

The Impact of Artificial Intelligence Applications on the Digital Marketing Development on the Telecommunications Companies in Jordan

Dr. Loma Shafiq MOHD Naji

Faculty of Business Administration, Mut'ah University, Jordan.

E-mail: Lama.naji@yahoo.com

Received August 18, 2021; Accepted December 02, 2021

ISSN: 1735-188X

DOI: 10.14704/WEB/V19I1/WEB19059

Abstract

This research mainly aims to analyze the main effect of the Artificial Intelligence applications; neural networks, expert systems and evolutionary computation, on digital marketing development. Specifically, the aim is to evaluate the new artificial intelligence applications in Jordan, especially those which can affect digital marketing development. Besides, the researcher designed questionnaires which were given on the basis of a technique of simple sampling. Moreover, they were applied on the Jordanian telecommunications companies. A number of 375 questionnaires were distributed. Furthermore, a number of 320 samples were gathered. The result was 85% response rate concerning all the respondents' responses. The researcher relied on reliability test, descriptive analysis, and multiple regression tests, which were applied to achieve the objectives of this research. Furthermore, this study's results reflected a positive effect of Artificial Intelligence applications; namely, expert systems, evolutionary computation as well as neural networks, on digital marketing development. However, Jordanian employees are concerned with Artificial Intelligence applications; expert systems, evolutionary computation as well as neural networks, on the basis of their perception's analysis. Such applications can develop the digital marketing in the Jordanian telecommunications companies. Finally, this study's results make it clear that companies have to improve those applications to enhance digital marketing world.

Keywords

Digital Marketing Development, Artificial Intelligence Applications, Expert Systems, Evolutionary Computation, Neural Networks.

Introduction

In our age, the advancement of technology has allowed industries to offer people an unlimited number of products. Moreover, digital marketing employs certain channels; like

the internet, in order to open new vistas for industries that like to advertise and, more importantly, sell their products. The concept of digital marketing embodies all the methods that ultimately create a clear and powerful impact on people, at a particular time, a particular place, and through specific channels (Rao, Srivatsala, & Suneetha, 2016). Digital marketing progress in the industrial sector is an outcome of merging big data with academic scientific research and applying them on intelligent systems. Thus, this article thoroughly analyzes and explains digital marketing methods through artificial intelligence (AI) research. However, the number of scientific publications remains at an intermediate level when the business sector seems to have moved forward (Stone et al., 2020). This study absolutely highlights the significance of AI applications in the field of the digital marketing. Truly, despite the wide research area as well as the number of publications on this concept, there is still a lack of purely scientific publications concerning the concept of digital marketing as well as artificial intelligence (AI) (Kerr & Phaal, 2020). However, there are still some serious research attempts to manifest certain digital marketing fields such as targeted ads, search engine optimization, web development consumer behavior and search engine ranking factors. This point gives hope that the artificial intelligence (AI)'s future will reflect a great impact on the field of digital marketing research (Orriols-Puig, Casillas & Martínez-López, 2010).

Statement of the Problem

Truly speaking, there is an obvious lack of studies on the Artificial Intelligence (AI)'s effect on the world of Digital Marketing. As it is emphasized by Gkikas and Theodoridis (2019), with the rapid expansion of businesses over the last years, the strong need to hire qualified expert staff emerged. Meanwhile, academic researchers opted to be immediately hired by companies instead of being stuck at the seats of universities or other research centers. Undoubtedly, the peak of AI research's maturity, in the business field, is much higher than it appears. This explains the AI's diffusion outside the walls of universities as well as in technology products. In this context, another main reason is associated with the fact that scientists lack data. At the same time, the business sector daily collects and stores billions of bytes. Such data is sufficient to conduct a number of researches. Ironically, the scientists in the field of artificial intelligence (AI) lack such data. However, fewer data to evolve their models (Cappa, Oriani, Peruffo & McCarthy, 2021). As per the data available on eMarketer.com, it is true that marketing experts tirelessly struggle to define the concept of artificial intelligence (AI). Moreover, instead of using certain words like 'predictive modeling,' 'data mining,' 'machine learning,' such marketing experts constantly employ the concept 'artificial intelligence' to define certain concepts like keyword searches, intelligent systems, data analysis, or user profiling. On the other hand,

computer scientists as well as IT engineers, around the world, lack the necessary marketing knowledge (Gkikas & Theodoridis, 2019).

Because of the considerable amount of data, which are continuously generated, it is true to argue that the decision making's complexity, along with the strong need for fast results, ultimately lead to a point where it becomes urging to invent a model of artificial intelligence applications that can enhance the development of digital marketing and can be adopted and applied in as many variant digital marketing sectors as possible. In doing this, it is urging to find the facts and identify the needed outcome. Moreover, it is true enough that we have used, and are still using, most methods of digital marketing; namely, optimization algorithms, big data's multiple attributes as well as numerous instances and sophisticated decision. Besides, the outcome of this could be a statistically significant and correct result. It could be helpful to decision-makers. In this respect, a model that categorizes data upon request as well as optimizes them in such a way to be more accurate would be probably needed (Wilson & Daugherty, 2018).

It is absolutely true to argue that having a generic optimization model, that produces classified data, would ultimately help decision-makers and give them the ability to reevaluate their choices on the basis of low-risk decisions. Moreover, the methods of digital marketing are different; varying from bidding optimization, targeted audiences to keyword selection. Suppose that it is statistically proven that the existence of specific data ultimately interacts and correlates with each other. In that case, the foundation could be formed for an intelligent decision agent (Gkikas and Theodoridis 2019). The applications of artificial intelligence; including expert systems, evolutionary computation and neural networks, can effectively provide all these abilities in digital marketing. Another issue is that this research will be applied in Jordan, an underdeveloped context regarding digital marketing and AI applications. This research will ultimately attempt to fill this gap by examining the model of artificial intelligence applications; namely, expert systems, neural networks and evolutionary computation, and digital marketing development in telecommunication companies in Jordan.

Questions of the Research

The present study is centered on its main question; that is, what is the effect of Artificial Intelligence Applications (AI) (neural networks, evolutionary computation, expert systems) on digital marketing development among the employees of Jordanian telecommunication companies. The researcher derived a number of sub-questions as follows:

1. Is there any effect of neural networks, on the digital marketing development among Jordanian telecommunication company's employees?
2. Is there any effect of evolutionary computation, on the digital marketing development among Jordanian telecommunication company's employees?
3. Is there any effect of expert systems, on the digital marketing development among Jordanian telecommunication company's employees?

Objectives of the Research

The present research ultimately attempts to explore if there is any significant impact of the Artificial Intelligence Applications (AI) (neural networks, evolutionary computation, expert systems) on digital marketing development among the employees of Jordanian telecommunication companies. The researcher has derived sub-objectives as follows:

1. To find out the effect of neural networks, on the digital marketing development among Jordanian telecommunication company's employees?
2. To investigate the effect of evolutionary computation, on the digital marketing development among Jordanian telecommunication company's employees
3. To investigate the effect expert systems, on the digital marketing development among Jordanian telecommunication company's employees.

Research Hypotheses

H1: There is absolutely a significant effect of neural networks on the digital marketing *development among Jordanian telecommunication company's employees at $\alpha \leq 0.05$.*

H2: There is really a significant effect of evolutionary computation on the digital marketing development among Jordanian telecommunication company's employees at $\alpha \leq 0.05$.

H3: There is ultimately a significant effect of expert systems on the digital marketing development among Jordanian telecommunication company's employees at $\alpha \leq 0.05$.

Literature Review

1. Digital Marketing

The concept of digital marketing encapsulates all marketing tactics as well as certain ways to apply an electronic device or, more importantly, the internet to reveal, promote, and sell services or products. Moreover, industries employ certain internet channels, in their marketing process, to help them succeed. An unlimited number of social media pages, websites, targeted advertisements, and emails effectively help such companies to grow

and market their products along with increasing the perspectives of customers. In this respect, promoters, customers, competitors, suppliers, resellers, positioning, the overall economy, segmentation, customer value, growth, products, expansion, brands, market share, price, advertising, advertising expenditures, churn, number of resellers are some of the most and main important variables that ultimately affect decision making. Decision-making is undoubtedly an issue of multiple variables that is truly based on analysis, experience along with ultimate judgment (Miklosik, Kuchta, Evans & Zak, 2019).

Artificial Intelligence (AI)

Due to the fact that the variables, that ultimately affect the desired outcome, can really be quantified as well as measured, there arises a new question “In what possible scale artificial intelligence (AI) can help in contributing to the field of digital marketing research?” In this context, marketing decision-makers always seem to be constantly employing their long experience to make decisions on the basis of a wide range of data, a number of statistic charts, certain opinions as well as tastes. Undoubtedly, this ultimately makes the desired decision hard to be made due to the complexity as well as multifactor circumstances. In this respect, Artificial intelligence (AI) becomes capable of solving the dilemma of how such big information is analyzed and ultimately processed. It also becomes helpful and necessary in producing a quick low-risk decision. Furthermore, the applications related to the world of artificial intelligence (AI) are different. They vary from one business to another. Yet, business predictive models really have their origins in a number of scientific researches. Nevertheless, there is still a slowdown concerning the field of artificial intelligence (AI) research. On the other hand, there is an increase in business (Gkikas & Theodoridis, 2019).

Artificial Intelligence and Digital Marketing

The evolution of marketing analytics from its traditional form towards AI has brought about a new fashion of marketing. It has fueled debates and hot discussions about AI, especially its use in the world of marketing, where the boundary between AI and advanced analytics becomes ultimately fuzzy. The concept of analytics has evolved to have a new form as it can today handle relatively unstructured issues and problems until coming up with a number of suggestions in such a way that could have been viewed and regarded as “expert” and even identified and defined as AI. In this context, one main feature of AI, that distinguishes it from the utterly classic “advanced analytics”, is its automation of feedback loops as well as improvement, i.e., (machine learning), also known as learning by the system. It is concerned with how to effectively make things

better. This, in turn, encapsulates that certain conclusions are ultimately being tested as well as evaluated against specific criteria, as it is opposed to merely being reviewed and evaluated by humans who tend to make decisions on what has to be done next. That is, the action, which is being “managed” by AI, is utterly precise, implemented quickly and contained. Besides, with the results, which are also being easily measurable and quickly assessable, AI is ultimately viewed as very productive (Stone et al., 2020).

However, at times when decisions become more wide-ranging, when they take time to implement as well as when time elapses just before the possible results of the decisions become apparent, regardless measurable and assessable, the deployment of AI becomes more complicated. That is, it may ultimately be hybrid, while the parts of the cycle are being effectively undertaken by AI along with human decision-makers. Here, marketing strategy is related to decision-makers (Nishant, Kennedy & Corbett, 2020). Yet, a technique, which can be employed to develop and improve applicability, is still back casting. In such a technique, decisions which have been taken earlier, and of which the ultimate results are now clear, are employed along with data collected during the period of analysis in order to train the system. Undoubtedly, this approach can ultimately and effectively be adopted to capture the “historic expertise” concerning the strategic marketers, either by adopting rule elicitation or at times case-based reasoning. It is true that the rise of AI in the world of marketing is not isolated from the rapid, more comprehensive development in the field of marketing technology, either in essential and main marketing operations, including contact centers, or marketing resources’ management (Zhu, Zhang, Xiang, & Ma, 2021). This development in the world of marketing helps in the ultimate deployment of AI in marketing. This is because it computerizes other aspects of marketing along with generating data that can ultimately be employed to support AI. Yet, this point also indicates that the use of AI should certainly be integrated with such applications, while taking data really and automatically provides feedback along with making recommendations concerning other relevant areas.

Framework of the Research

Consequently, following the preceding evidence, the conceptual framework of the present study below illuminates the effect of the Artificial Intelligence applications, namely, expert system, evolutionary computation and neural networks, on digital marketing development among the employees in the Jordanian telecommunication companies. Expert system, evolutionary computation and neural networks were considered as the independent variables. On the other hand, digital marketing development was considered

d the dependent variable. The following figure (Figure 1) represents the study's conceptual framework.

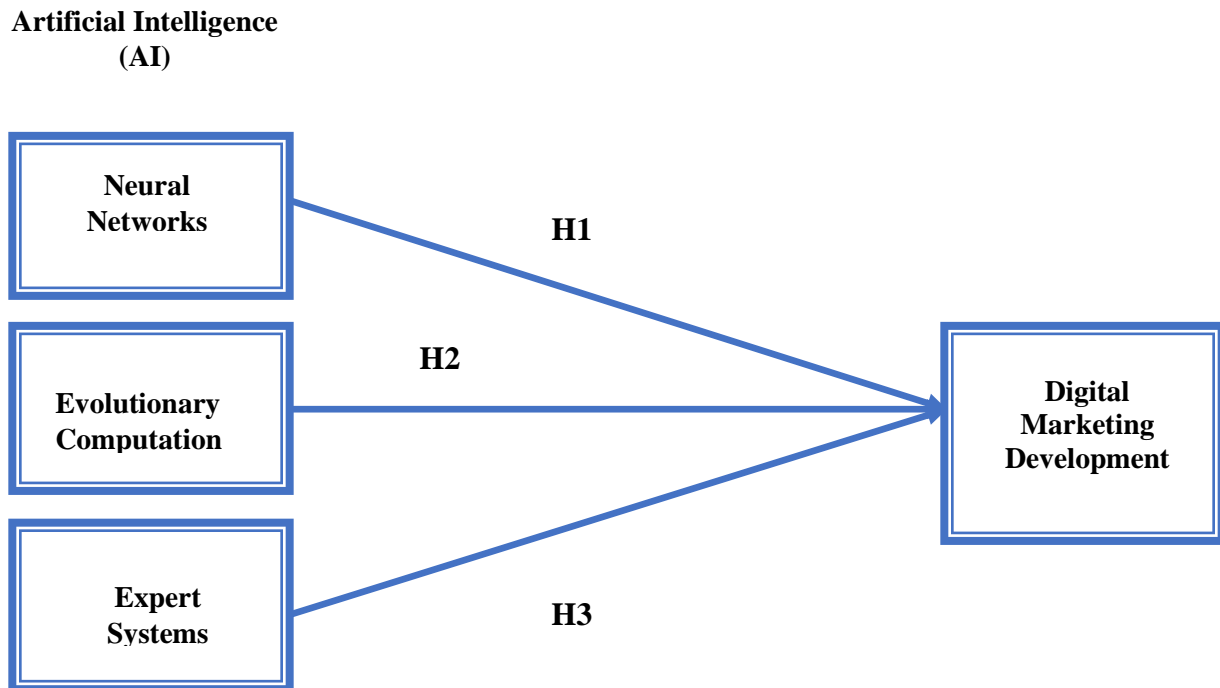


Figure 1 The conceptual framework of the study

Research Methodology

In the present study, the researcher follows the empirical method demanded to investigate the relationships among independent as well as dependent variables in the proposed model of the effect of the AI applications (neural networks, evolutionary computation, and expert systems) and digital marketing development. Furthermore, the empirical method is adopted to achieve the main objective of this study, that is, to find out the effect of AI applications, namely, (neural networks, evolutionary computation, and expert systems), which are regarded as independent variables, on digital marketing development, which is viewed as the dependent variable. The researcher employed one unique model, using the statistical methods which will be clarified later.

Research Methods and Design

To accomplish the purposes of this research, a descriptive and quantitative research approach, which is based on the survey being adopted to collect data from respondents, adapted from the prior literature in the AI and digital marketing area, is used. The descriptive and quantitative survey approach was manipulated to examine the effect of AI applications (neural networks, evolutionary computation, and expert systems) on digital

marketing development among the employees of Jordanian telecommunication companies.

Collection of Data

To achieve the study's objectives, primary along with secondary data collection methods were employed. Moreover, the study's primary data were ultimately collected by means of questionnaires administered to select employees in Jordanian telecommunication companies. The study tool, the questionnaire, is separated into different sections. The first section covers questions on the background and personal information of the respondents. Besides, the second section, section B, covers questions that will measure the respondent's perception about the neural networks, and section C, which covers questions related to their perception and views about the evolutionary computation, section D includes a question that measures expert systems. The last section, (E), on the other hand, embodies questions related to the respondent's perceptions about digital marketing development. Moreover, the secondary data was ultimately collected in the form of a literature review of previous studies which have been carried on the same subject.

Analysis of Data

The present study's data was exclusively collected by means of an online survey. This is due to the current outbreak of coronavirus pandemic and its consequences that have ultimately resulted in the closing of all life aspects including the universities in Jordan, during the conducting of the present research. Besides, data were further analyzed by means of the Statistical Package for the Social Sciences (SPSS):

1. This study embodies descriptive statistics; including standard deviations and arithmetic means.
2. The researcher uses the Cronbach's alpha coefficient. This is employed for each of the four measures in order to calculate and evaluate the reliability as well as to examine the validity of designed questionnaire.
3. In order to test the hypothesis relationship, which is proposed in this study, the researcher uses multiple regression analysis in order to determine the impact of all the independent variables on the dependent variable.

The Target Population

According to a study conducted by Sekaran and Bougie (2016), it is true that the word population refers to the complete set of cases, from which a small sample is selected.

Therefore, this study's target population is the employees of Jordanian telecommunication companies. As for the Jordanian Department of Statistics (2020), the number of employee's works in telecommunication companies in Jordan in 2020 was 16000. Following these statistics, it becomes obvious that the target population of the present study will be 16000. Moreover, the researcher follows random sampling technique during data collection process.

Sample Size & Sampling Technique

Generally, there are two distinct types of sampling; probability and non-probability. In this connection, probability sampling embodies numerous methods which are adopted for the random selection of certain students out of the entire population. Moreover, concerning the researcher's full access to the study's whole population, it becomes obvious that the possibility of selecting each member of the study's population is known (Sekaran & Bougie, 2019). For achieving the main objectives of the present study, employees were selected using the random sampling technique. The sample was taken from 16,000 employees in telecommunication companies in Jordan based on a statistical department of Jordan (2020). The sample size for this population is 375 based on Krejcie & Morgan's (1970) Random sampling technique used to select 375 respondents from telecommunication companies in Jordan.

Rate of Response

This study's target population included 16000 employees' works on the telecommunication companies in Jordan. In this context, the following table, (Table 1), reflects that a number of 375 questionnaires were administered; a number of 320 were answered, which indicates that the response rate is 85%. In this connection, Hair et al. (2010) commented that the statistically significant response rate, concerning analysis, should record at least 50%. The following table (Table 1) reflects the present study's response rate.

Table 1 Rate of Response

Rate of Response	Size of the Sample	Percentage
Answered questionnaires	320	% 85
Unanswered questionnaires	55	% 15
Total	375	% 100

Descriptive Statistics

The researcher, in the present study, employed descriptive analysis mainly to analyze the data, simply by expressing, or descriptively explaining the participants who are viewed as

a study variable. Moreover, the descriptive analysis of respondents' responses was employed to identify the participant's assessment standards, with ultimate average value scores. Following Table 2, there is a number of 320 valid answers. Their arithmetic mean and standard deviation were investigated. The study's results reveal that the mean of the answers for the independent variables where necessary. The highest mean was for the neural networks, expert systems, and evolutionary computation. It appears that there is obviously no low level concerning mean scores. Furthermore, the participants ultimately agree that such variables have strong impact on the world of digital marketing development.

Table 2 Standard Deviations & Means

Component	Mean	Std. Deviation
Neural Networks	4.05	1.061
Evolutionary Computation	3.89	1.501
Expert Systems	3.97	1.316
Digital Marketing Development	3.92	1.363

Reliabilities of Scale

The researcher relied on Cronbach's alpha in measuring as well as in assessing the tool's internal consistency, its efficiency and reliability. Furthermore, Cronbach's alpha was mainly employed to find out the reliability of the study's findings, which are the direct outcome of measurements, based on correlations between all the factors of the present study. This is also known as internal consistency. Besides, Cronbach's alpha is ultimately and frequently used to test the arithmetic means of the questionnaire's items as they are evaluated in tests as well as their relationships. Furthermore, SPSS software, in the present study, is utilized to mainly analyze the reliability of the data being collected. Last, the general scale's consistency, of the present as well as selected conditions, is tested and confirmed by Cronbach's alpha. It should exceed the normal as well as acceptable scale of 0.70 (Hair et al., 2010). Moreover, Cronbach's alpha, in this study, was mainly employed to measure the items reliability. The calculated Cronbach's alpha, as it is shown below, ranges between 0.88 and 0.93. This is ultimately an excellent result. (See Table 3).

Table 3 Analysis of Reliability

Variables	No. of items	Alpha
Neural Networks	6	0.871
Evolutionary Computation	6	0.906
Expert Systems	4	0.922
Digital Marketing Development	5	0.896

Result of Hypotheses Testing

Three hypotheses were previously created for this study. Such hypotheses necessitate using a multiple regression analysis (for all the three hypotheses).

Table 4 Model Summary Indicators

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.871 ^a	.759	.759	.67008
a. Predictors: (Constant), NeuNet, EvoCom, ExpSys				

Coefficients ^a						
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-.122-	.170		-.715-	.475
	NeuNet	.122	.023	.095	5.310	.000
	EvoCom	.378	.018	.416	20.824	.000
	ExpSys	.507	.022	.489	23.428	.000
a. Dependent Variable: DigMark						

In the *Model Summary* output table 4, the **R Square (0. 759)** which illustrates that the result's arithmetic mean records **75.9%** of the variance (R^2) concerning the digital market development. This has further been significantly explicated by all the three independent variables, namely, expert systems, evolutionary computation and neural networks. The next table titled *Coefficients* helps researcher to see which among the three independent variables influences most the variance in digital market development. If we have a look at the column of Beta under *Standardized Coefficients*, it will be seen that the highest number in Beta is 0.489 for expert systems, which is significant at the 0.000 level, which means hypothesis H3 approved and there is significant effect of the expert systems on the digital marketing development among Jordanian telecommunication company's employees at $\alpha \leq 0.05$. Moreover, Beta was 0.416 for evolutionary computation which means there is significant effect at the 0.000 level, which means hypothesis H2 approved and there is significant effect of the expert systems on the digital marketing development among Jordanian telecommunication company's employees at $\alpha \leq 0.05$. Finally there was weak effect of neural network from the perception of the respondents on the development of the digital marketing in the Jordanian telecommunication companies with beta (**0.095**) at significant level 0.000.

Discussion

The world of Artificial intelligence (AI) will undoubtedly and ultimately bring about new standards in the world of digital marketing, both in the field of academia as well as

businesses. The industrial sector now is just few steps ahead of the point at which the academic world, at the global level, stands today. Moreover, despite the existence of companies' artificial intelligence (AI) model's evolution, the world of academia will eventually manage to bridge the gulf in between. Besides, marketing science ultimately does evolve in the business sector and in universities, where new knowledge is created; businesses rely on the latter.

This study ultimately aimed to find out and explore new trends concerning AI applications and digital marketing, particularly in Jordan. This is a relatively new context. Moreover, this study has discussed an important and critical matter in the marketing field; digital marketing development as a dependent variable and three applications of artificial intelligence; expert systems, evolutionary computation and neural networks. This study shows the strong effect of two independent variables (evolutionary computation and expert systems) on the dependent variable digital marketing development, and the weak effect of the neural networks. The importance of this study stems from its originality and its novelty in the sense that there is no previous study set to examine the three applications of AI (neural networks, evolutionary computation, and expert systems) on digital marketing development in one model. Furthermore, this study has effectively covered new concepts as well as trends related to AI and the world of digital marketing in Jordan.

References

- Bougie, R., & Sekaran, U. (2016). *Research Methods for Business: A Skill Building* 7 ed. Wily.
- Buck, J.W., Perugini, S., & Nguyen, T.V. (2018). Natural language, mixed-initiative personal assistant agents. *In Proceedings of the 12th International Conference on Ubiquitous Information Management and Communication*, 1-8.
- Cappa, F., Oriani, R., Peruffo, E., & McCarthy, I. (2021). Big data for creating and capturing value in the digitalized environment: unpacking the effects of volume, variety, and veracity on firm performance. *Journal of Product Innovation Management*, 38(1), 49-67.
- Gkikas, D.C., & Theodoridis, P.K. (2019). Artificial Intelligence (AI) Impact on Digital Marketing Research. *In Strategic Innovative Marketing and Tourism, Springer, Cham*, 1251-1259.
- Hair, J.F., Celsi, M., Ortinau, D.J., & Bush, R.P. (2010). *Essentials of marketing research*, New York, NY: McGraw-Hill/Irwin, 2.
- Kanagarajan, K., & Arumugam, S. (2019). Intelligent sentence retrieval using semantic word based answer generation algorithm with cuckoo search optimization. *Cluster Computing*, 22(3), 7003-7013.
- Kerr, C., & Phaal, R. (2020). Technology road mapping: Industrial roots, forgotten history and unknown origins. *Technological Forecasting and Social Change*, 155.

- Krejcie, R.V., & Morgan, D.W. (1970). Determining sample size for research activities. *Educational and psychological measurement, 30*(3), 607-610.
- Miklosik, A., Kuchta, M., Evans, N., & Zak, S. (2019). Towards the adoption of machine learning-based analytical tools in digital marketing. *IEEE Access, 7*, 85705-85718.
- Nishant, R., Kennedy, M., & Corbett, J. (2020). Artificial intelligence for sustainability: Challenges, opportunities, and a research agenda. *International Journal of Information Management, 53*.
- Orriols-Puig, A., Casillas, J., & Martínez-López, F.J. (2010). Automatic discovery of potential causal structures in marketing databases based on fuzzy association rules. In *Marketing Intelligent Systems Using Soft Computing, Springer, Berlin, Heidelberg*, 181-206.
- Peng, D., Li, T., Wang, Y., & Chen, C.P. (2018). Research on information collection method of shipping job hunting based on web crawler. In *Eighth international conference on information science and technology (ICIST)*, 57-62.
- Rao, S., Srivatsala, V., & Suneetha, V. (2016). Optimizing technical ecosystem of digital marketing. In *Artificial intelligence and evolutionary computations in engineering systems, Springer, New Delhi*, 691-703.
- Sekaran, U., & Bougie, R. (2019). *Research methods for business: A skill building approach*. John Wiley & sons.
- Spentzouris, P., Koutsopoulos, I., Madsen, K.G., & Hansen, T.V. (2018). Advertiser bidding prediction and optimization in online advertising. In *IFIP International Conference on Artificial Intelligence Applications and Innovations, Springer, Cham*, 413-424.
- Stanica, I., Dascalu, M.I., Bodea, C.N., & Moldoveanu, A.D.B. (2018). VR job interview simulator: where virtual reality meets artificial intelligence for education. In *Zooming innovation in consumer technologies conference (ZINC)*, 9-12.
- Stone, M., Aravopoulou, E., Ekinci, Y., Evans, G., Hobbs, M., Labib, A., & Machtynger, L. (2020). Artificial intelligence (AI) in strategic marketing decision-making: a research agenda. *The Bottom Line, 33*(2), 183-200.
- Wilson, H.J., & Daugherty, P.R. (2018). Collaborative intelligence: humans and AI are joining forces. *Harvard Business Review, 96*(4), 114-123.
- Zhu, S., Ma, C., Zhang, Y., & Xiang, K. (2021). A hybrid metamodel-based method for quick energy prediction in the early design stage. *Journal of Cleaner Production, 320*.