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Towards the Adoption of Machine Learning-Based Analytical Tools in Digital Marketing

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ABSTRACT Exponential technological expansion creates opportunities for competitive advantage by applying new data-oriented approaches to digital marketing practices. Machine learning (ML) can predict future developments and support decision-making by extracting insights from large amounts of generated data. This functionality greatly impacts and streamlines the strategic decision-making process of organizations. The research gap analysis revealed that a little is known about marketers' attitude toward, and knowledge about, ML tools and their adoption and utilization to support strategic and operational management. The research presented here focuses on the selection and adoption of the ML-driven analytical tools by three distinct groups: marketing agencies, media companies, and advertisers. Qualitative and quantitative research was conducted on a sample of these organizations operating in Slovakia. The findings highlight: 1) the important role of intelligent analytical tools in the creation and deployment of marketing strategies; 2) the lack of knowledge about emerging technologies, such as ML and artificial intelligence (AI); 3) the potential application of the ML tools in marketing, and; 4) the low level of adoption and utilization of the ML-driven analytical tools in marketing management. A framework consisting of enablers and a process map was developed to help organizations identify the opportunities and successfully execute projects that are oriented toward the deployment and adoption of the analytical ML tools in digital marketing.

INDEX TERMS Big data, data-driven analytical tools, digital marketing, machine learning (ML), marketing agencies, marketing analysis.

I. INTRODUCTION

In recent years, the extensive development of information and communication technologies in the private and public sectors initiated the emergence of a new digital marketing environment. Due to the proliferation of information technology, a huge amount of data is currently generated. It is estimated that 2.5 quintillion bytes of data are created every day and this number increases with the onset of the Internet of Things (IoT) [1]. It is also estimated that 90% of the available global data has been generated in the past two years [2]. Timely and precise business decisions depend on the generation, access, and utilization of quality information. Exponential technological expansion and its barrier-free global dissemination therefore create opportunities to gain competitive advantage by applying new data-oriented approaches to marketing management [3].

Digital marketing emerged as a natural response by companies to leverage and benefit from the significant consumer concentration on the Internet. Various types of organizations, including businesses, hospitals, schools, professional associations, councils and NGOs, use digital marketing as part of their marketing strategies and deployment programs. Some of these organizations can also operate their own e-commerce platform, but they mostly use the Internet as a channel/medium within their communication strategy. These organizations typically fulfill the role of clients or advertisers – also referred to as brands. Other categories of organizations also operate in the digital marketing space. Digital agencies create and implement marketing strategies for the

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organizations in the first group and use digital marketing as part of their own marketing strategy. Organizations in the third group, namely media, are used by digital agencies (or the advertisers directly) to communicate with their target audience.

The Internet environment enables companies to learn more about consumers through a few clicks in the appropriate analytical tool. The greatest advantage of digital marketing over other marketing tools and channels is its measurability. The digital footprint of every Internet user contains a significant amount of data that can serve as input for marketing analysis. Manual acquisition and analysis of the data has been time-consuming and only marginally regulated [4]. Analytical tools are currently used in marketing management to systemize processes, streamline the decision-making, and automate work. These sophisticated analytical tools use machine learning (ML) to learn from historical data and help plan future activities more effectively [5]. The ML tools can be utilized in many sectors. The research presented in this article focuses specifically on their use in marketing analysis towards improving strategic and operational decisions in marketing management. Using an interdisciplinary approach, the research explores the potential of ML in marketing analytics, the degree of implementation of the technology, as well as the attitudes of marketing agencies and marketing managers towards active utilization of these tools.

II. LITERATURE OVERVIEW

A. IMPORTANCE OF DATA ANALYSIS IN STRATEGIC PLANNING

Analytical tools streamline strategic planning and help organizations make operational decisions faster and more efficiently. In the past, strategic planning was usually based on data and information that were gathered in the organization over the past periods. In the current dynamic age, it is important to regard strategic planning as a live, ever-changing process. Whether it is a process of analyzing past events or predicting future events, strategic planning is supported by advanced marketing analysis and analytical tools utilizing recent IT innovations. The strategic planning process that uses IT tools must include at least the following four phases: 1) planning; 2) presenting a strategic idea; 3) fine-tuning the strategic idea; 4) developing a strategic plan [6]. The first phase is followed by two additional stages, namely the 1) execution phase that transforms the strategic plans into practical activities and the 2) information support phase that provides information about the current and future organization status [7]. Large quantities of information are required in these phases to create a comprehensive overview of the examined area and incorporate facts that may negatively affect the planning process.

Evaluation of the effective implementation of marketing strategies also forms part of companies' strategic management processes. Many organizations neglect this phase or completely ignore it, which can lead to failures in future strategic planning. The evaluation of the implemented strategic plan helps reform the decision-making process, identify deficiencies at all stages of the strategic planning and indicate steps in future planning [8]. In today's technology era data-based mechanisms should be used to streamline the strategic process, increase the chances of a successful, result-orientated strategy implementation and enhance organizational effectiveness [9].

On the basis of sufficient data volumes and large computing power, current analytical tools can predict e.g. consumer buying behavior, the response to product introduction and the probable success of a developed strategic plan [10]. The processing of big data present opportunities and transformational potential for many industries. As the volume of data increases, deep learning becomes meaningful, allowing the utilization of predictive analytical solutions [11]. Analytical tools of this type can be created to learn and improve. Data sets that form the input for marketing analysis can be prepared promptly, thereby saving weeks, months or sometimes years of individuals' manual efforts. Current marketing has entered the era of AI and ML that greatly streamline the strategic process of organizations and support strategic decision-making. Linking marketing analysis and advanced analytical tools opens the door to a new world where we can "breathe life" into machines and programs by teaching them how to learn and thereby make life easier for people. AI has the potential to be used in all areas of our lives and its current application is merely the beginning.

Selecting the right analytical tool that will meet the requirements of data analysis is vital to ensure return on investment and the added value of the generated information. When developing the best marketing strategy the attention of responsible staff should be shifted from traditional analytical tools to advanced and specialized analytical tools [12]. This is especially important in marketing, where hundreds of potentially relevant metrics need to be considered. Analytical tools in marketing have the potential to: 1) access the data as strategic assets; 2) visualize data into clear structures; 3) provide an overview of existing and potential customers; 4) increase the effectiveness of marketing decisions; 5) focus on proactivity towards consumers; 6) create tailor-made offers to specific consumers; 7) adapt the digital environment to the preferences of specific users; 8) engage in real-time discussions with consumers; 9) increase the effectiveness of marketing activities (including online and offline communication); and 10) focus on indicators of company success [13].

B. ML-BASED ANALYTICAL TOOLS IN MARKETING

ML includes adaptive mechanisms that allow a computer or machine to learn, based on experience and examples. Learning new skills will increase the system performance over time. ML mechanisms form the basis for adaptive systems. The technological capabilities of current information systems include computational capacity for performing demanding statistical mathematical methods. For this reason, the increase in software development projects embracing ML principles leads to higher numbers of intelligent analytical systems.

Their use does not only save companies considerable costs in the long run, but it also makes life easier for consumers. In the marketing sector ML has huge potential to be utilized in decision-making, interaction with customers, and strategic planning.

By applying neural networks, a specific problem that requires thinking - human or artificial – is solved. ML can be perceived as superficial data processing that deals only with one layer of acquired information [14]. In-depth learning, which is part of ML, handles several layers of data simultaneously. Thus, solutions embracing in-depth learning can obtain new information from which they create additional layers to be processed subsequently. Based on this approach, predictive analysis becomes possible. The application of in-depth learning can reveal relationships between variables that were hidden from ML [15]. Thus, in-depth learning contributes to a more efficient decision-making process with fascinating implications for theory and business practice. In-depth learning works on the principle that the system is fed with data, the data are processed, and the system also considers other data in its decision. At present, autonomous vehicles serve as an illustration. The system is provided with initial data to process, yet when its practical tests and usage started, more data are accumulated, allowing objects to be recognized and responses developed. Thus, in addition to the original settings, the system collects the data it uses when deciding on the other data collected [16].

The relationship between price and demand in the housing market by looking at online advertisements has been examined [17]. ML is used to identify pairs of duplicate advertisements that refer to the same housing unit. An artificially intelligent chatbot has been developed and deployed to deliver highly accurate automatic answers by using a knowledge base and supporting the 24/7 service availability of customer service centers (contact points) [18]. The chatbot increases the efficacy of support services and automates the related process in the digital environment. ML models are developed to predict the degree of visibility of corporate websites [19]. A trending hashtag generating application for social media business users is developed using ML and other approaches, generating trending and relevant hashtags for user content in order to get a broad reach of target audience [20]. A methodology using ML to accurately detect the marketing and sale of opioids by illicit online sellers via Twitter has been developed and deployed [21]. In another study, data mining, text mining, ML and statistics is used to analyze website user behavior and introduce two models of behavior based on the sequence and number of URLs accessed [22]. A quantitative study exploring how organizations in Dubai use big data and data driven marketing to know and serve their customers better and enhance shareholder value has been accomplished [23]. The strength of ML and big data in predicting the occurrences of consumer changing their mobile phones has been demonstrated, which greatly impacts marketing strategies in the mobile communications industry [24]. Real-Time Bidding (RTB) as an approach in display advertising building automation, integration, and optimization has been analyzed [25]. A methodology to accurately identify tweets marketing the illegal online sale of controlled substances has been developed [26]. A trained ML model is used to help online marketers understand the popularity evolution of online information, considering the ''burst'', ''peak'', and ''fade'' key events together as a representative summary of popularity evolution [27]. Methods are proposed that can effectively extract information about the intent of users from online texts with significantly high accuracy [28]. Understanding the intent of users (e.g. to buy an apartment, rent a car, or travel somewhere) on online social media channels has great potential in digital marketing. ML models based on conditional random fields (CRFs), an advanced statistical graphical model for sequence data, and bidirectional long short-term memory (Bi-LSTM), a well-known deep learning model, have been developed.

C. DEPLOYING ML-DRIVEN ANALYTICAL TOOLS IN DIGITAL MARKETING

Digital marketing is widely considered as an umbrella term, including online marketing, Internet marketing and mobile marketing [29], [30]. It can be defined as marketing that utilizes digital technologies (hardware, software, communication technologies) for the deployment of marketing strategies [31], [32]. The tools utilized in digital marketing include market research, polling, various forms of advertising, search engine marketing, newsletters and social media marketing. Marketing analytics is an inherent part of effectively using any of these tools. All three types of organizations (advertisers, agencies, media) need the awareness and ability to work with large amounts of data to extract meaningful information and increase the effectiveness of their digital marketing initiatives.

It can be concluded that ML can, based on extensive data processing, provide the information necessary for the decision-making process of marketing specialists. The application of ML-driven tools into digital marketing introduces various new challenges and opportunities. Among the biggest benefits of using these tools in marketing are:

- Optimal performance – machines perform steadily at 100% because they cannot be disturbed or distracted.
- Faster decision making – machine decision-making time is determined by the available data. After a quick calculation, machines can decide (almost) immediately. The decision is not affected by subjective factors such as feelings, personal preferences, opinions, etc.
- Automatization of predictable activities – ML can very effectively automate routine activities. For example, in digital marketing, ML can assist with generation of regular reports on advertising campaigns in social media marketing.
- Reducing error rates – eliminating errors normally caused by human factors. Machines perform a task by always following the predefined procedure.

- Digital assistants – personal human assistants are already commonly used. ML-driven systems can handle complicated tasks and optimize daily routines.
- Exploring areas unavailable to humans – in many areas a person is unable to perform the required tasks for various reasons. For example, humans can't dive into the deepest areas of oceans or process large amounts of data that are generated every minute on the Internet. Machines can be adapted to almost any condition, and computing can handle even the most difficult mathematical-statistical operations.

Implementation of ML applied to marketing analytical tools has no obvious disadvantages. However, depending on the type of tool, there are several concerns or limiting factors for its effective use:

- Creativity – much of the decisions and application of marketing is based on creativity. Creativity results in combining several parameters that are native to humans, with emotions, intuition, and empathy playing a significant part. These three components will be very difficult to replicate by machines.
- Moral and ethical principles – it is the ability to make decisions, express emotions, make sense of ethics and morals that makes people human. It is questionable whether machines will never have this ability, or it could be possible developed in later stages. There are justified concerns about whether machines will still be performing in the interest of people and within ethical and moral boundaries when the progress continues.
- Consumer preferences – users do not always want to interact with a robot or software. It is thus expected that, in the near future, the need for interaction with a human being will remain preferential, with consumers having greater confidence in such communication.
- ML tools cannot work without human intervention – in the upcoming decades, human minds will still be needed to work with ML systems and develop and optimize this technology.
- Algorithms can be wrong – decisions based on MLs' mathematical calculations and statistics can possibly result in incorrect actions taken, because of faulty instructions or data. Any advanced information systems are intended primarily to serve people. As peoples' requirements change and evolve over time, it can result in the ML-based tools not providing the optimal results in the current configuration. Automated responses to social media requests or automatically generated discounts in case of unhappiness with the purchasing process can serve as examples [33].
- ML and employment – there are systems that can partially replace human workforce in digital marketing. For example, automatic uploading of posts on social media, automated article reader support, etc. However, it is important to note that these systems will never perform properly without human support [34].

III. RESEARCH GAP AND AIMS

Previous research in the fields of ML and AI focused on how ML-driven systems and applications can be improved to help address specific questions, resolve issues, support decision-making, understand target markets, predict consumer behavior, increase the efficiency of marketing communications, support the launch of new products, streamline digital marketing-related internal processes or improve team management. However, the research failed to investigate and discuss the issues of selection and adoption of these ML-driven analytical tools by stakeholders, including marketing agencies and other marketing specialists. Very little is known about marketing professionals' knowledge of, and attitude towards these tools, as well as the adoption and utilization of the tools for both strategic and operational management. This research gap forms the foundation of the research described here.

A deeper study of relevant resources and work with secondary data revealed that numerous information systems that embrace the principles of ML are available to marketing managers and agencies. However, these businesses and individuals have been slow in adopting and utilizing these systems. This research focuses on identifying the reasons for the slow application of ML in digital marketing and suggesting possible solutions. The main aim of the research is to identify possible applications of ML analytical tools in the marketing field. Secondary objectives are to 1) investigate the role of analytical tools in the process of preparing, implementing, and evaluating digital marketing strategies; 2) determine how selected digital marketing entities use marketing analysis and analytical tools; 3) identify the level of awareness of relevant terminology such as big data, data management, ML or AI; and 4) find out how ML-based tools are used in the digital marketing environment.

IV. METHODOLOGY

A. RESEARCH TYPE AND SAMPLE SELECTION

Qualitative research, using the method of in-depth interviews, was used to gain insight into the way ML is practically used in marketing. Digital marketing specialists representing 1) firms in the role of advertisers; 2) agencies in the role of intermediaries; and 3) businesses providing the media space in Slovakia, were selected as interview participants, based on the following key criteria: The interviewee is a middle or senior manager, has been working in digital marketing for at least five years and has direct experience with information systems in the field of Pay Per Click (PPC), Search Engine Optimization (SEO) or Real-Time Bidding (RTB) campaign development and optimization. Three experts from each of these three groups were interviewed, i.e. a total of nine respondents. The findings from the in-depth interviews indicate the current situation in the area of using ML-driven analytical tools by organizations that are active in the field of digital marketing. Quantitative research, using a standardized questionnaire, was conducted to confirm the findings and gain more insights into the identified issues.

B. IN-DEPTH INTERVIEWS

The process of in-depth interviews consisted of three steps: 1) preparation; 2) implementation; 3) data processing. The preparation stage included defining the interview structure, formulating initial instructions for respondents, preparing research questions, providing audio recording techniques, and selecting a suitable environment for the interviews. The estimated length of the interview was one hour. Prior to each interview, the respondent was asked to sign a consent form. The interviews were based on a pre-defined structure and moderated. However, respondents were given the opportunity to suggest additional topics and make comments that stem from the flow of the conversation. Before the interviews, participants were requested to express their feelings and beliefs and to provide only true information. They were given the assurance that there are no wrong answers, that answers are considered confidential, that responses will not be linked to individuals, and that the audio recording of the interview and the written notes taken by the researcher will be used solely for research purposes. Interviewees were also informed that the findings of the research may be presented in both written and oral form.

In addition to the initial and final instructions, the interview protocol contained 19 open questions. In several cases the conversation turned to areas that were not listed in the prepared scenario, thereby identifying new opportunities and risks associated with the possibilities of marketing analysis and ML-driven analytical tools. The questions were divided into the following four headings:

1) General information: the purpose of this part was to confirm that the respondents met the selection criteria as specified in the methodology and define the strategic process of their marketing activities.
2) Marketing analysis and analytical tools: This section examined the perception and actual use of marketing analysis and analytical tools in practice.
3) Awareness level regarding big data and data management: Questions in this area examined the level of awareness and assumptions associated with big data and their utilization in marketing.
4) ML and AI practical application: Respondents expressed their knowledge and opinions on the challenges of ML technology and the application possibilities in the field of digital marketing.

C. QUESTIONNAIRES

The results of the interviews were used as basis for developing a questionnaire to verify the results on a larger sample. The questionnaire contained 15 questions: 11 closed-ended questions, 3 rating scale questions, and 1 open-ended question. To reach the specific group of marketing specialists, the questionnaire was distributed online via four different channels. These included: a) IAB Slovakia, the regulatory body for digital marketing in Slovakia; b) Digital agency SamsiDigital; c) Personal Facebook profile of a digital marketing blogger; d) Facebook group 'Marketers, copywriters and SEO optimizers'. A total of 58 responses from digital marketing specialists and C-level executives from companies involved in digital marketing were analyzed using descriptive statistics.

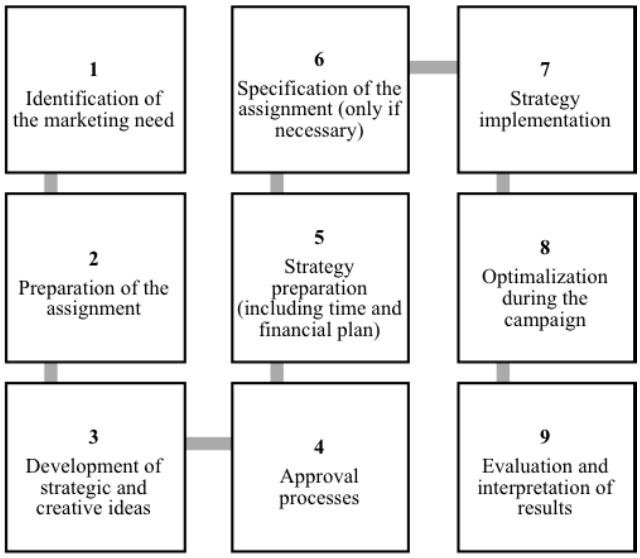

FIGURE 1. The process of preparation, implementation, and evaluation of digital marketing strategies.

The in-depth interviews took place between 15th June and 30th July 2018, followed by the quantitative research. The questionnaire was prepared between 06 August and 15 August 2018 and afterwards distributed using the abovementioned four channels. The results were collected between 21 August and 10 September 2018. After the completion of data collection, data were processed (finalized on 14 October 2018), resulting in evaluation of the findings and preparation of the research outputs.

V. FINDINGS

A. THE PROCESS OF PREPARATION, IMPLEMENTATION AND EVALUATION OF DIGITAL MARKETING STRATEGIES

Based on the information obtained, a model of the preparation process, the implementation and the evaluation of digital marketing strategies (Fig. 1) was developed.

Agency, media, and advertisers' workers are largely following the abovementioned nine-step model. However, different steps were emphasized by different respondents. Based on their responses, the following steps are considered as most important for different organizations:

- Agencies: Steps 3, 5, 7, 8, and 9 are the most crucial. In the process of marketing communication, agencies are the executors of client assignments (in this case, advertisers), so the steps to prepare, implement, optimize, and evaluate marketing campaigns are most important for them.
- Media: They draw attention to steps 7, 8, and 9 and provide media spaces throughout the whole process. Their main interest is to achieve good tracking results (such as the number of banner advertisements, mouse actions,

etc.). Therefore, the steps of implementing, optimizing, and evaluating campaigns are most important for the media. If the campaign achieves good results, the probability of future orders from the agency or advertiser increases.

- Advertisers: Steps 1, 2, 4, and 9 were mostly discussed. A specific brand product must clearly define what it aims to achieve with a marketing campaign and correctly interpret its goals to the agency or media that are the executor of the communication process. Another important step for the advertiser is the evaluation of the campaign, providing valuable information about future marketing communication strategies.

The follow-up quantitative research confirmed that marketing analysis and work with software analytical tools significantly affect the process of preparing marketing strategies. The five most decisive factors for developing marketing strategies are: 1) know-how from previous campaigns (85%); 2) marketing analysis (studies and available data) (79%), analytical software tools (64%), subjective decision-making – 28%, personal opinions and experience (26%). It is clear that data and tools help to extract meaningful information from respondents and are perceived as fundamental in the process of developing marketing strategies.

B. PERCEPTION OF MARKETING ANALYSIS AND ANALYTICAL TOOLS

In the second set of questions in the in-depth interviews, the intention was to find out how respondents perceive marketing analyses and analytical tools and how they implement these tools in digital marketing processes in their company.

The first question focused on the way respondents use marketing analysis in the process of planning and implementing digital marketing strategies. The following comments illustrate the situation in this area:

- Respondent working in the media: ''We use marketing analysis regularly. It is a thing without which we will not move. This means that the analysis is probably the most important part before we decide what further steps we will take.''
- Respondent working in the agency: ''Marketing analysis forms a substantial part of the whole process. They give us valuable impulses for creating a marketing strategy and think about what to do and how to do it.''
- Respondent working for the advertiser: ''All agency assignments we work with are based on our analysis and data.''

The next question in the second section focused on respondents' expectations of marketing analysis at any step in the preparation and implementation of a marketing strategy. The most common answers were:

- information about marketing campaign target group,
- segment size detection,
- information about competitor marketing activities,
- current trends in digital marketing in the local market,
- detection of relevant keyword search volume,
- information about potential marketing communication intervention,
- prediction of frequency of displaying the desired marketing message to the user,
- demographic information about the target group, and
- identification of situations where purchases are most common.

TABLE 1. Overview of the most commonly used analytical tools in digital marketing.

	Advertiser			Agency			Media		
Freely available surveys carried out by research agencies				✓	✓	✓	✓	✓	✓
Paid surveys conducted by research agencies	✓	✓	✓						
Historical data generated in previous marketing campaigns	✓		✓	✓	✓	✓	✓		
Internal analytical tools		✓	✓	✓	✓	✓	✓	✓	
Internal quantitative surveys		✓	✓						
Internal sales and customer data	✓	✓	✓		✓				
Information provided by partners	✓	✓	✓	✓	✓	✓			

The findings illustrated that marketing analysis serves as a source of information and are used by respondents for all important areas of preparing and implementing digital marketing strategies.

This was followed by the question: ''What are the sources of this information?'' The purpose of this question was to check where the respondents are searching and accessing the necessary information. The answers shown in Table 1 were mostly repeated:

The term ''source of marketing information'' can be regarded as any information about the market, segment, product, target group or competition that has been obtained from internal sources and from paid or unpaid third-party resources. It is important to realize that, despite the source of this information, it is usually necessary to work with analytical tools that help in the process of collecting, segmenting, evaluating and interpreting the collected data.

When asked the next survey question: ''Do you use analytical tools in the process of creating marketing strategies?'' all respondents answered yes. Any activity on the Internet is measurable through digital technologies and the collected results are used to make more effective decisions in future activities. Digital marketing professionals are well-aware of this and they use measurability as one of the most important competitive advantages of their company.

The various analytical tools available on the market can be integrated into the preparation, implementation and evaluation of digital marketing campaigns. The choice of the specific tool is subject to business needs. The question: ''Please indicate what tools you use and what purpose do they serve?''

sparked discussions about the most commonly used analytical tools and confirmed that the marketing agencies focus on execution, while media companies are focused on evaluation, and advertiser are focused on assigning digital marketing strategies. Table 2 lists the declared analytical tools, a short specification, and the entity that uses the tool. The tools are ranked by frequency of occurrence.

The list contains analytical tools that are most frequently used by respondents. Many of the mentioned tools are universal and their use was confirmed by respondents from all three entities (agency, media, advertiser). Each respondent regularly uses an average of 16 analytical tools with analytical capabilities that cover almost all areas of digital marketing. Respondents from all three entities said that 60% of the process of creating and implementing a digital marketing strategy is done by analytical tools and data, while 40% is done through activities such as brainstorming, creating advertisements, creating visuals, etc. We assume that various other tools are used infrequently, or the interviewee did not mention them due to the limited time dedicated to the interview.

The importance of data analysis in marketing was confirmed on the larger sample. One of the questions in the questionnaire determined whether marketing managers perceive digital marketing as a science or an art. 40% of respondents selected the first option, 19% selected the second, 41% were neutral, recognizing that both these definitions are true and in balance. Another question asked how data are collected and processed in companies. Only 9% of companies do not collect relevant data on customers and markets but they are planning to start doing so. 71% of companies are collecting data internally. Of these, 16% uses third-party to assist them with their processing and analysis. 19% of companies use a third-party partner to also collect the data on their behalf. 2% of the respondents were unsure how data are managed in their companies. Marketing managers are fully aware that, in today's environment and markets, data play a crucial role in digital marketing.

TABLE 2. Overview of the most commonly used analytical tools in digital marketing.

Analytical tool	Specification	Agency	Media	Advertiser
Google Analytics	An analytical tool that monitors users' activities on website.	✓	✓	✓
Google Data Studio	Visualizes collected data into graphs and infographics.	✓	✓	✓
Google AdWords	Advertising system for banner advertising and search engine advertising.	✓	✓	✓
Firebase	Provides information about using mobile and web applications.		✓	
Screaming-frog	A web browser that provides information about SEO settings.	✓	✓	
Facebook Ads Manager	Facebook social network advertising system.	✓	✓	✓
Facebook Insights	An internal analytical tool that includes profile and user information.	✓	✓	✓
Zoomsphere	Enables comprehensive management of social networks, including competition monitoring.		✓	✓
Kontentino	It makes it easier to work with content that is designed for social networks.	✓	✓	
Marketing Optimizer	A tool designed to automate marketing activities in the digital environment.		✓	
TestBirds	Optimization of digital products through user testing.			✓
Ahrefs	Analytical tool for SEO optimization and competitor information.		✓	
Clicktale	Real-time monitoring of user behavior on a website or in an application.			✓
Hotjar	Creating heat maps by moving a user's mouse on a web page.	✓	✓	✓
Exponea	A tool for automation, based on AI, aimed at achieving specific goals.	✓		✓
Piwik	Provides user behavior information across multiple platforms.			✓
Visual Website Optimizer	Comprehensive web site analysis to optimize user environment.	✓		✓
Gemius Explorer	Gathers and segments information about receiving Internet content by specified target groups.	✓		

C. LEVEL OF AWARENESS OF BIG DATA AND ML

The in-depth interviews identified respondents' perception regarding terms such as big data and data management and how they perceive these terms. Some of the comments were:

1) BIG DATA

- Respondent 1: "I see the big data as a huge amount of data from different segments of the online environment that companies should collect and evaluate internally because that is the future of doing business in the Internet environment."
- Respondent 2: "They are extensively large data that is raw, not segmented in any way, not processed in any way."
- Respondent 3: "Every company has some amount of data or has some data available in some form. Big data is an industry that processes these extreme amounts of data, and within this software available data are visualized."

TABLE 2. *(Continued.)* **Overview of the most commonly used analytical tools in digital marketing.**

Gemius Direct Effect	Monitors the performance of ongoing campaigns placed in the Internet environment.	✓		
Mautic	Software designed primarily for process automation, email campaign management, goal-oriented optimization, etc.			✓
Mailchimp	A marketing tool designed for small businesses, especially to manage email campaigns.	✓		✓
AIM monitor	A freely available tool that monitors traffic and other parameters for each website listed in the dashboard.	✓	✓	✓
Internal data	Each online activity generates a lot of data that are stored for future use.	✓	✓	✓
Third party data	Advertisers use agency data, agencies use generic or custom results of surveys, media data, etc.	✓	✓	✓

- Respondent 4: ''A large number of Excel spreadsheets with plenty of data. High volumes of data are being collected nowadays, but when people do not know how to use them, it is better to collect them less, but to know the purpose of their use.
- Respondent 5: ''Processing large amounts of data using different databases. Big data are a very good start and its processing and understanding will be used to create AI as one of the approaches to digital marketing.''

The four other interviewees completely or partially agreed with these answers. All the respondents have heard of, and understand, the concept of big data. They were all able to define the term in their own words, i.e. as a large amount of information and data that are thus far unprocessed. The next step is to segment and ''translate'' the big data into a form understandable for people. All respondents agreed that exploiting big data creates competitive advantage and that data are the future of digital marketing and many other industries.

Respondents were also asked how they understand the term 'data management' that is closely linked to big data. Some of the comments were:

2) DATA MANAGEMENT

- Respondent 1: ''Data management is a tool to manage these data.''
- Respondent 2: ''It is through data management that these data can be processed and converted to their advantage. Because having data is great, everyone can have it, but the question is how a person can transform those big data into something specific. How to use them, whether they can use them to target, as our company do, or use them for a look-and-like targeting, or for negative targeting, or can accurately identify that a particular cookie has a particular product but doesn't have its superstructure, etc.''
- Respondent 3: ''You have a platform where the data are stored. Data should be given meaning, logic and evaluated accordingly. This is supported by software that work on data management principles.''
- Respondent 4: ''Finding a connection between data. Their correct categorization. Big data are a refrigerator and data management means that you know exactly what to choose from the refrigerator when you want to cook something.''
- Respondent 5: ''Data management is a part of working with big data.''

The responses of the four other respondents partially or completely supported these comments. The collected information reveals that respondents some understanding of data management, but they are much less confident with big data. About half of respondents perceive data management as a tool for processing big data. Others either confused the concepts of big data and data management, considered their substance to be the same, or were not able to comment on the term as they do not understand it. All respondents agreed that nowadays, one should pay attention to data management. However, many admitted that additional education is needed because to fully embrace the opportunities requires significant knowledge.

When asked how respondents and their companies deal with data, most respondents indicated that they use their own analytical tools or third-party data. Only one of the interviewees reported no activity in this area. All respondents regard data as a strategic asset that creates competitive advantage for the company. Respondents who use analytical tools to retrieve data, primarily get the information from sales reports and historical marketing campaigns. Some companies acquire data from third parties, including business partners and freely available databases.

Although it was not the primary purpose of the question, the interviews revealed that agencies rely on third party data, media companies rely primarily on their own data, and more progressive advertisers use a combination of their own data and data from third parties. A less progressive advertiser does not work with data yet, although it sees great potential for such activity in future.

The question also elicited interviewees' opinions about the biggest obstacles to using data for digital marketing purposes:

- High costs: Seven out of nine (78%) respondents consider the entry costs of developing and implementing platform data management to be extremely high. Only an international company with high turnover and above-average budget can afford such a step in the Slovak market. All respondents agreed that, irrespective of the input costs, such an investment has a relatively short payback period. Respondents also expressed the view that it is easier to build a data-oriented business from

the start, than to incorporate data solutions into existing, often rigid, structures.

- Time consumption: Most respondents have had experience of introducing new systems into their current company, or a previous employer. All respondents (100%) agreed that the process of implementing new approaches is time-consuming and often exceeds a pre-agreed timeframe. Respondents are concerned about the time-consuming implementation of data-oriented approaches, based on their previous experience.
- High pressure on know-how: Digital marketing is a relatively young industry that requires a lot of new information, thus putting pressure on education and training of employees. Data-based approaches are an even younger industry that is embedded in the technology-digital world. New professionals in this industry are therefore required to provide a link between the technology, mathematical-statistical, and marketing worlds. This combination of skills is relatively scarce, and people with such experience are costly to the company because of their high intellectual value. Another solution may be to educate internal human resources, which in turn requires time and costs. Once the employees are trained the company may lose them to a competing company, due to high labor market fluctuations.
- Limited Slovak market: Respondents consider the size and possibilities of the local market as one of the problems in the implementation of data access. There are agencies in the world exclusively dedicated to analytical work and data processing. These agencies act as third parties that provide data processing services to their clients or they sell directly collected and processed data packages. According to the interviewees, the existence of such a company is unrealistic in Slovakia, because the digital marketing entities do not currently have the required funds to cover the costs of employing such a data company. Another problem is the size of the Slovak population, the penetration of the Internet and the additional costs associated with constantly updating the data collected, of which the timeliness is often linked to a cookie that only keeps track of information from the last 30 days.

The in-depth interview questions explored the current use of marketing analysis and analytical tools. While talking about analytical tools, the respondents directed the conversation to process automation, ML, and AI, as applied to digital marketing. Another interview question was: ''What do you imagine under the term AI? Try to define the difference between AI and ML.'' Especially when asking this question, respondents were reminded that the question examines their opinion and beliefs, regardless of their level of education. While in previous questions the respondents were relatively certain of their answers, they now needed more time to formulate their answers and their answers were unclear and inconsistent. This is illustrated in the following responses:

3) ARTIFICIAL INTELLIGENCE

- Respondent 1: ''A machine, a mechanism that thinks. It has a processor and does something.''
- Respondent 2: ''AI is something that is programmed by a person and does something that is based on some rules that the man sets.''
- Respondent 3: ''AI is a superstructure, it's a Mercedes among ML. It can learn not only from case studies that someone gives it, but it can also educate itself.''
- Respondent 4: ''AI should be able to solve problems on its own.''
- Respondent 5: ''AI is an algorithm that at some point starts to make decisions based on a large number of derived, indirect inputs. Given that it is starting to enter inputs from this point on its own, we can basically talk about intelligence.''

All respondents have encountered the term before and consider it to be very relevant in the current era. However, the answers varied, were unclear and confusing. All respondents vaguely understood the characteristics, almost no perception of the term was entirely consistent with its definition in the literature. The answers did not capture, or only partially captured the essence of AI.

The characteristics of the term ML was also part of the question. Some of the most relevant comments were:

4) MACHINE LEARNING

- Respondent 1: ''It can evolve. It can learn and develop.''
- Respondent 2: ''Based on what it does, it learns, and, in the future, it makes its activities better, more natural. The first step is to have AI and then link ML to it so that AI learns better, for instance to communicate with you based on some data.''
- Respondent 3: ''All robots and bots, manual work ...those things that can be set with a simple scheme ...conditional: when this, then this ...can be automated. These are responses to customer service, manual activity automation, etc.''
- Respondent 4: ''ML should be a process by which the process is improving in some way, that means, it should be able to produce better results after different sequences.''
- Respondent 5: ''ML is more predictable and only responds to directly set inputs. However, its specificity is that it has received a great amount of data, or that it ''experienced'' many simulated situations, making its output more accurate and relevant.''

All respondents identified ML as part of AI. Most respondents also correctly identified that ML is a kind of process that takes in large amount of data on which the system bases its learning and developing. Again, the answers only partially coincided with the definition given in the literature. Two of the respondents confused the concepts of AI and ML. The respondents took a considerably longer time to formulate their answers, in comparison to the other questions.

When we asked the additional question: ''Where did you hear about the mentioned terms for the first time?'' most respondents mentioned professional marketing conferences where the topic is currently very popular. Other responses included Internet resources, articles on marketing and technology websites, e-mails after voluntary subscription to news from a specific website and various educational-relaxation videos. It follows from the above that respondents are aware of the terms; they have encountered them in practice and have an approximate idea of what they represent.

Other questions were focused on the application of AI and ML to digital marketing processes and on the interviewees' opinions about how this application is reflected in practice. All respondents agreed that AI and ML have great potential, especially in technology-oriented industries such as digital marketing, and that the issue is closely related to process automation and the ability to work with large amounts of data. The digital marketing industry uses digital technology almost exclusively to process outputs. The work is carried out on computers and tablets, including administrative activities, communication and creative activities such as drawing graphics, websites and banners design, additional photo editing, etc. Even brainstorming, consultation and oral outputs are recorded in electronic format. The specialized work of experts allows a large part of these processes to be automated. Some employees are already being replaced by automated software for routine activities such as preparing regular reports, distributing generated content, paying subscription support on social networks, and even partially communicating with customers via email or automated responses on social network. Respondents see the greatest potential of AI and ML in the automation of activities and systematization of processes. Digital marketing is a combination of analytical and creative work. According to respondents, the analytical part will increasingly be carried out by machines and software, and people will be able to devote their time more to creative work and strategic decision-making.

As part of the follow-up quantitative study, respondents were asked to share their perception about the use of AI-based tools in their company. The research revealed that, even though most of the respondents knew what AI means and how it can be utilized (59%), a large group of marketing managers still lack basic knowledge about AI or have doubts about its usefulness. 31% of respondents are not completely sure what AI is and 10% of respondents only have minimal knowledge of the term AI. When asked about the areas that currently benefit from the power of ML and AI in their companies, the three most frequent answers were: 1) Process automation (81%); 2) Optimization of running marketing campaigns (71%); 3) Data mining, including the interconnection of several analytical tools (52%). When the same questions was asked, but not limited to their own company, the first choice was the same, namely process automation (81%), followed by precise targeting (81%), personalization of advertising content, and faster delivery of results (52%).

D. USING ML IN PRACTICE

During the in-depth interviews, respondents were asked: ''Can you define marketing analytical tools that are based on the basic principles of AI?'' the following tools were mentioned most often in respondents' responses: Google (AdWords, Search); Google Data Studio; YouTube; Facebook Ada Manager; chat applications; software for programmatic purchase; Echobox; automated webinars; Mailchimp.

Respondents are aware of some digital marketing tools that are based on ML or AI. In addition to mentioning marketing tools, respondents also listed companies that develop graphics cards, autonomously managed cars, and text translators. When asked which of these tools are used in their company, respondents listed the same tools as in the previous question.

The responses indicate that the tools that are based on the principles of ML will mainly affect the following areas of digital marketing:

- advertisement systems and the management of advertisement campaigns,
- automation of reporting processes,
- partial automation of communication (especially in written form, such as emails or chat communication).

Analytical tools can be used to retrieve data from the aforementioned areas. This eliminates the need for human intervention and the software solutions can perform defined actions autonomously.

In areas where AI is difficult to apply, respondents consider:

- creative processes,
- building and maintaining relationships with business partners.

These areas mainly work with data in a limited or very specific form. Nowadays, the development of ideas or drawing pictures can also be automated. However, results generated by machines will probably never be comparable to those generated from human brainstorming. Computers will probably never be able to be emotional, which significantly impacts the result (sometimes in a good way).

Another question in the qualitative survey was: ''What activities does your company plan for ML in the near future?'' If the respondent was poorly aware of analytical tools, marketing analysis, big data, data management, etc. and the respondent's company supports the deployment of ML-driven tools only marginally, only very basic or no activities are planned. If the respondents were fully aware of the topics discussed and works in an innovative company, the ML plans were well-developed. Among the most frequent areas where the respondents' companies are planning such activities are:

- report automation,
- linking several marketing analytical tools,
- collection of data generated from marketing activities,
- automation of the processing of collected data,
- digital content creation.

The last question was: ''Do you think human work can be replaced by machines in future? If so, how will marketing be

affected?'' All respondents agreed that human work certainly can, and almost certainly will, be replaced by machines. However, there will still be areas where machines and automated software will not be able to fully control and manage. According to the respondents, replacement will mostly affect areas that work with data, as well as repetitive work (such as weekly or monthly reporting of campaign results). Employees who have been doing this repetitive work in the past will be able to devote more time to strategic and creative activity that is often required in the digital marketing environment. When asked what percentage of the jobs in digital marketing will be replaced by machines in five years' time, the minimum estimate was 50% and the maximum was 95%.

Following the qualitative study, the questionnaire aimed to identify the barriers and risks of ML and AI application in digital marketing and the anticipated future role of ML-based tools in this industry. The cost of implementation (62%), time required to learn how to deploy and use the tools (47%), and market limitations (market size and lack of opportunities to use ML and AI based tools) (45%) were the three most common barriers. Marketing managers are afraid that using ML-based analytical tools might : result in higher error rate due to lack of know-how (50%); have a negative impact on results and relationships due to missing moral and ethical dimensions of behavior of the software and its intelligence (41%); or mean losing control over marketing processes (35%). Despite this, 72% of respondents believe that ML and AI represent the future of digital marketing (9% responded that they think these tools will cease to be used and 19% were unsure).

E. FRAMEWORK FOR SUCCESSFUL ADOPTION OF ML IN DIGITAL MARKETING

Analysis and interpretation of results from both qualitative and quantitative research enabled the construction of a framework aimed fostering the utilization and adoption of ML-based analytical tools in digital marketing. The framework consists of two main components: 1) Enablers, i.e. factors of organizational culture and management contributing to the atmosphere and conditions, where such a project can be initiated and successfully finalized, and 2) Process map, i.e. a map of processes of such a project consisting of four main phases (Fig. 2).

The absence of the enabler and/or following the suggested path may negatively affect the success of ML-driven tools' adoption.

Firstly, the project needs top management support. Due to its character (cost, cross-departmental reach etc.), adoption of ML tools cannot be pursued without top managers' commitment. There have been cases where projects fueled by regular employees and lower level of management were successful. However, in general, a top-bottom driven innovative climate is required for such complex project to succeed. The company's managers should also act as leaders who are aware of the importance of continuous improvement, the contribution of detailed analytics to the business and performance of their project teams. They should introduce ideas, adopt new solutions and test them. Secondly, introducing innovative solutions, measures, and tools needs to be embedded in the company culture and connected with its competitiveness and process efficiency. Thirdly, the company needs to realize that technologies form the base for its effective operation success. A knowledgeable CIO and other C-level managers should have at least a high-level understanding of recent technological innovations and their advantages for business. It is advantageous if the company has an internal IT team and/or has developed steady and sustainable relationships with technical partners and developers. Lastly, the company needs to foster frequent and detailed use of data for the sake of deploying its services, analyzing the impact of marketing strategies, and for internal management. Without this component, the initiative to automate data-intensive processes and reporting would not be justifiable by hard data, suggesting huge time savings and efficacy boosts.

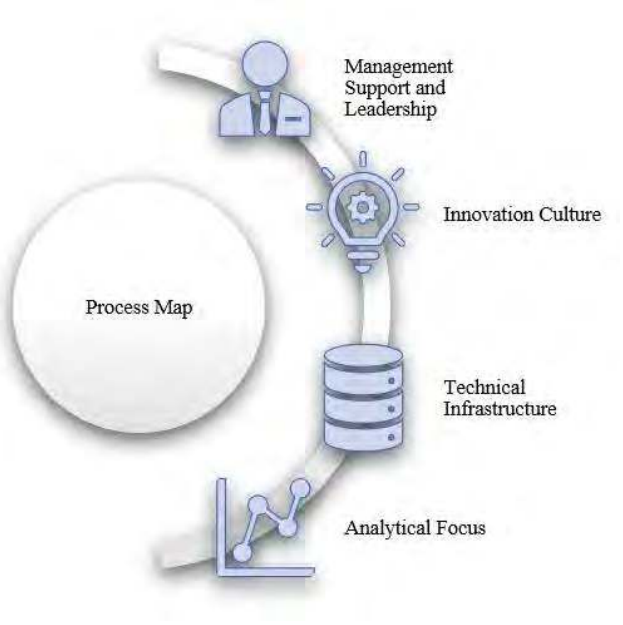

FIGURE 2. Framework for successful adoption of ML in digital marketing.

The process map (Fig. 3) outlines the phases and necessary steps for introducing automation of digital marketing processes and ML-driven analytical tools into companies.

Following the process map will guide the organization through the stages of the project to pay attention to all necessary aspects, enabling the minimization of risk and increasing the chance of project success. The processes of implementation and adoption of ML-based analytical tools in digital marketing are included in one of four main phases. The focus of the process map is the identification of periodical, time-consuming processes, predominantly in the area of data analysis that be supplemented by intelligent software solutions, utilizing the power of ML.

The process map builds on the knowledge generated by this research. The implementation process, as outlined in Fig. 3, starts with the Education phase. The possible lack of

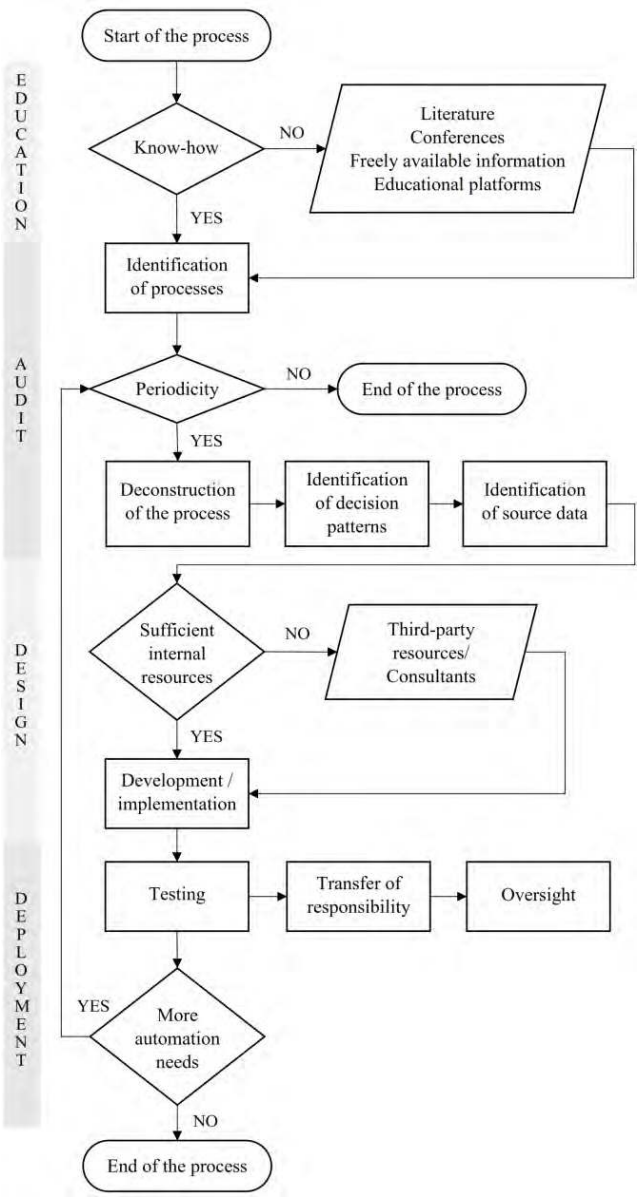

FIGURE 3. Process of identification, deconstruction, and substitution of periodical processes by ML-driven analytical tools.

knowledge about the opportunities of utilizing of ML and AI in marketing prevents companies from developing ideas on deploying these technologies. Companies are encouraged to raise knowledge and acquire know-how in this area. Four potentially valuable and accessible groups of knowledge resources have been identified. Quality literature from verified peer-reviewed sources should be used to naturally filter incorrect or misleading content. Marketing managers are used to participating in conferences and they represent a popular source of knowledge. Relevant materials can be also obtained from free internet resources on topical blogs, vlogs, websites of institutes, and associations and their newsletters. Finally, a number of educational massive open online course platforms, both free and paid, can be utilized to develop the knowledge on data analytics, ML and AI by company's key staff.

The Audit phase begins with the identification of processes that consume a significant amount of key employees' time. These processes can originate in any of the nine steps of implementation and evaluation of digital marketing strategies (Fig. 1) are typically connected with analyzing large amounts of data. This analysis results in the deployment digital marketing campaigns, understanding the behavior of consumers, their reaction towards the communication message, products, and, in general, their preferences. The identified processes need to be categorized as either creative or periodical. The potential of ML-driven analytical tools currently lies in the automation of time-consuming periodical analytical processes that are often ineffective when performed by humans. Each identified process will be deconstructed to individual steps that are performed in a sequence. Next, patterns of behavior and decision-making are identified. These represent the know-how of each employee when dealing with the process, for example the inputs he or she considers when generating a periodical performance report. Also, the preferences of end users of the product, the client, need to be acknowledged and considered. Finally, before moving to the next phase, all data sources that are used in each process are identified and closely analyzed. Most of the platforms would have their own APIs which can be used when developing the software solution.

The Design phase starts with making the decision whether to involve external experts and third parties in the process. Following the team creation, the process of designing, developing and releasing the software starts. Sometimes, existing products and solutions might get chosen and implemented, in other occasions these might need to be customized and integrated. In other cases, custom development needs to happen to satisfy the defined requirements.

In the Deployment phase, the new solutions are to be tested and the responsibility of their use will be transferred to dedicated teams. Managers need to monitor their use, resolve upcoming issues and address possible improvement ideas. In case more processes that need attention and automation were identified in the Audit phases, the process returns to evaluate whether these occur periodically. It would also make sense to automate them.

VI. DISCUSSION AND CONCLUSION

Based on all the answers, we can clearly state that marketing analysis is the cornerstone of the process of preparing and implementing a marketing strategy. All nine respondents confirmed that they work with data and use data analysis on almost a daily basis. All respondents agreed that they would take no further steps without information gained from marketing analysis. This is also reflected in the model (Fig. 1), where the marketing analysis and analytical tools that serve as a source of input information are an essential part of the preparation and execution of steps 2, 3, 5, 7, 8, and 9.

The respondents confirmed the dependence of marketers on marketing analysis and analytical tools, as the information supports decision-making in the development of digital

marketing strategies. The analytical tools serve as the main source of information for marketing analysis, on which marketing managers base their strategic decisions. Working with analytical tools has many advantages, such as: an overview of competitor activities and market mapping; accelerating the decision-making process; possibility of importing internal data into third party analytical tools; possibility of visualization of obtained data; rich targeting capabilities; instant availability of information; the ability to track real-time data in ongoing campaigns; the ability to identify space for optimizing ongoing processes; the accuracy of the observed parameters; possibilities of target group segmentation by behavioral profiles; often assisted analytical tool implementation or intuitive user interface.

On the other hand respondents referred to disadvantages of using these tools, such as: data access can be limited in specific analytical tools (some analytical tools require additional charges for full data access); the implementation of analytical tools is often expensive; inaccurate data (incorrectly measured) leads to misrepresented decisions; the correct use of analytical tools increases the pressure on additional know-how, thus generating costly additional staff training; the implementation of analytical tools is often a complicated and time-consuming process; many analytical tools use samples of respondents based on which gained information prevail across the whole market (often it is questionable whether a sample is representative); different analytical tools use different metrics that are often not compatible with each other and additional calculations are needed to achieve a summary result; the metrics are often adjusted, according to who owns the analytical tool; the absence of a comprehensive view of the results achieved across all analytical tools used.

The discussion about the use of data and big data for marketing analysis can be summarized in the following statement: large companies in the Slovak market will manage and use data within their custom developed IT systems. This has been the results of advancements in the technological possibilities of data-oriented approaches and the decreasing costs for the development and implementation of own software solutions. Small businesses, on the other hand, will probably not have enough money to pay for custom development. The option of implementing standardized solutions and applications can also prove difficult due to the diversity of digital marketing activities.

Based on respondents' answers, the level of awareness of ML and AI-related concepts, and partially also their current use rate, were identified. Discussions about the current application of ML to digital marketing processes and identifying areas where ML can be applied led to the conclusion that the greatest use of ML is to provide better quality data and process automation. Automation can be applied to a recurring process such as reporting, creating and optimizing advertising campaigns, and even communication with customers. When introducing innovative technologies, the focus is primarily on process automation and data processing. These activities are currently performed manually, although only minimal intellectual input is needed for these tasks. Even in the creation of digital content, which appears to be highly intellectually intensive, respondents referred to automated translation of articles from foreign media. Most of the content that is published on Slovak digital platforms is taken over from foreign media and only slightly adapted to the needs of the local market. The respondents' companies are turning to other technology companies to develop and implement tools that use innovative technologies, including ML. They see the process of self-development as too costly and time-consuming and they therefore focus on working with specialists in the field.

Based on the results of this research, it can be stated that ML already has a place in the work of marketing managers and digital marketing specialists. The qualitative research provided insights into the way respondents think about the use of ML in digital marketing and how their companies perceive the benefits and drawbacks of ML and AI tools. Findings from the experience of digital marketing professionals in Slovakia can be tested in other countries of the world in the follow-up research. The follow-up quantitative research revealed that the topic is still new to marketing managers and some of them are unsure, even about the basic definition and functioning of ML and AI. Despite this fact and identified barriers of adoption and risks of implementing ML-based tools, most marketing managers believes that ML and AI are the future of digital marketing.

The framework represents a contribution to the current body of knowledge, which predominantly focuses on the development of the most advanced and smart technologies, while lacking the focus on their deployment and adoption. It enables practitioners both from IT and marketing to understand the complexities of the process of implementing ML-based tool into the organization. The framework also has the potential to reveal opportunities of such a project and guide the organization through the whole deployment process.

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