metrics of production and test classes. To solve this task, the authors employed three different learning classifiers, to check feasibility of the process and compare their performance. They created own set of metrics all of which were later assessed for their impact on prediction. Created models yield a promising result, with best of them achieving over 85% for both F-Measure and Precision along with 73% for Matthews correlation coefficient. With the fact of well-balanced data used in creation of model, it is safe to assume that they hold some merit. All steps taken to achieve this result are explained in detail.

The next work named "Intelligent Freight Forwarder with Tabu Search Algorithm" aims to determine which part of Freight Forwarder processes can be enhanced with use of this cutting-edge technology. Initial step toward the goal was to split the whole process into smaller independent parts. This way four layers of the issue were obtained: data layer, planning layer, realtime coordination layer, and dynamic scheduling layer. Each of the layers required unique approach and deep understanding of the knowledge behind it. Obviously for the found problem, there were no absolute solutions, hence for every classified case paper depicts various ideas of fixing it.

The chapter authored by Joanna Ochelska-Mierzejewska and Przemysław Zakrzewski "Comparison the Genetic Algorithm and Selected Heuristics for the Vehicle Routing Problem with Capacity Limitation" compares the operation of the genetic algorithm with selected heuristics (savings heuristics, Dijkstra heuristic, Christofides heuristics) for the routing problem with capacity constraints, for which the following comparison criteria were defined: time to find a solution, filling the fleet and accuracy of the solution. The chapter analyzes five random datasets differing in the location of points (cities) and the size of orders. Such a variety of data made it possible to analyze the effectiveness of selected heuristics. Results from genetic algorithm were compared with other heuristic. The results are presented in appropriate graphs, which facilitate the analysis of the results and their comparison.

In the research performed by Krzysztof Stepien and Dawid Kossowski "Dynamic Analysis of Website Content Using a Mobile Application," a mobile application, which is used to analyze changes on websites, was created. It allows user to track all or any user-selected items on any site that uses Hypertext Transfer Protocol Secure (HTTPS). Nowadays, the use of mobile and Internet applications has become extremely popular. It has led to a very large development in these areas. More and more data and information are provided to users, and their processing is a very time-consuming process. The existing solutions that allow for the improvement of the data selection process are usually created in a limited way for the user.

The following chapter presents a study on the "Code Smells Detection Using Artificial Intelligence Techniques: A Business-Driven Systematic Review." It aims to identify and investigate the current state of the art with respect to: (1) predictors used in prediction models to detect code smells, (2) machine learning/artificial intelligence (ML/AI) methods used in prediction models to detect code smells, and (3) code smells analyzed in scientific literature. Most researchers still use source code metrics as predictors. Precision, recall, and F-measure are the go-to performance metrics. There seems to be a need for modern reference data/projects sets that reflect modern constructs of programming languages. Thus, the authors identified various promising paths of research that have the potential to advance the state of the art in the area of code smells prediction.

The work authored by Stephanie Burghart and Milan Fekete "Risk Management of Procurement of the German Medium-Sized Industrial Companies with the Focus on Security of Supply" presents developed recommendations for action to strategically secure the supply of goods not produced by the company itself. The authors conceive these recommendations for action which are suitable for strategically improving the security of supply for German medium-sized industrial companies. For this purpose, a research approach based on Hans Ulrich's demand for application-oriented research was chosen. No theories are developed or tested by hypotheses. Instead, the focus is on advising the practice.

The chapter "The Documentation in the Project of Software Creation" describes the documentation process in software development projects, which are based on various methodologies. The classic waterfall model of the software development process, Rational Unified Process, and eXtreme Programming were chosen as examples of methodologies. The RUP and XP methodologies are the main examples of two different groups of methodologies—agile and traditional. Although these methodologies represent completely different approaches to the design of the system and the process of its documentation, both have gained great popularity and are currently used in many software companies. The aim of the work is to provide the reader with various documentation processes, compare their essential content, and demonstrate their impact on the success of the project. Due to the advantages and disadvantages of the presented documentation processes, the result of the work is the creation of a universal form of the documentation process in software development projects.

The next chapter presents a research on the chapter "E-Commerce Platform Using SQLite." It describes the process of online store software development and administration panel for its administration, based on SQLite database. It lists the technologies and tools that were used to create the online store application. In addition, the performance of the database used was tested on another popular database management system. Their advantages and disadvantages are presented, as well as exemplary deals that were realized with their help. Part of the lever is the technical documentation of the created project and the administration panel of the online store. The documentation contains a general description of the application, which explains its structure. At the end of the work, the documentation of the system administrator and the user documentation of the store are presented.

In the following chapter "How to Prevent Unsafe Behaviour of Employees? Explanatory Models of Insecure Behaviour at the Workplace and Prevention Methods" authored by Valéry Wöll, Rozália Sulíková, human error is considered to be the main cause of occupational accidents, accounting for up to 96%. Four models are currently cited in the german-speaking world to explain human error in the occupational safety. Except for the ABC model, which is regarded as the only holistic, scientifically proven and practicable model for explaining the causes of human error in occupational accidents, the other models are controversial or are not considered adequate when used in isolation. A quantitative literature analysis of 56 legal texts, regulations, and official notices from the field of occupational safety made it possible to investigate which methods are currently required by law to prevent the causes of occupational accidents in companies. It can be seen that the elements of the qualification method, with a share of approx. 76 %, are the measures most frequently required by law.

In the work named "Privacy and Cost Concerns in Online Advertising—Literature Review and Analysis," Tomas Lego claims that thanks to technological advancements, improvements in data analysis, and the widespread of the Internet, online advertising became a growing industry worth billions of US dollars. With large numbers of active users and data on their behavior being easily retrievable, the Internet provides a cost-efficient way of targeting individuals. Through its reliance on the behavioral data of individual Internet users, it however also poses a great threat to users' privacy. Having conducted a keyword search in six independent digital libraries, the author provides a description of the topic of privacy and cost issues of targeted online advertisement in the form of a literature review. Drawing on a sample of 70 unique journal articles, conference papers, or book chapters, the author introduces the reader to the relevant sources and offers an overview of the most salient keywords used in this context.

In the subsequent work "Technological Advancements Within the Canadian Electric Vehicle Industry," the authors find that electric vehicle industry is experiencing moderate market adoption rates in Canada, and as of 2019, they are even becoming more affordable. Inevitably, the technology available in these vehicles will surpass that of the traditional internal combustion engines (ICEs). However, there is much more business owners can do to elevate the consumer perception of EV and synthesize market attractiveness. The rise in Big Data analysis and IoT has promised to provide incredible benefits to both consumers and corporations; however, their significance can be blown out of proportion. For that reason, the specific technologies that can be implemented in the EV are further explored to find their realities. It is found that the most prominent barrier slowing adoption is consumers' range anxiety, and the technologies researched can be used strategically to minimize this negative perception while simultaneously providing businesses fantastic insight. The findings show that the opportunity cost is high but can be excellent for accelerating market share and altering consumer perceptions.

The chapter "Game Analytics—Business Impact, Methods and Tools" authored by Flunger et al. outlines the relevance and potential of game analytics in the context of gaming business. The authors identify and discuss crucial aspects of analytical

and predictive models for free-to-play (F2P) business models. Based on a litera-ture review, they analyze several business issues where game analytics may provide major benefit. Besides identifying motivations for small- and medium-sized game developers to use game analytic tools, the authors furthermore introduce six studies, which discuss churn prediction models in F2P games, as well as four studies on prediction of customers' lifetime value. Emphasis is laid on methods, metrics, and tools in game analytics, such as player churn prediction and customer lifetime value (CLV) prediction, and their functionalities.

The next chapter "Synergistics and Collaboration in Supply Chains: An Inte-grated Conceptual Framework for Simulation Modeling of Supply Chains" explores the approaches to simulation of supply chains' strategic development specifically focusing on formation of cooperation strategies between supply chain partners. The objective of this paper is to suggest a conceptual scheme and stratification approaches that enable creation of a model reflecting polysystemic representation of the supply chain. The following base levels of the supply chain representation are considered: object-based, configuration/network-based, process-based, and logistics coordina-tion levels. In the field of supply chain transformation and strategic development, there is a strong need in concurrent and aligned usage of different supply chain representations. That defines the approach to building generic supply chain repre-sentation based on composite simulation models. Depending on addressable tasks of supply chain analysis and synthesis, process and system dynamic simulation models of different degrees of detail may be used. Agent-based modeling is used to model interorganizational coordination between supply chain partners.

The chapter authored by Loretta Pinke, René Pawera, and Oskar Karlík "Time Management and Procrastination" introduces the time management tools that can be used to combat procrastination. Organizations that use time management software have a better overview of their activities, so it can be expected their performance to grow.

In the next work called "Creating Database Models in Rational Data Architect" the authors are analyzing various uses, types, and programming languages. As a practical demonstration and better conduct analysis, they also create database models or better put one single database model in several programs to better compare their advantages and disadvantages. Additionally, the authors are analyzing which databases are best in what kind of business situations. The authors conclude that there is no single best data modeling software and that the decision on which to use needs to be made with a prepared list of requirements in mind. While a simple database may be modeled in free software, more complex will require paid software, such as Rational Data Architect. The analysis conducted in this paper aids in making such decisions.

The research performed in the chapter "The Dynamic Environment of Pricing in E-Commerce and the Impact on Customer's Behavior" highlights the relevant sources regarding the problem of fairness, and the outcome this price strategy can cause within a consumer, while also covering an example of this dynamism in airline and hotel businesses. Results indicate that businesses should aim for a stable long-term relationship with customers to win their loyalty, as they view small price changes as fair (e.g., roughly around 5% price difference). Future researches can

focus on a combination of dynamic pricing and loyalty programs, to investigate whether substantial price differences (e.g., above 25%) could be accepted by loyal customers by including any additional benefits (e.g., discount bonus for the future).

Then the final chapter "An Investigation of the Complexity of Bitcoin Pricing" aims to investigate whether it is possible to combine existing research regarding specific attributes of Bitcoin and other cryptocurrencies into one model of Bitcoin price explanation. To do so, an extensive literature review is conducted to explore the publications available. The literature review results in a list of variables used to explore various research areas regarding Bitcoin. The most popular variables (such as the amount of web searches regarding Bitcoin, the gold price or security of blockchain technologies) are selected and combined into a regression model. Even though the coefficient estimates for the Google Trends index, the mean transaction fee, the number of Bitcoin wallets, the security breach dummy variable, and the lagged Bitcoin price are reported as significant, statistical testing indicates severe issues with the model. The paper therefore concludes with the finding that research regarding Bitcoin is not advanced enough and that its pricing mechanisms are too complex to build a sum-of-the-parts model. For future research, the exploration of an advanced model with measures implemented to counteract mentioned issues is suggested.

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