

Suitability of Industry 4.0 technologies' to be applied in SMEs marketing related functions

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ABSTRACT

The influence of Industry 4.0 on SMEs has drawn a lot of attention from academics in recent years. According to scientific literature, the ability to involve customers in the manufacturing processes distinguishes Industry 4.0 from the previous Industrial Revolutions. As a consequence, customer centricity and the role of marketing become essential for SMEs continuous growth. Therefore, this study aims to investigate the Industry 4.0 technologies' suitability for application within marketing related functions of SMEs. Qualitative research was executed, and a content analysis method was used to elicit deeper meaning about the deployment of Industry 4.0 technologies in SMEs marketing related functions. In total, eleven C-level Executives in Lithuania participated in the study. In essence, this study provides a guideline for marketing managers of SMEs in responding to the Industry 4.0 phenomenon and applying the most suitable Industry 4.0 technologies for marketing related purposes. This study fills in the research gaps in this area and helps to better understand how Industry 4.0 technologies can enhance the marketing practices of SMEs.

KEYWORDS - Industry 4.0, technology application, marketing, SMEs.

1. INTRODUCTION

SMEs are enterprises with fewer than 250 employees, a yearly turnover under EUR 50 million, and/or a yearly balance sheet total below EUR 43 million, according to the official definition. It is impossible to underestimate the significance of SMEs in the context of global business expansion, given that they account for 99% of all companies operating in the European Union (European Commission, 2020). However, due to the recent rapid corporate digitalization processes, often referred to in scientific and business-related literature as Industry 4.0 or the 4th Industrial Revolution, the current business environment in which SMEs operate is remarkably dynamic.

The primary driving forces behind the 4th Industrial Revolution are the Internet of Things (IoT), Artificial intelligence (AI) and other technologies. Consequently, SMEs in particular have the chance to take advantage of Industry 4.0 and enable the most modern technologies in their marketing related functions to execute customer-focused strategies and reach audiences that were previously only accessible to large corporations (Pranjic & Rekettye, 2019). Nevertheless, for SMEs – changing the way they operate is not an easy task, as SMEs are still in the early stages of embracing Industry 4.0 technologies, particularly in roles that are related to marketing. According to Cimini et al. (2017), putting Industry 4.0 concepts into practice necessitates not just the adoption of new technology and infrastructure but also a fundamentally different organizational structure and set of procedures from those present in conventional SMEs. In addition to this, in practice, SMEs often lack structure, resources and are heavily affected by their owners or management (Gilmore et al., 2001; Resnick et al., 2016; Walsh & Lipinski, 2009). Consequently, the guidelines regarding Industry 4.0 technologies' application suitability within SMEs marketing related functions become of high importance.

Although in recent years the interest of scholars researching Industry 4.0 technologies' application within SMEs has been increasing, the majority of the current studies are focused on the factors that enable SMEs to adopt Industry 4.0 technologies across a variety of business activities (Eze et al., 2019; Maroufkhani, 2020; Nair et al., 2019; Prause, 2019). However, up until now, there has been a research gap regarding Industry 4.0 technologies' suitability to be applied in SMEs marketing related functions. Consequently, this research aims to solve the scientific problem: which Industry 4.0 technologies are the most suitable to be applied to in marketing related functions within SMEs? This study relies on the qualitative research method and employs the semi-structured online interview technique to gather eleven C-level Executives from Lithuania insights on the Industry 4.0 technologies' application suitability in SMEs marketing related functions.

This study provides the originality aspect, as it reveals the most suitable Industry 4.0 technologies to be applied in marketing functions within SMEs.

2. LITERATURE REVIEW

The role of marketing in explaining SMEs' business performance has received significant attention throughout the history of the marketing discipline. For instance, Morgan (2011) developed an integrative theory-based conceptual framework linking marketing with firms' business performance. According to the model, marketing capabilities within the firm together with marketing resources (knowledge, finance, etc.) have an impact on marketing strategy decision making and its' implementation, which turns into the positional advantage. Joensuu-Salo et al. (2018) researched more than 100 Finnish SMEs and revealed that marketing capability mediates the effect of market orientation on firm performance. Meanwhile, the study of Sadiku-Dushi et al. (2019) revealed that opportunity focus, resource leveraging, and value creation are the dimensions of entrepreneurial marketing that are positively related and have a significant impact on overall SME performance. Such scientific findings prove the importance of the marketing function for SMEs growth.

Literature analysis reveals that Industry 4.0 technologies' enable enhanced customization possibilities in the marketing function, and this should be the main motivation driver towards Industry 4.0 technology adoption within SMEs. Based on the scientific literature analysis (Brkljac & Sudarevic, 2018; Calabrese et al., 2020; Cimini et al., 2017; Čóckalo, et al., 2019; Da Silva et al., 2019; Młody, 2018; Saniuk et al., 2020; Saucedo-Martinez et al., 2018; Ungerman & Dědková, 2019; Sima et al., 2020), Industry 4.0 technologies can be categorized into seven groups, such as network technologies, cybersecurity technologies, data analytics technologies, sharing technologies, smart work technologies, computing technologies, and production line technologies, that are supporting the transition from traditional manufacturing towards Industry 4.0. Such technologies and their applications are noted in Table No 1.

Table 1. Industry 4.0 Technologies and their applications

INDUSTRY 4.0 TECHNOLOGIES' GROUPS	SPECIFIC TECHNOLOGIES' EXAMPLES	INDUSTRY 4.0 TECHNOLOGIES' APPLICATIONS
NETWORK TECHNOLOGIES	Internet of Things (IoT)	Core technologies for connecting objects and devices in manufacturing systems.
CYBER SECURITY TECHNOLOGIES	Cyber Physical Systems (CPS)	Core technologies for protection of the system control processes.
DATA ANALYTICS TECHNOLOGIES	Big data (BD)	Core technologies for large amounts of data processing.
SHARING TECHNOLOGIES	Cloud computing (CS), manufacturing	Core technologies for allowing access to software and data storage in the cloud representation of the Internet.
SMART WORK TECHNOLOGIES	Artificial intelligence (AI), Augmented reality (AR), Virtual reality (VR), Smart glasses	Core technologies for the integration of Industry 4.0 system solutions.
COMPUTING TECHNOLOGIES	Simulation, Digital twin	Core technologies for creating and designing real or imaginary systems.
PRODUCTION LINE TECHNOLOGIES	Additive manufacturing, 3D, Robots	Core technologies for automation.

Source: *created by the author based on* (Brkljac & Sudarevic, 2018; Calabrese et al., 2020; Cimini et al., 2017; Čóckalo, et al., 2019; Da Silva et al., 2019; Młody, 2018; Saniuk et al., 2020; Saucedo-Martinez et al., 2018; Ungerman & Dědková, 2019; Sima et al., 2020).

According to Brkljac and Sudarevic (2018), businesses can collaborate with clients and provide them with the most appropriate items using Industry 4.0 enabled digital platforms. Such a co-creation strategy can improve the customer's experience and overall satisfaction. Based on Młody (2018), due to Industry 4.0, product development may be improved by employing simulation processes or 3D product models. Big data solutions, customer intelligence integration, digital marketing, and e-commerce solutions may also be utilized to improve sales and marketing operations. Also, according to Sima et al. (2020), the main drivers for consumer behavioural changes in the context of the Industry 4.0 revolution may be the Internet of Things, Artificial intelligence, and data mining.

The authors (Calabrese et al., 2020; Mody, 2018; Ungerman & Dědková, 2019) list the following as the main advantages of Industry 4.0 implementation for SMEs related to the marketing function: increased operational efficiency, revenue growth, improved productivity and product quality, better usage of resources, inventory management, workplace safety, increased competitiveness of the company, increased customer satisfaction and changing the ways products are created. Meanwhile, Ungerman et al. (2018) found that improved customer communication, increased corporate competitiveness and changes in cost are the most significant effects associated with the deployment of marketing innovation in enterprises as a result of Industry 4.0. In addition to that, Arromba et al. (2020) identify additional implications, such as agile marketing decision-making caused by data processing capacity, making possible the rapid identification of new market opportunities as well as better aligning marketing, product development and operations process issues regarding Industry 4.0. Therefore, it can be stated that the application of various Industry 4.0 technological tools seeks to meet customer demand with solid organizational structures that collaborate in synergy and offer the most value possible while developing services or goods (Saucedo-Martinez et al., 2018).

Nonetheless, according to several scholars (Gilmore et al., 2001; Resnick et al., 2016; Walsh & Lipinski, 2009), SMEs tend to practice marketing differently than large corporations. The intrinsic size and stage of development of the firm, as well as the entrepreneur's or owner's inherent traits and behaviors, may both influence these qualities, according to Gilmore et al. (2001). These restrictions can be summed up as follows: limited resources, a lack of specialized knowledge and limited impact in the marketplace by SMEs. So, it is likely that SME marketing will be unplanned, informal, loose, unstructured, spontaneous, reactive, built upon and conforming to industry norms. Walsh and Lipinski (2009), who suggest that the marketing function is less established and less influential in SMEs than it is in large businesses, also support this idea. Meanwhile, Bocconcelli et al. (2018) carried out a systematic literature review about SMEs' marketing within the period of 2006-2015. The study revealed that great attention has been paid to the SME marketing topic and the growing role of networks and Information and communication technologies in SMEs' marketing activities. However, the study still highlights a distance in the reviewed studies between their theoretical bases and analyses of marketing behaviour and practices by SMEs. In addition to it, according to authors (Mintzberg, 1982, cited in Moeuf et al., 2017), most SMEs also have a short-term strategy, which prevents significant long-term investments, which is important in the context of Industry 4.0. In addition, there is usually a lack of expert support functions in SMEs, such as supply chain management, information technologies, or financial management. Therefore, it can be stated that the smaller the SMEs are, the greater the risk that they will not be able to benefit from this Revolution.

To summarize, the philosophy of the marketing discipline has evolved over the years to become the critical framework for gaining a competitive advantage. According to scientific research, Industry 4.0 technologies' adoption within SMEs marketing activities provides a lot of benefits, as it helps to improve the quality of the product and its' uniqueness and provides the chance for more creative and close communication with the final consumer. However, SMEs are still underutilizing the chance to acquire a competitive advantage while integrating new technology into marketing related functions, which can be attributed to a number of variables, including firm-specific and management elements, resource availability, and environmental factors. As Industry 4.0 technologies' enablement in SMEs marketing related functions is crucial for SMEs to become more competitive, further study will consist on the identification of the most suitable Industry 4.0 technologies' to be applied in marketing related functions within SMEs.

3. METHODOLOGY

This study aims to identify the most suitable Industry 4.0 technologies for application in marketing related functions within SMEs. Due to the preliminary nature of research related to Industry 4.0, this study employs qualitative research and a semi-structured online interview technique to gather data from C-level Executives in Lithuania. According to the authors (Veile et al., 2019; Khin & Kee, 2021), it is a suitable research form as it provides profound and deep-rooted information, gives a unique depth of understanding of the chosen topic and allows informants to freely disclose their experiences and thoughts. To gather the most accurate data, the requirements for the interviewed informants were set:

- (1) All C-level Executives must be working in SMEs based in Lithuania.
- (2) All C-level Executives must be closely involved in or responsible for Industry 4.0 implementation projects.
- (3) All C-level Executives must have management positions or be in charge of company operations.

The sample size and criteria for the semi-structured interview were based on the previous studies' results related to Industry 4.0. (Khin & Kee, 2021; Rahman et al., 2021; Veile et al., 2019; Yunus, 2020). According to the researched studies, the sample size of the semi-structured interview should include 10–12 participants. A summary of the respondents who participated in the study is listed in Table No 2.

2 Table. The interviewees' profiles in qualitative research

ID	Current Title	Industry	NACE code of industry	Company size
C-LEVEL EXECUTIVE 1.	Industry 4.0 Researcher, PhD and business consultant	Social science	M72 - Scientific research and development	Micro enterprise locally only
C-LEVEL EXECUTIVE 2.	Director and digital transformation leader of a consulting firm	Finance	M69 - Legal and accounting activities, M70 - Activities of head offices; management consultancy activities	Medium-sized enterprise locally, part of large enterprise globally
C-LEVEL EXECUTIVE 3.	Leading Manager of the Industrial and Automation Business Area	Management and Automation	G46.5 - Wholesale of information and communication equipment	Small enterprise locally only
C-LEVEL EXECUTIVE 4.	CEO of a digital advertising agency	Advertising	M73 - Advertising and market research	Small enterprise locally, part of large enterprise globally
C-LEVEL EXECUTIVE 5.	Business Development Executive and Digitalisation leader	Information and Technology	J62 - Computer programming, consultancy and related activities	Medium-sized enterprise locally only
C-LEVEL EXECUTIVE 6.	CEO of a Fintech company	Fintech	J62 - Computer programming, consultancy and related activities, K64 - Financial service activities, except insurance and pension funding	Medium-sized enterprise locally only
C-LEVEL EXECUTIVE 7.	Marketing Channel Program Manager	Consumer Electronics	G47.5 - Retail sale of other household equipment in specialised stores	Micro enterprise locally, part of large enterprise globally
C-LEVEL EXECUTIVE 8.	Venture capital Investor and Industry 4.0 consultant	Information and Technology, Fintech	K64.3 - Trusts, funds and similar financial entities	Medium-sized enterprise locally only
C-LEVEL EXECUTIVE 9.	Business Analytics and digitalisation Team Lead	Fintech	J62 - Computer programming, consultancy and related activities, K64 - Financial service activities, except insurance and pension funding	Medium-sized enterprise locally only
C-LEVEL EXECUTIVE 10.	E-commerce Growth and digitalisation Strategist	Fast Moving Consumer Goods	G47.91 - Retail sale via mail order houses or via Internet	Small enterprise locally, part of large enterprise globally
C-LEVEL EXECUTIVE 11.	Head of Finance of an e-commerce marketplace and digitalisation leader	E-commerce	G47.91 - Retail sale via mail order houses or via Internet	Medium-sized enterprise locally only

Source: created by the author based on (Research Results and European Commission, 2023)

During a semi-structured online interview, respondents were asked about Industry 4.0 technologies' suitability for application in the marketing functions of SMEs. The semi-structured interview guideline consisted of two parts. The first part of the interview dealt with personal facts such as job position, company and industry field. The second part focused on the open questions related to Industry 4.0 technologies' application in SMEs marketing functions. The list of interview questions is presented in Appendix No 1. The duration of one semi-structured online interview took between 20 and 30 minutes. The interview forms were conducted in the

English language. To avoid any informant bias, before starting the interviews, it was made sure that informants were very clear on the nature and topic of the research and how the interview would be conducted.

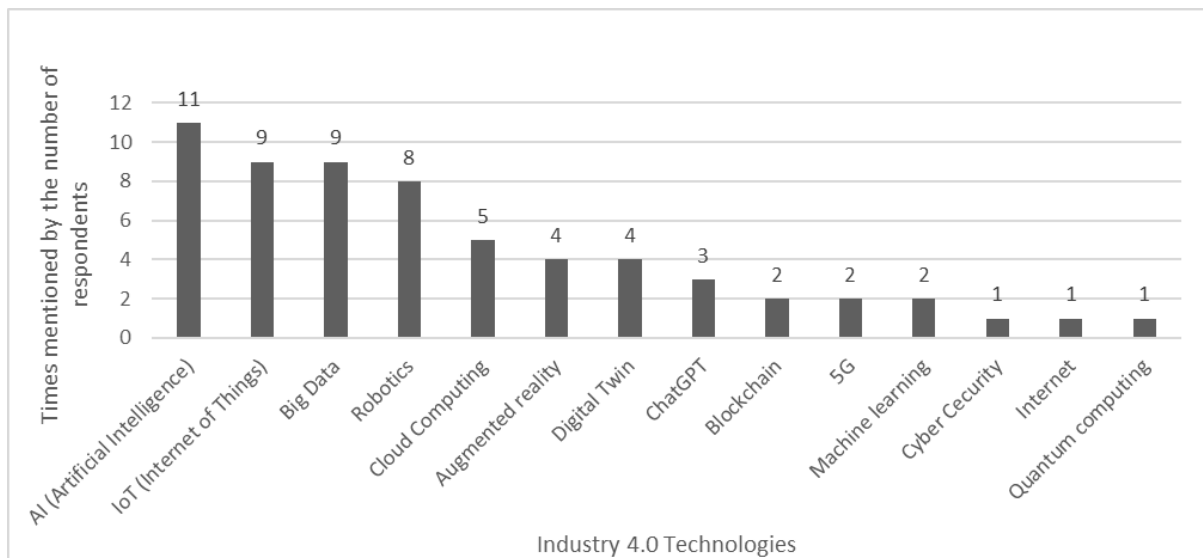
The time and budget limitations of the research project were acknowledged, therefore, this study used purposive sampling, which involved selecting the SMEs that best guarantee comprehension of the studied phenomenon and directly contacting potential informants via the Internet through business social media platform (LinkedIn) and e-mails. In total, 50 C-level Executives were contacted, and 11 informants agreed to participate in the study. All of the C-level Executives met the three criteria: all of them held management positions or were in charge of company operations (2 CEOs, 7 Heads of departments, 1 Industry 4.0 researcher and consultant, 1 Industry 4.0 investor and consultant). All of them worked in Lithuanian-based SMEs (2 micro-sized SMEs, 3 small-sized SMEs, and 6 medium-sized SMEs) and all were closely involved in or responsible for Industry 4.0 implementation projects. The study assured that respondents' identities, such as their names or company titles, would be kept anonymous and that the collected data would be used only for academic purposes.

Interviews were executed during the period of July–August 2023 and the method of qualitative content analysis was applied. This study coded the informants' responses, found similarities and differences and attempted to make relations for further Industry 4.0 technologies' application suitability in SMEs marketing related functions.

4. RESEARCH RESULTS AND DISCUSSION

4.1. Industry 4.0 Technologies

This study discovered through the semi-structured online interviews that all eleven informants are familiar with Industry 4.0 technologies. C-level Executives were asked to list at least five technologies, which in their opinion, can be linked to Industry 4.0 and briefly explain how and why. Figure No 1. shows the distribution of respondents' answers.



1 figure. Mentioned Industry 4.0 technologies

Source: created by the author

All respondents in the study highlighted Artificial Intelligence (AI) as one of the key Industry 4.0 technologies. The C-level Executive 1. mentioned that: "AI enables autonomous decision-making and process optimization in Industry 4.0. It empowers machines to learn from data, adapt, and improve efficiency, leading to increased productivity and reduced operational costs". These thoughts were supported by C-level Executive 5., who stated that employment of AI: "results in increased efficiency and reduced human intervention and C-level Executive 6., who stated that AI has: "almost unlimited applicability". However, C-level Executive 9. highlighted the importance of correct data usage, stating that: "for AI to be effective, we need to be sure that we do not fill AI with incorrect data, for that, everything has to start from the basics". Respondents' answers confirmed that AI can be defined as one of the major Industry 4.0 technologies, as the C-level Executive 4. described AI as: "probably the biggest and largest change since the invention of the personal computer". The C-level Executive 11. confirmed it by stating that: "AI development is currently ongoing and still needs a lot of work to be done, but this would be a very groundbreaking change for everyone".

Nine out of the eleven respondents mentioned IoT and Big Data as the key Industry 4.0 technologies. C-level Executive 1. stated that: "IoT connects physical devices and sensors to the Internet, facilitating real-time data collection and analysis. In Industry 4.0, IoT enables smart manufacturing, remote monitoring and seamless communication between machines, enhancing efficiency and data-driven decision-making". This idea was supported by various C-level Executives: C-level Executive 7. described IoT as: "technology allowing to access real time data from a variety of sensors", C-level Executive 5: "IoT involves connecting devices, sensors, and machines to the internet to gather and share data", C-level Executive 11: "IoT is having all those small devices connected to the internet, providing some data points and helping everyday life", C-level Executive 6.: "IoT can be used to get digital data to systems and AI from the place where it is originating", C-level Executive 4: "IoT - almost everything is connected, almost everything could be controlled". Based on C-level Executive 6.: "Big data is food for AI, optimization and data-driven decisions". C-level Executive 5. added that Big Data technology applications can: "help in identifying patterns, trends and anomalies, leading to informed decision-making, process optimization and enhanced product quality". C-level Executive 7. mentioned that Big Data is also important for: "creating extremely personalised offers or products for consumers". C-level Executive 1. also suggested that Big Data usage can: "enhance customer experiences and identify new business opportunities". However, C-level Executive 9. stated that: "for the Big Data to be efficient and have a really strong impact on the economy, we need to look for more efficient ways to gather all the needed information".

Another key Industry 4.0 technology mentioned by respondents was – Robotics. C-level Executive 7. identified robotics as: "machines with the ability to perform tasks without human interaction". C-level Executive 5. suggested that: "advanced robotics and automation systems play a pivotal role in Industry 4.0. They improve manufacturing efficiency by performing repetitive tasks accurately and quickly, leading to increased productivity, reduced errors and safer working conditions". Such statements were supported by the other respondents: C-level Executive 4. stated: "with robotics, everything becomes easier, faster, and cheaper from a long-term perspective", C-level Executive 8. stated: "Robotics helps any industry line reap efficiencies in terms of costs and time", C-level Executive 6. added: "due to Robotics - humans are free to do creative work as it increases productivity and quality", C-level Executive 10. stated: "no need for human intervention, a broader specter of data and more optimized processes".

Cloud computing technology was mentioned by five out of eleven respondents. C-level Executive 1. described Cloud computing as a technology that: "provides scalable and flexible computing resources for storing and processing data". Three respondents: C-level Executive 1., C-level Executive 5. and C-level Executive 7. highlighted that Cloud computing: "supports real-time data sharing, remote monitoring and collaborative efforts across geographically distributed teams". Augmented Reality and Digital Twin technologies were mentioned by four out of eleven respondents. C-level Executive 9. and C-level Executive 11. described the importance of Augmented Reality. According to C-level Executive 9.: "future technologies such as Apple Vision Pro are a way in the right direction". Meanwhile, C-level Executive 11., shared the personal job experience, where: "augmented reality glasses were developed for maintenance: seeing all the instructions based on what you are seeing how to repair something in your glasses and then suddenly having all this knowledge ready to use". Meanwhile, C-level Executive 1., C-level Executive 2. and C-level Executive 5. stated the importance of Digital Twin: "Digital twin technology creates virtual replicas of physical assets and processes. It allows for real-time monitoring, simulation and analysis, enabling predictive maintenance and optimization, making it an integral part of Industry 4.0's smart manufacturing and service delivery".

Industry 4.0 technologies' such as Chat GPT, Blockchain, 5G, Machine learning, Cyber Security, Internet, Quantum Computing were mentioned by three or fewer number of respondents. It indicates that such technologies' are not top of mind technologies' related to Industry 4.0 mentioned by the C-level Executives. However, such technologies still play an important role. For example, according to C-level Executive 11.: "Chat GPT boomed into the everyday lives of lots of specialists and the speed at which it took off is rather unprecedented". However, C-level Executive 9. raised data accuracy questions: "Latest reports about ChatGPT refer to the fact that it is getting less precise. Why? Because it is fed with low-quality data. How do we solve this?". According to C-level Executive 1.: "Blockchain technology enhances trust and security in Industry 4.0 by providing an immutable and transparent record of transactions and data exchanges". However, C-level Executive 4. stated that: "the Blockchain technology itself is great, but we are not ready yet. Anyway, it will be coming soon". According to C-level Executive. 3 and C-level Executive. 6.: "5G ensures less delay and wider data channels for real time applications". Based on C-level Executive 5.: "Machine Learning enable machines to learn from data and make intelligent decisions". According to C-level Executive 9.: "Machine learning is being applied in our everyday interactions (all the targeted advertising, forecasting of sales or revenue, etc.).

This is where we can make better decisions based on data but we need infrastructure and retrospective data to be able to use it". C-level Executive 11. also mentioned quantum computing, as an important Industry 4.0 technology: "it will be millions of times faster than current super computers".

The qualitative study results confirm the C-level Executives' knowledge of Industry 4.0 principles, as the majority of the technologies' mentioned by the respondents coincide with the Industry 4.0 technologies mentioned in the scholar articles (Brkljac & Sudarevic, 2018; Calabrese et al., 2020; Cimini et al., 2017; Čočkalo, et al., 2019; Da Silva et al., 2019; Młody, 2018; Saniuk et al., 2020; Saucedo-Martinez et al., 2018; Ungerman & Dědková, 2019; Sima et al., 2020). The only technology mentioned by the C-level Executive, such as the Internet, is not considered to be related to Industry 4.0. This technology was established in 1983 and in the context of Industry 4.0, the Internet rather serves as the base technology platform for more modern Industry 4.0 technologies' establishment, such as IoT (Zhou et al., 2015). The further study concentrates on the above mentioned Industry 4.0 technologies' and their suitability to be applied in SMEs marketing related functions.

4.2. Industry 4.0 Technologies and SMEs Marketing

Study results revealed that, according to C-level Executives, the most suitable business functions for Industry 4.0 technologies' applications in SMEs are: Manufacturing and Production, Marketing, Supply Chain & Logistics, Research & Development, Business Administration, Sales, Accountancy & Finances, Human Resources and Customer service & support. It is important to note that Manufacturing and Production function was identified as the most suitable business function for Industry 4.0 technologies' application, as seven C-level Executives of out of eleven mentioned it. Meanwhile, the second most suitable business function for Industry 4.0 technologies' application was found to be the marketing function (mentioned by 6 out of 11 respondents).

To identify which Industry 4.0 technologies are most suitable to be applied to the marketing related functions of SMEs, respondents were asked to list at least three technologies and explain how they can be applied. In total, C-level Executives mentioned nine suitable technologies, such as: Big Data, Artificial Intelligence, Augmented Reality, Cloud Computing, Automation, IoT, Digital Twin and Machine Learning. Table No 3. summarizes the study results and highlights each Industry 4.0 technology's potential application in marketing related functions of SMEs.

It is worth noting that Industry 4.0 technology – 'Big data' was mentioned by all eleven respondents as the applicable technology in the marketing related functions of SMEs. Most of the C-level Executives (C-level Executive 1., C-level Executive 4., C-level Executive 5., C-level Executive 6., C-level Executive 9., C-level Executive 11.) mentioned that Big data is specifically applicable in the marketing function for consumers' behaviour prediction and future trends' forecasting. Also, C-level Executive 1., C-level Executive 2., C-level Executive 5., C-level Executive 8. and C-level Executive 10. highlighted that Big data enhances overall marketing performance as well as is very suitable for improving customer targeting mechanisms. Also, this technology is helpful for data enablement and usage for creating more personalized offers, products and services (C-level Executive 3. and C-level Executive 7.).

Another key Industry 4.0 technology mentioned by the respondents as one of the most suitable to be applied in the marketing functions of SMEs was - Artificial Intelligence (mentioned by 10 out of 11 respondents). Six out of eleven C-level Executives mentioned that this technology is beneficial for the creation of the marketing materials, such as branding elements and promotional content. Meanwhile, three respondents (C-level Executive 1., C-level Executive 5., C-level Executive 6.) identified that Artificial Intelligence, similarly to Big data, enables consumer behaviour data insights to be applied for more optimized and personalized displayed content for consumers. In addition to this, C-level Executive 1. and C-level Executive 7. highlighted that such Artificial Intelligence enablement can reduce the need and spending for the creative marketing agencies as well as optimize the resources of the internal marketing teams. Three C-level Executives also mentioned that Artificial Intelligence is one of the key technologies' to be applied to the customer service support area, as it can be more automated by introducing Chatbots and help nurture relationships with customers.

Meanwhile, according to four respondents out of eleven (C-level Executive 3., C-level Executive 6., C-level Executive 7., C-level Executive 11.), Augmented reality is the suitable Industry 4.0 technology to be applied into the marketing function of SMEs in regard to its' ability to demonstrate the benefits of the products and services while enabling virtual try on tools which in this way helps to enhance the whole customer experience. Cloud computing was also mentioned as one of the key Industry 4.0 technologies' suitable for marketing related activities within SMEs. According to C-level Executive 1., C-level Executive 2. and C-level Executive 3., this technology enables SMEs to store and access marketing data securely. C-level Executive 1. also highlighted

that: "this technology can be beneficial if a particular company has branches or divisions in separate geographical areas, as it helps facilitate seamless collaboration among marketing teams across different locations". C-level Executive 2. also added that: "Cloud computing helps SMEs reach a great variety of marketing platforms for reasonable fees and, in this way, leverage the existing tools instead of creating new ones". C-level Executive 2., C-level Executive 4. and C-level Executive 8. also enhanced the benefits of automation technologies in the promotion function of marketing. Based on the respondents' answers, such technologies' can be widely used for automating marketing campaigns, are capable of creating hundreds or thousands of ads in a minute and are effective while targeting the potential customers.

3 Table. Industry 4.0 Technologies' application in SMEs Marketing related functions

Industry 4.0 Technology	Industry 4.0 Technologies' application suitability for SMEs marketing related functions	Mentioned by the C-level Executives
Big Data	Leverages historical data to forecast future trends in consumer behaviour.	<i>C-level Executive 1., C-level Executive 4., C-level Executive 5., C-level Executive 6., C-level Executive 9., C-level Executive 11.</i>
	Helps to improve customer targeting and enhance overall marketing performance.	<i>C-level Executive 1., C-level Executive 2., C-level Executive 5., C-level Executive 8., C-level Executive 10.</i>
	Allows the creation of highly personalised offers, products or services.	<i>C-level Executive 3., C-level Executive 7.</i>
Artificial Intelligence	Helps to create marketing materials: slogans, ads, campaigns, branding for different target audiences.	<i>C-level Executive 2., C-level Executive 4., C-level Executive 7., C-level Executive 9., C-level Executive 10., C-level Executive 11.</i>
	Helps to automate and enhance customer support.	<i>C-level Executive 1., C-level Executive 3., C-level Executive 5., C-level Executive 11.</i>
	Helps to identify patterns and preferences in customer data and enables content optimization and personalization.	<i>C-level Executive 1., C-level Executive 5., C-level Executive 6.</i>
	Optimises the resources of the marketing team and reduces spending for Creative agencies.	<i>C-level Executive 1., C-level Executive 7.</i>
Augmented Reality	Helps to demonstrate the benefits of the products and services' and enhances the customer experience.	<i>C-level Executive 3., C-level Executive 6., C-level Executive 7., C-level Executive 11.</i>
Cloud Computing	Enables scalable infrastructure for marketing data storage and processing.	<i>C-level Executive 1., C-level Executive 2., C-level Executive 3.</i>
	Facilitates collaboration among marketing teams across different locations.	<i>C-level Executive 1.</i>
Automation (Robotics)	Helps to automate marketing campaigns and more effectively target customers.	<i>C-level Executive 2., C-level Executive 4., C-level Executive 8.</i>
IoT	Enables geotargeting to deliver targeted marketing messages to customers' devices based on their physical location.	<i>C-level Executive 5.</i>
	Allows businesses to create their unique selling propositions (USP) while providing combined Smart solutions.	<i>C-level Executive 7.</i>
Digital Twin	Enables testing different marketing initiatives in a risk-free virtual environment, helps SMEs identify the most effective approaches for implementation in the real world.	<i>C-level Executive 1.</i>
Machine Learning	Helps to analyse the information and integrate patterns of consumer behaviour.	<i>C-level Executive 9.</i>

Source: created by the author

Industry 4.0 technologies' such as IoT, Digital Twin or Machine Learning were referred to only by a few C-level Executives and the possible application suitability in marketing related functions was very specific. For example, based on the C-level Executive 5., while utilizing IoT technology, it is possible to "enable location-based services and geotargeting and in this way, SMEs can promote offers, discounts, and events to potential customers near their business locations". C-level Executive 7. also mentioned that IoT: "allows businesses to create their unique selling propositions while providing combined Smart solutions" and it is particularly important in the consumer electronics industry: "products with biometrical sensors and functionality enable people to call for medical assistance when needed, etc". C-level Executive 1. suggested that Digital Twin can be utilised within SMEs while creating virtual models of their target audience and simulating customer behaviours and responses to marketing strategies. According to the C-level Executive 1., while analysing and testing different marketing initiatives in a risk-free virtual environment, SMEs can identify the most effective approaches before implementing them in the real world, therefore, this approach: "allows for more targeted and optimized marketing campaigns that resonate with customers, leading to better engagement and conversion rates". Meanwhile, C-level Executive 9. highlighted the importance of machine learning for enhanced marketing performance in the future: "machine learning models help to analyse the information and integrate patterns of consumer behaviour".

To summarize, according to the study respondents, eight out of the fourteen Industry 4.0 related technologies mentioned by the C-level Executives, were found to be suitable to be applied in the marketing functions of SMEs. Also, it was found that Big Data has the most varied application possibilities and benefits for SMEs marketing related functions. Therefore, it can be considered as the most suitable Industry 4.0 technology to be applied to marketing related functions of SMEs. The main application possibilities of Big Data are listed in Table No 4.

4 Table. Big Data applications in SMEs Marketing related functions

Big Data applications in Marketing	Benefits	Mentioned by C-level Executives
Operational efficiency	SMEs can optimize marketing campaigns in real-time and refine strategies to boost sales, engagement, efficiency and build brand loyalty.	<i>C-level Executive 1., C-level Executive 2., C-level Executive 4., C-level Executive 5., C-level Executive 6., C-level Executive 8., C-level Executive 9.</i>
	Enables businesses to segment their audience more effectively.	<i>C-level Executive 1., C-level Executive 5., C-level Executive 6., C-level Executive 11.</i>
	Gathering data through sources like site visits, social media and purchases allows for targeted campaigns.	<i>C-level Executive 1., C-level Executive 4., C-level Executive 5., C-level Executive 8.</i>
	Can help forecast trends using historical patterns, aid inventory planning, and allocate resources more efficiently.	<i>C-level Executive 5., C-level Executive 6., C-level Executive 10.</i>
	Helps automate marketing data processing by creating the right tools for such solutions.	<i>C-level Executive 2., C-level Executive 3.</i>
SMEs' Competitiveness	Can help monitor rivals' strategies, spotting trends and differentiation opportunities.	<i>C-level Executive 5., C-level Executive 6.</i>
	Aids SMEs in identifying market opportunities, refining value propositions and gaining a competitive edge.	<i>C-level Executive 1.</i>
	Can help to create a similarly high quality of marketing material, irrespective of the company's size.	<i>C-level Executive 9.</i>
Customer Centricity	Helps to create personalized products, services or offers based on the consumers' needs, demand, historical purchase or interest data and preferences.	<i>C-level Executive 1., C-level Executive 3., C-level Executive 4., C-level Executive 5., C-level Executive 7., C-level Executive 8., C-level Executive 11.</i>
	Analyse customers' feedback for improved customer satisfaction and products/services alignment.	<i>C-level Executive 1., C-level Executive 5.</i>

Source: created by the author

5. CONCLUSIONS

Results obtained during this study provide a new, original aspect to the existing information regarding Industry 4.0 technologies' enablement in the marketing related functions of SMEs. Based on the results of the research and discussion previously described, it can be concluded that eight out of the fourteen Industry 4.0 related technologies mentioned by the C-level Executives, were identified to be suitable to be applied in the marketing related functions of SMEs. Such technologies are: Big Data, Artificial Intelligence, Augmented Reality, Cloud Computing, Automation (Robotics), Internet of Things, Digital Twin (Simulation), Machine Learning. Six Industry 4.0 technologies mentioned by the respondents (ChatGPT, Blockchain, 5G, Cyber Security, Internet, Quantum computing) were not highlighted as suitable Industry 4.0 technologies for application in SMEs marketing functions.

This study's main theoretical implication is that the qualitative study revealed that Big Data is considered to be the most applicable Industry 4.0 technology for marketing related functions as it provides many benefits for SMEs. It enhances operational efficiency, as gathered data helps optimize marketing campaigns, enables more efficient segmentation and targeting and helps forecast future trends. It also enhances SMEs competitiveness as it helps to monitor rivals' strategies and create high-quality marketing materials. Last but not least, it provides the opportunity to enable the customer-centricity element while improving customers' satisfaction and creating more personalized offerings.

Such results coincide with the scientific literature sources, as based on the results of the other studies' (Brkljac & Sudarevic, 2018; Calabrese et al., 2020; Cimini et al., 2017; Čoćkalo, et al., 2019; Da Silva et al., 2019; Młody, 2018; Saniuk et al., 2020; Saucedo-Martinez et al., 2018; Ungerman & Dědková, 2019; Sima et al., 2020), the most universal technologies of Industry 4.0 in relation to marketing functions were found to be network technologies, for instance, Internet of Things, Artificial Intelligence and Augmented Reality. According to Caliskan et al., (2020), Augmented reality enables shopping online and Ungerman and Dědková (2019) state that digital marketing trends are being widely used in promotion element, such as artificial intelligence, which analyses the behaviour of social network members automatically. Sima et al. (2020) suggest that, for marketing and promotional function, IoT technology is key, as IoT enables the establishment of huge networks that will connect all members of the value chain and influence purchasing and consumption patterns. Casliskan et al. (2020) also highlighted the importance of Big Data for pricing related marketing functions, as dynamic pricing focuses on the product and, more importantly, on the customer to create optimal revenue and develop a successful relationship with the customer. However, it is worth mentioning that 3D printing was not mentioned by the C-level Executives, participated in the qualitative study, as an important Industry 4.0 technology suitable for the marketing related functions of SMEs. However, according to the literature review, such technology can be particularly suitable for product development related functions (Młody, 2018).

This study provides necessary information for SMEs while evaluating the possibility of applying Industry 4.0-derived technologies in their marketing. This research also extends the current knowledge about Industry 4.0 application benefits, particularly in SMEs marketing related functions. Such insights gained in this study can help society be informed and benefit from cooperating with SMEs while achieving more precise, personalized offers. Further researchers can expand the research by extending the qualitative interview part and including the Industry 4.0 technologies' suitability rating part in specific marketing related functions, such as: promotion, price, place, and product.

6. LIMITATIONS

Due to its qualitative design and limited sample size, the findings of this study need to be supplemented by quantitative studies, thus allowing proper testing of Industry 4.0 technologies' application suitability in SMEs marketing related functions.

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Appendix. Interview guideline

Part (I) Introduction:

1. Please indicate your: Name and Surname.
2. Please indicate your: Current Job Title and Industry Field you are currently working in.

Part (II) Open questions related Industry 4.0 technologies' application in SMEs:

1. Please list at least 5 technologies, which in your opinion can be linked to Industry 4.0? Please briefly explain how and why.
2. Based on your opinion and expertise, please list at least 3 business functions, in which Industry 4.0 technologies' can be applied? Please briefly explain how and why.
3. In your opinion, which Industry 4.0 technologies can be applied in marketing function of Small and Midsize enterprises (SMEs)? Please list at least 3 technologies and briefly describe their possible application.
4. Please describe how, in your opinion, Industry 4.0 technology - "BIG DATA" could be applied to marketing function of Small and Midsize enterprises (SMEs)?
5. Please describe how, in your opinion, Industry 4.0 technology - "CHATBOTS" could be applied to marketing function of Small and Midsize enterprises (SMEs)?