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INTEGRATING VIRTUAL ASSISTANT TECHNOLOGY INTO OMNI-CHANNEL PROCESSES

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Abstract

The purpose of the study was to examine Virtual Assistant Technology and to identify certain advantages and disadvantages in integrating such a technology into omni-channel processes in the case of some already existing examples of companies using Virtual Assistants.

The study investigated how the Virtual Assistant Technology could help to make a business process more profitable in the omni-channel model from the customer's and company's perspective. This thesis also gave in-depth analysis of the benefits from using Virtual Assistants.

The thesis was divided into three major parts. The first regards to the evolution of logistics approaches towards omni-channel model of doing business. The second is dedicated to the essence of Virtual Assistant Technology and types of these agents. The third part concerns about current situation on the market and the challenges and perspectives of introducing Virtual Assistants into omni-channel approach.

The qualitative method for the survey was conducted. Secondary data analysis in particular was used to re-think and re-analyze already existing materials in order to generate some new ideas based on the discussed theory. The information was gathered mainly from reports and surveys of leading companies in the sphere of omni-channel approach, as well as from journals and conferences related to the topic of Virtual Assistant Technology.

The study showed that Virtual Assistant Technology is a trend in the omni-channel mean of communication with customers and has great potential for the future development.

Keywords

single-channel, multi-channel, cross-channel, omni-channel, Virtual Assistant Technology, Virtual Assistants

CONTENTS

1   INTRODUCTION

Nowadays, Internet plays an important part in most people's lives. People buy products via online stores as well as do shopping in physical stores and malls. However, it is more convenient for customers to combine these two kinds of shopping or at least integrate some online processes to physical stores and vice versa. Omni-channel approach makes the process of shopping more personalized for customers and gives them an opportunity to choose the most convenient way of buying products.

Companies should consider all the wishes of their customers if they want to gain more profit. The companies should also take into consideration that different customers have different preferences. Nevertheless, in general, almost everybody has become an online customer, using their gadgets constantly. This is why it is better to provide a wide range of opportunities for buyers. Some people prefer to buy online but others would rather collect their orders from physical stores. Moreover, there are customers who appreciate the same day delivery to their homes.

Virtual Assistants helps both sellers and buyers in order to improve omni-channel way of communication with customers. Such a technology could be integrated not only in customers' experience such as chat bots in online chats or Voice Assistants in phone conversations to make the process of purchasing easier, faster and clearer for the buyers, but also on a company level in the warehouse systems or program software to optimize the storage of goods and make the working processes more automated. That will reduce the human factor and increase the effectiveness of a particular company.

1.1   Research objective

The objective of the thesis is to examine the Virtual Assistant Technology, to identify certain advantages and disadvantages of integrating such a technology into omni-channel processes in the case of some already existing examples of companies using Virtual Assistants. Moreover, the study shows why businesses

need such a technology and explains how companies will benefit from using Virtual Assistants. In addition, different types of Virtual Assistant Technology were defined and perspectives of integration the Virtual Assistant Technology into the omni-channel model were highlighted.

1.2 Research question

The main research question was to define how the Virtual Assistant Technology could help make a business process more profitable in the omni-channel model from the customer's and company's perspectives.

From the customer's perspective: Virtual Assistants are defined as personalized agents, the objective of which is to predict the customer's wishes based on the whole history of their journey and to make the communication with the buyer more individual.

From the company's perspective: Virtual Assistants are integrated in the software of the company in order to help with finding certain products in large warehouses, help with inventory processes and optimize the usage of space according to the size of the products.

In addition, in order to achieve the objective of the thesis, the following sub-questions had to be answered:

- What is the difference between single-channel, multi-channel, cross-channel and omni-channel approaches?
- What benefits are there in using omni-channel approach for the company and for the customer?
- What points should the company take into consideration while moving towards the omni-channel model?
- What risks and challenges could companies face in such an approach to communication with customers? How could companies overcome them?
- How could Virtual Assistant Technology make a customer journey beneficial?

1.3   Research method

The main research method for the study was a qualitative method: a desk research (or secondary data analysis). According to Melissa P. Johnston, the desk research is the analysis of existing information collected by someone else for the needs of the author of the new study. This type of research has certain advantages for the researcher, the main ones of which are re-thinking and re-analyzing already existing materials in order to support the discussed theory or, on the contrary, to generate completely new ideas (Johnston, 2014, p. 624; Sherif, 2018, p. 3). Desk research provides the author with convenience in finding the necessary data and cost-effectiveness as a result (Johnston, 2014, p. 624).

The qualitative method of this study is based on the data related to the omni-channel strategy and Virtual Assistant Technology: companies' reports, journals, different surveys, white papers and conference articles. The desk research was chosen for this thesis in order to process and analyze existing up-to-date theoretical data. Then, materials were gathered to make a deep analysis of the foundings.

The analysis of the information was made in the following way: first, the main questions of the thesis were defined, then the suitable sources were found. After this, an Excel table containing the questions was created and all gathered information was organized according to the topics. Then, the information under every question was read and compared, the result being personal thoughts about the topic based on the materials.

1.4   Theoretical framework

The theoretical framework of this study emphasizes omni-channel model and integration of Virtual Assistant Technology in order to improve customer's journey in such an approach. This is why the theory related to single-channel, multi-channel, cross-channel and omni-channel approaches, as well as to Virtual Assistant Technology was used.

2   DEVELOPING THE APPROACHES IN LOGISTICS

This chapter provides general information about the approaches of communication between companies and customers in logistics. The main strategies of each approach are defined and examples of every model of communication are given. Moreover, different channels of communication are described in detail in this chapter. Finally, a comparative table showing the main differences between the aforementioned models is presented.

2.1   Single-channel approach

Channels of communication between customers and sellers play a vital role in the sphere of logistics and retailing. Over the recent years, the way of communication has changed, and new channels of communication have been invented to develop interaction between these two parties.

Single-channel approach implies that there is only one way of cooperation between customers and sellers. The most illustrative example of this model is a supplier who sells goods or services directly to customers via one distribution channel. In such a case, the customer engages with the seller directly or with the help of mediators (Fernandez, 2008, p. 32). This way of communication is automatically chosen by customers because of a lack of any other alternatives.

Single-channel approach is applied mostly in two cases. First, the supplier has a limited amount of resources or the buyer has a steady demand, and second, there are only few market areas and a lack of customers inside these areas. (Fernandez, 2008, p. 32).

Kan Jiang and Liuyan Xu state that single-channel customers are more loyal than multi-channel customers. This is due to the fact that the seller has direct contact with the customer in single-channel strategy, while in multi-channel approach there is less human contact as customers are switching within channels, which leads to channel conflicts and probably losing the customers. (Kan and Liuyan, 2015, p. 357).

The benefits of single-channel approach are that the seller has an opportunity to monitor all the wishes of the customers and predict the demand based on previous deals. Furthermore, the seller has the whole history of interaction with each customer, which could help him to provide each buyer with a personalized service. Moreover, desires and changes in the wishes of customers could be discovered at an early stage because this approach is applied within a specified group of people or products. In addition to this, there is little risk of having a twofold data management and the run-off of expert knowledge. (Fernandez, 2008, p. 33).

Furthermore, Tarun Kushwaha and Venkatesh Shankar state that single-channel customers have higher monetary values than multi-channel customers, as single-channel customers tend to make unplanned or impulse purchases. The main characteristics of impulse purchases are excitement about the product and disregard for the consequences. This means that single-channel customers are guided by emotions and only rarely make comparison with other variants on the market. In this case, strong marketing plays a leading role in forcing the customer to make a deal with the seller. (Kushwaha and Shankar, 2013, pp. 72–73).

According to Mary J. Fernandez (2008, p. 33), the reason why retailers use single-channel approach is that it provides the maximum revenue. Consequently, sellers can focus on evaluating customer behavior within only one channel and fully analyze the whole customer's experience in that particular interaction.

On the other hand, retailers who use such an approach may not be convinced that the market is covered sufficiently. In this case, there is a possibility that customers are informed poorly and the seller will lose these buyers. This especially may be the case when the seller has only offline or face-to-face means of communication with customers and does not conduct business on the Internet as nowadays the Internet is commonly used for finding information and doing shopping by people of all ages.

2.2   Multi-channel approach

Multi-channel approach implies the parallel use of several channels to communicate with customers in the process of selling products or services, whereby the seller does not control the integration of channels and the customer has no opportunity to interact via several channels at the same time (Beck and Rygl, 2015, p. 174). All the channels in this model operate independently and even compete with each other for the customer's attention. The focus of multi-channel approach is on each channel separately (Mirsch et al., 2016, p. 5). Moreover, these channels can provide the customer with various product information, pricing and customer service (Kraemer, 2015, p. 4).

In this approach, a great number of functions and information that is available for online users is not available for retail shoppers, which makes customers' experiences different. For instance, when the customers use a mobile application or website of the company but are unable to find the necessary information, they are forced to communicate with the seller via another channel (for example, write an e-mail or request a callback). This could be considered as just another request from the company's point of view and there will be no understanding of the search history and background information about this customer. (Goubet, 2016, pp. 63–64).

Another example of multi-channel approach is when the customer finds all the necessary information about the product or service before coming to the physical retail store. In this case, an analysis of the customer journey is made twice in parallel channels: the customer journey on the Internet and separately the customer journey inside the store. All the collected information is secured within one channel and is not accessible via any other channel. This means that the channels are not interconnected (Mirsch et al., 2016, p. 5). These channels are generally managed by different teams, and there is no exchange of data across channels.

This is also the main disadvantage of this approach because when retailers interact with buyers via different channels, they cannot transfer information from

one channel into the other to make a comprehensive analysis of each customer. Nowadays, customers use more frequently several channels to make a purchase, which makes it difficult to analyze the whole experience of each customer.

According to Rajkumar Venkatesan et al. (2007, p. 114), the reason why retailers use multi-channel approach is that multi-channel customers have a higher annual purchase volume than single-channel customers. This is because, since customers have a variety of means of communication with the seller, they can find the desired information or function in the other channels and are more likely to complete the purchasing process. Owing to this, the number of failed purchases is lower.

As for the number of the channels of communication between customers and sellers, there is a great variety to choose from for both sides. Figure 1 shows the results of a research made in the US that presents the proportion of interactions by commonly used channels:
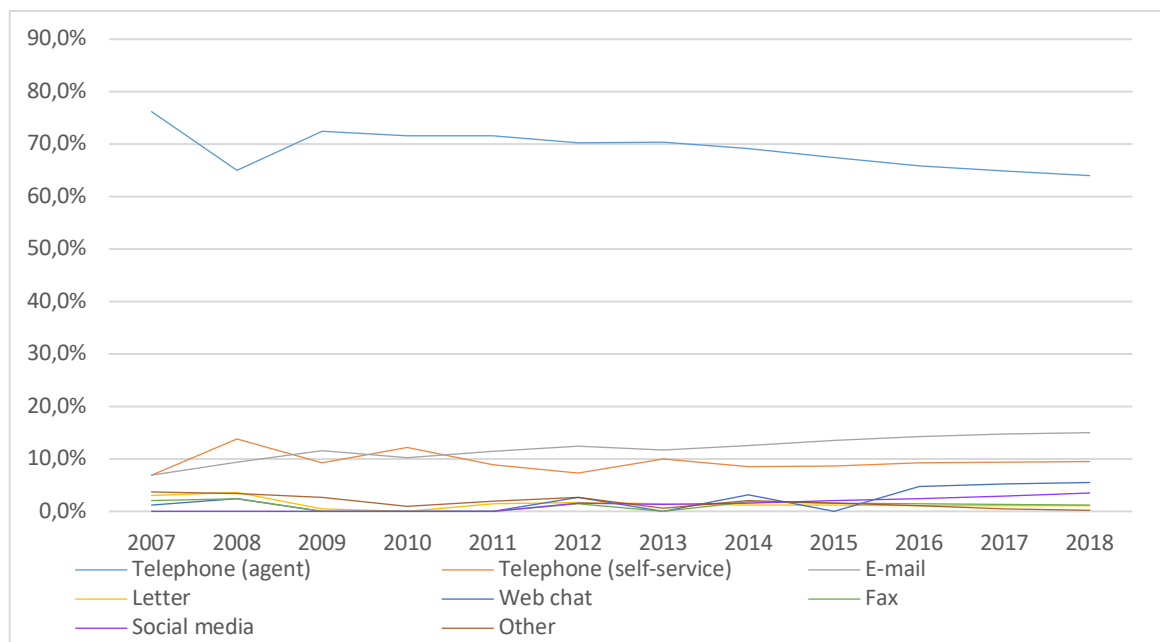

Figure 1. Interactions with customers by channels, 2007–2018 (Goubet, 2016)

As shown in Figure 1, the use of social media to interact with customers started in 2011. In 2015 there was an increase from 1.4 % to 2.8 %, and the importance of communication via that channel continues to grow. This means that it is

convenient for customers to contact the company through its Facebook page, Instagram or Twitter account. Moreover, it seems obvious that an e-mail communication has become more popular since 2013. What concerns web chatting, the usage of this channel has been growing since 2015. On the contrary, communication with agents via phone calls has been declining since 2009. These four examples show that people are using Internet channels more often and they feel more comfortable having non-voice conversations rather than talking to agents. (Goubet 2016, p. 15).

Actually, the growth in using different online channels was one of the main drivers towards multi-channel approach (Verhoef et. Al, 2015, p. 175). According to Jean-Etienne Goubet (2016, p. 16), the role of online means of communication will continue growing due to people's increasing use of the Internet in their daily lives. Such means of communication will become more mainstream, as there is an opportunity for the customer to ask a quick question and receive an answer in real time.

Online communication channels provide customers with added value, such as personalization of website information according to the preferences of the buyer, and customer loyalty programs. Personalization of website information can be used for individual targeting and can help to refine company's marketing segmentation. Added value for customers in that case is that it is easier for them to collect and analyze information on different topics, which reduces uncertainty in their purchase decisions. Customer loyalty programs in the case of multi-channel approach could track customers' activities across channels. This provides the retailer with more information about its customers, while customers can be offered more personalized information. (Müller-Lankenau, 2006, p. 89).

2.3   Cross-channel approach

Norbert Beck and David Rygl (2015, p. 175) state that in cross-channel approach, the retailer can control separated channels, and the customer can interact with the seller via several channels. This model is the next evolution step of multi-channel approach. In such a model, the customer's actions in one channel can

be affected by his experience in another one (Fernandez, 2008, p. 32). As a result, whatever channel the customer chooses, his previous activities in other channels will be taken into consideration. However, the customer has a possibility to switch between some but not all channels (Mirsch et al., 2016, p. 6).

The main characteristics of cross-channel approach are incomplete interaction and integration between channels (Mirsch et al., 2016, p. 6). This means that communication has a great impact on the customer's journey and makes it more convenient for customers to cooperate with the seller. In this case, the seller summarizes the whole customer's experience into one image, using cross-referencing of database (Camiade, 2013).

Consequently, in cross-channel approach, the customer can read information about the product or service in one channel and easily buy it through another without entering his data twice. For instance, the customer can find the characteristics of the desired product on the company's website, make an order there, and then collect his purchase in the retail store.

In Figure 2, the scope of the interactions by channels is presented. The data was collected in 2016 in the US by Jean-Etienne Goubet. This diagram shows the average amount of cooperation between customers and retailers:
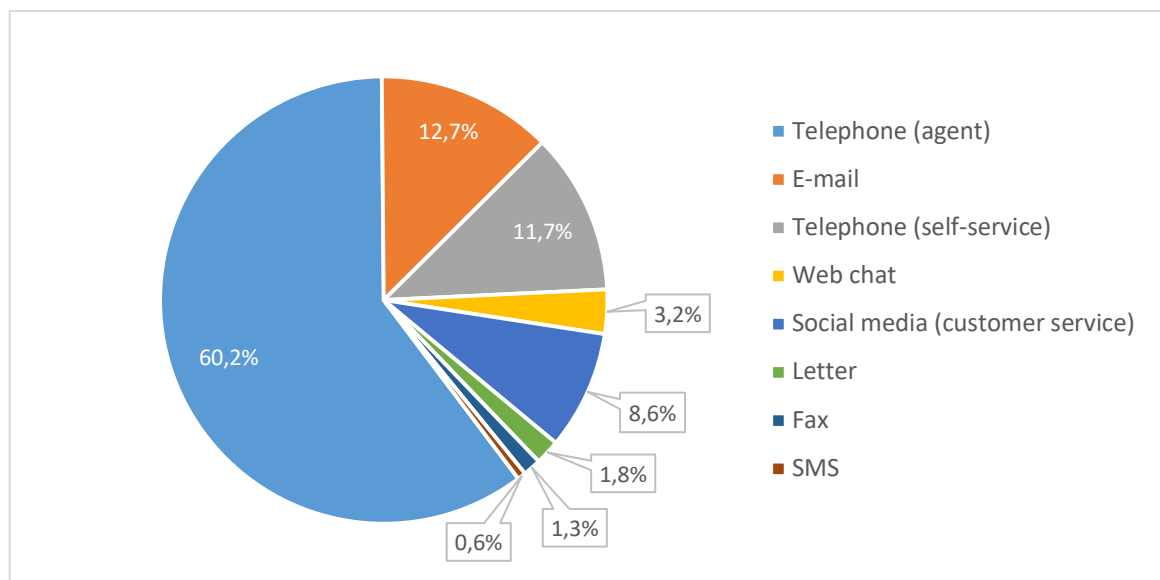

Figure 2. Scope of interactions by channels (Goubet, 2016)

It seems obvious from Figure 2 that phone conversations still play an integral part in interaction with customers. According to the survey regarding telephone conversations, phone agents have very little information about the customer: most often only a name. This is insufficient for the agent to understand the customer's problem. As a result, such means of communication rarely leads to a quick problem solving. Moreover, the time spent on the conversation is much higher in comparison to other channels. (Goubet, 2016, p. 64).

The main idea of cross-channel approach is to be in contact with the customer at any given time. This is why retailers should offer customers more complex services with a great variety of interconnected channels, such as store fulfilment and pick-up possibilities, home delivery and reservations (Bagge, 2007, p. 9). What is more, customers expect online tracking of the delivery process and knowing the exact delivery time.

As was mentioned above, customers tend to use online communication with companies. According to Goubet (2016, p. 41), in comparison to previous years, nowadays people use social media more due to several facts:

- **Channel availability**: via apps on mobile phones or desktops.
- **Ease of use**: people know how to write a message in Facebook or reply to a post in Instagram or Twitter.
- **Low cost of use**: it is free.
- **Painless**: customers can leave negative feedback and dissatisfaction can be eliminated.
- **Speed of reply**: fast response and personalized service.

It should be noted that the customer's channel selection depends on several factors, the most important being income and education. Thereby, young people prefer the online channels (social media, web chats) over the offline ones (telephone conversation). (Hummel et al., 2016, p. 9).

In Figure 3, target response times for handling a customer service request via social media are presented (Goubet, 2016, p. 43). This diagram makes it obvious

why customers choose social media: the time of response is almost instantaneous compared to, for example, the e-mail channel.
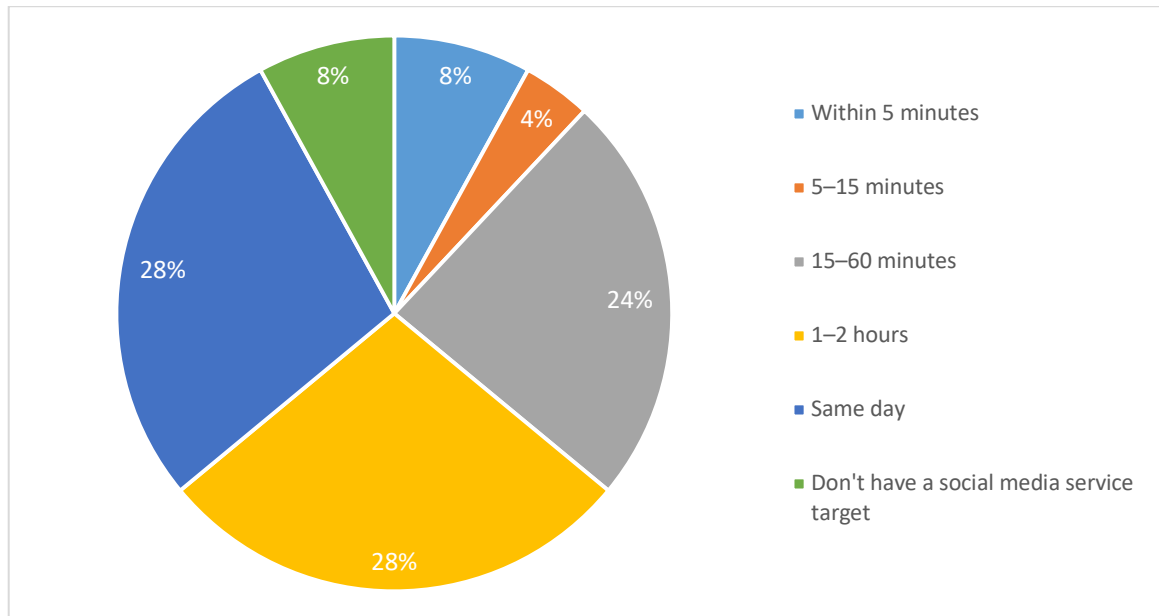

Figure 3. Target response times for handling a customer service request via social media (Goubet, 2016)

The way of cooperation with customers through social media is a great example of cross-channel approach. For instance, the seller can respond to a request on Facebook page through an outbound call, having all the necessary information from another channel (social media). This is the main value-added option for customers in cross-channel approach.

Moreover, the cross-channel model of cooperation is good for both sides. According to Goubet (2016, p. 42), social media as a mean of communication gives the retailer the following advantages:

- analysis of competition on the market
- opportunity to provide customers with a fully-supported customer service
- advertisement of the product or service
- immediate reaction on complains and comments and monitoring them

All in all, cross-channel approach is regarded as a medium zone between multi-channel and omni-channel approaches.

2.4   Omni-channel approach

First, the word "omni" should be explained. According to Merriam-Webster, omni means "all: in all ways, places, etc." and "without limits". From this definition follows that the data from different channels is fully integrated into all channels without any limitations and it is available from any point (Mirsch et al., 2016, p. 7).

In omni-channel approach, the customer is fully integrated into channels of communication with the seller, and the seller can monitor the actions of the customer within all the channels simultaneously. Norbert Beck and David Rygl (2015, pp. 174–175) give examples of such channels: a physical store, printed catalog, telephone conversation, e-mail chatting, online shopping or mobile application.

The main aspect differentiating omni-channel from multi-channel and cross-channel approaches is that the customers' experiences in one channel should be taken into consideration in the others. Moreover, a seamless channel switching should be implemented. In such an approach, the data from each channel should be added to the database as soon as possible, ideally in real time, as this can impact the decision to buy. (Kraemer, 2015, p. 4).

According to Tobias Mirsch et al. (2016, p. 7), there are no barriers neither for the customer in the channel selection, nor for the information that fills the database from different channels. This information can be used by any channel for a more personalized customer's experience.

Different channels can give various opportunities for the customer. For instance, classical brick-and-mortal stores give the customer physical contact with the item before buying it, while online channels provide the buyer with all the necessary information about the product, such as price comparison and rating of reviews on the planned purchase (Mirsch et al., 2016, p. 3).

Customers expect seamless shopping experience from companies when using omni-channel approach. (Goubet, 2016, p. 13). The four main components of a seamless customer's experience are presented in Figure 1 and described below.

Figure 4. Components of seamless customer experience (Woensel and Broft, 2016, p. 16)

Product quality. The quality of products should be the same, no matter whether they were bought in a brick-and-mortal shop or were ordered online. Differences in sizes and colours are permitted, otherwise the quality must not vary. (Woensel and Broft, 2016, p. 16).

Availability. Customers expect products to be available for ordering online and to be in stock in retail stores. This is why stock positions of the products should be accesible constantly and updated periodically. In order to accomplish this, companies should invest in IT systems that can help in tracking products. (Woensel and Broft, 2016, p. 16).

Price. Information about the price in different channels should be available for customers. For example, on the web-page special discounts in retail shops or the price for delivery should be visible. This is necessary to give customers an opportunity to decide the most suitable alternative for them. (Woensel and Broft, 2016, p. 16).

After-sales service. When it comes to after-sales service, there should be no differences in terms of quality irrespective of the selected channel of purchase. (Woensel and Broft, 2016, p. 17).

Such a seamless way of intercommunication can be clearly illustrated by the following example. A customer was attracted by a T-shirt on a billboard in the city center. Then he found information about that T-shirt on the web-site of the seller. He downloaded an application, created a personal account and entered personal data. However, the customer was not sure about the size and color, and he decided to visit a local retail store. When he entered this store, the system recognized the customer via the geolocation in the app and provided a shop assistant with his information. Now, the assistant knew the customer's preferences, his wishes and was able to help to make the right decision. The customer asked the assistant to give him T-shirts of different sizes for trying on. While the assistant was going to the store room, the customer noticed a pair of sneakers he liked, but the color was not good for him. He opened the application and scanned this pair in order to see the color options of that particular pair of sneakers. Luckily, he found a suitable one and then tried the T-shirt and the sneakers. The customer decided to buy the T-shirt in the store and make an order of the sneakers online. In this example, the customer used several means of communication simultaneously, and the data was shared within channels in real time, which helped the customer to make the right decision.

In the light of the discussion above, it seems obvious that customers tend to use their mobile devices, such as tablets or mobile phones. These devices should be considered as additional parts of the shoppers' omni-channel experiences because the usage of portable devices has a great effect on the customer's purchase behavior (Verhoef et. Al, 2015, p. 177). Customers use such devices in the searching phase while buying a product or service and then later to discuss the purchase with their friends or post their personal thoughts on social media.

The fact that the usage of portable devices is increasing is verified by Daniel Kraemer. According to his research in 2015, the number of mobile subscriptions

will grow from 1.6 billion to 5.6 billion in 2019. What is more, he expects constant Internet access in up to 90 % of consumers' devices. He also claims that omni-channel customer behavior will be increased due to the increasing popularity of smartphones and continuous Internet penetration. (Kraemer, 2015, p. 5).

With the increasing usage of the Internet, e-commerce is developing quickly. Moreover, IT facilities for retailing are also expanding their effect. Taking these two facts into consideration, it seems obvious that there are multiple ways of integrating the online and offline channels. Nowadays, the form "buy online and pick up in a store" is becoming more popular and is regarded as the most important implementation of omni-channel approach. This form stimulates customers to gather all the necessary information about the product in an online shop and then order the product from a physical one. What is more, this form provides customers with the added value gained from that way of purchasing. On the other hand, customers have some risks in that form of buying, for example, they could not receive the product immediately after payment. (Liu and Fan, 2017, p. 67). Nonetheless, according to Daniel Kraemer (2015, p. 6), omni-channel customers usually spend 15–30 % more than traditional buyers. This is another argument in favor of such an approach.

In omni-channel strategy, borders between one-way and two-way communication channels are becoming vague (Verhoef et. Al, 2015, p. 176). In this case communication might take place not only between a customer and a seller, but also between customers. Social media are there to provide customers with a means of exchanging opinions, giving feedback and chatting with each other. Peer-to-peer communication also occurs.

According to the DHL research (2015), Daniel Kraemer claims that customers' expectations from omni-channel approach are the following:

- fast delivery (71 %)
- product variety and availability (64 %)
- enhanced search functionality (59 %)
- flexible delivery options (54 %)

- easy return and exchange (52 %) (Kraemer, 2015, p. 32).

What concerns companies, according to Brightpearl and Multichannel Merchant, the main reasons for applying omni-channel approach are the following:

	%
Having different methods for transacting with your customer (e.g., online, physical store, phone)	67%
Delivering a seamless and consistent customer experience across all sales channels	66%
Marketing strategies which are geared towards customers converting on any channel	64%
Processes like Click + Collect, buy in store deliver elsewhere	40%
Giving customers the ability to see all of their orders in one place	37%
Speedy delivery times	21%

Figure 5. Objectives from applying omni-channel approach (Brightpearl and Multichannel Merchant, p. 9)

However, omni-channel model is still developing and is gradually adopted by companies. According to van Woensel and Broft (2016, p. 22), in 2016 only 15 % of companies in the Netherlands managed to successfully implement omni-channel approach into their ways of doing business. For companies the process of switching to omni-channel approach could be difficult due to some obstacles. Tobias Mirsch et al. (2016, p. 10) and van Woensel and Broft (2016, p. 20) state that the main limitations are:

- The inability to seamlessly switch between channels for customers due to the low power of the company's IT and software systems.
- Difficulty in establishing a database that could collect and analyze the data about each customer from different channels.
- Challenges and mistakes in synchronizing the information within channels.
- Complexity of forecasting the demand of new order channels.
- Problems with unclear customer requirements for the first time.

Moreover, companies often make a very common mistake: they simply add new channels to existing ones within an old system without updating it or creating a completely new dedicated IT infrastructure. This is due to the price of such technologies. Omni-channel approach involves the use of technologies that

nowadays are expensive. Sometimes retailers have lack of investments for switching to that approach. (Mirsch et al., 2016, p. 10).

This is why the main issues that companies should focus on in order to implement omni-channel approach are creating a holistic customer's experience and making effective technology investments. (Mosquera et al., 2017, p. 178).

Moreover, challenges could come not only from a company's side. Customers could simply be not aware of channels and opportunities of switching between channels. In this case, it is necessary for the company to promote a new approach for customers. A great deal for retailer is to improve customer acquisition, customer extension and customer retention (Mirsch et al., 2016, p. 10). Information management plays an important role in such a situation. Furthermore, companies may face some challenges in controlling all the channels. In this case, business rules must be adapted in order to stimulate marketing, merchandising and customer fulfillment to work across all channels rather than separately in each channel (Kraemer, 2015, p. 6).

Nevertheless, there are certain benefits for companies in the omni-channel approach. After implementing this strategy, a company might receive more information about customers and their preferences, which will help to individualize communication. Moreover, the omni-channel way of communication provides the company with actionable data about customers' journey, which results in higher customer satisfaction and loyalty. Companies with omni-channel approach will be more appreciated by customers due to the simplicity, diversity and convenience of communication. In addition, it will be easier to control customers and their actions to predict the demand on some products. (Mirsch et al., 2016, p. 10).

What is more, there are certain technological advantages of using omni-channel approach. First of all, automated real-time collection of information into a database. Moreover, risk management techniques which include utilizing special

software and partnering with external suppliers to provide new services previously not required (Chakraborty and Chung, 2014, p. 386).

Using omni-channel approach could provide customers with some benefits. Companies with such a model can create an improved database that will increase value for customers, improve customers' experiences, increase customer loyalty and efficiency by the channel synergy. Moreover, organizational flexibility and improved customer knowledge can also be on the upper level in comparison to single-channel, multi-channel or cross-channel approaches. (Mirsch et al., 2016, p. 10).

All in all, despite all the challenges in adopting omni-channel approach to companies' ways of communicating with customers, nowadays this strategy seems to be an ideal one. The reason for this is availability of different channels, coherent and consistent communication across them and seamless switching between them, as well as the newest technologies in accordance with current customers' behavior. (Mosquera et al., 2017, p. 173).

2.5 Comparison of single-channel, multi-channel, cross-channel and omni-channel approaches

After analyzing all the approaches, it is necessary to make a comparison of the features of each approach in order to show the key differences in these models. Table 1 presents a comprehensive overview of the characteristics of single-channel, multi-channel, cross-channel and omni-channel approaches:

Table 1. Differences between single-channel, multi-channel, cross-channel and omni-channel approaches (Mosquera et al., 2017; Mirsch et al., 2016; Verhoef et al., 2015)

Characteristics	Single-channel	Multi-channel	Cross-channel	Omni-channel
Concept	Integration within one channel	Division between channels; channels in parallel	Partial integration of some channels	Seamless switching between channels

Channel scope	One channel	Multiple channels	Multiple channels	Multiple channels
Degree of integration	None	None	Switching between certain channels	Total
Objectives	Customer communicates within one channel	Customer communicates within each channel separately	Customer communicates by channel or within several channels	All channels work together to offer a holistic customer's experience
Channel management	Gathering the information within one channel	Separated per channel toward optimizing the experience with each one	Per channel and cross-channel; sharing information between some channels	Synergetic management of the channels
Customers' experience	Interaction within only one channel	No interaction within channels

Use channels in parallel | Partial interaction within channels

Use channels in parallel, some channels are connected | Full interaction of channels

Use channels simultaneously |
| **Companies' experience** | Full control of integration of one channel | No control of integration of all channels | Partial control integration of all channels | Full control of integration of all channels |

Data	Data remains in one channel	Data is not shared across channels	Data is partially shared across channels	Data is shared across channels

Summing everything up, there was an evolution of the approaches on logistics. This evolution is visualized by Figure 6 below. The way of communication with customers started from single-channel and then, step-by-step, new models were created taking weaknesses of the previous ones into consideration. Nowadays, omni-channel approach is the newest model of communication between customers and sellers in the fast-moving world, but it is still evolving and then there will probably be an improved and more developed model.

Nevertheless, today, only a few companies have omni-channel approach fully integrated into their way of doing business. This is why, it is better for companies to take into consideration all the advantages of that approach and move toward it.
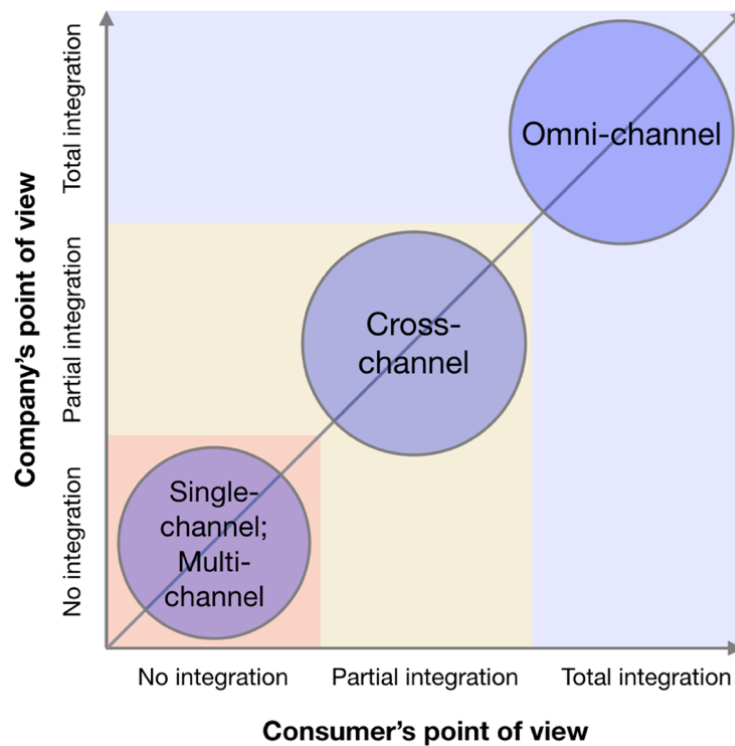

Figure 6. Evolution of logistics approaches according to the level of integration (Mosquera et al., 2017, p. 172)

3 VIRTUAL ASSISTANT TECHNOLOGY: LOGISTICS CASE

This chapter gives information about Virtual Assistant Technology in logistics aspect. First, the main components of the technology are discussed, as well as the technologies and systems on which Virtual Assistants are based. Moreover, the types of Virtual Assistants are identified according to the complexity of the tasks performed. Then, main differences between the types of Assistants are explained. Finally, based on these types, certain examples of each type both from the company's and customer's side are considered.

3.1 Main aspects of Virtual Assistant Technology

In order to understand Virtual Assistant Technology and its types, certain systems and technologies which are the essence of Virtual Assistant Technology should be defined.

Virtualization is a process of visualizing or simulating physical interactions between people and objects or different processes that occur in reality on computer-based devices. Sensory, relationship, synchronism and control requirements, as well as identification, are the main constructs of virtualization. (Overby, 2008, pp. 279–280). Visualization is a tool that gives the user an overall impression of the dataset (Droste et al., 2011, p. 7). All the virtualization processes take place in a virtual environment.

The virtual environment is a computer-generated system that allows users to have a real-time virtual interaction with various processes and objects that are simulated in that environment (Singh et al, 2010, p. 434; Schroeder, 2008, p. 2). The main component of the virtual environment is an information system (Pekkola and Ylöstalo, 2010, p. 96). The information system gathers data about real processes in a certain database, analyzes social interactions between people and transforms them into the virtual environment form with the help of special technologies (Schroeder, 2008, p. 2).

Virtual technologies are considered as technologies in the information system which could simulate or emulate an object's actions within the virtual environment. Such technologies are made to copy the object's behavior or way of thinking and interaction with other objects. The main idea of virtual technologies is to make real what is not with the help of special software. (Mathias, 2017).

Virtual Assistant Technology is a technology that combines digital records of different types in order to enable functions of an object or real-life resources and provides the user with the information available (Lee and Leonas, 2018, p. 2). This technology is used to ensure the efficiency of Virtual Assistants itself.

Virtual Assistant or Intelligent Personal Assistant is an application that could be installed on smartphones, tablets or other devices. Assistants are regarded as software agents which can recognize voice, text or visual commands and complete the set tasks (McLaughlin, 2018). This is why users could engage with Assistants through the main methods of interaction, which are:

- text interaction (applications, chat bots)
- voice interaction (voice assistants such as Siri, Alexa, Google Assistant)
- visual interaction through uploaded pictures (Samsung Bixby)

Using these methods of interaction, the main tasks of Virtual Assistants can be defined. According to Greg Digneo (2018), companies use Intelligent Personal Assistant for the following tasks:

- enterprise management
- social media management
- preparation of analyzing reports
- digital marketing
- special personal tasks (Digneo, 2018).

Virtual Assistant Technology is mostly based on Artificial Intelligence (AI) — the ability of a system to receive and interpret data, then learn from it and, finally, use this knowledge to achieve the set objectives through flexible adaptation (Kaplan

and Haenlein, 2019, p. 17). In order to receive the data, Virtual Assistants should be connected to the Internet (McLaughlin, 2018). As it is visible from the definition, Assistants based on AI are learning constantly and becoming more advanced with every new interaction with users. Nowadays, the functionality of Virtual Assistants is growing, this is why the usage of such agents is expanding. (Lee and Leonas, 2018, p. 2).

3.2 Types of Virtual Assistants

Taking into consideration that Virtual Assistants are based on Artificial Intelligence, the following types of Assistants can be distinguished according to their functionality and abilities. Table 2 outlines the four types of Virtual Assistants and provides the information about the presence or absence of certain kinds of intelligence:

Table 2. Types of Virtual Assistants (Kaplan and Haenlein, 2019, p. 18)

	Types of Virtual Assistants				
	Expert	Analytical	Human-inspired	Humanized	Human beings
Cognitive intelligence	✗	✓	✓	✓	✓
Emotional intelligence	✗	✗	✓	✓	✓
Social intelligence	✗	✗	✗	✓	✓
Artistic creativity	✗	✗	✗	✗	✓

In order to compare the complexity of the intelligence of Virtual Assistants, the right column presents human capabilities.

Expert Virtual Assistant is the simplest type of these agents. This Assistant possesses only the information which people include into the program which this Assistant is based up on. The program uses "If – Then" algorithm to complete

tasks. (Kaplan and Haenlein, 2019, p. 18). This Assistant can answer only certain questions. In the case of communication with users, Expert Virtual Assistant can only offer installed alternatives of the question and do not have an opportunity to browse the question and find additional information on the Internet. Moreover, this Assistant does not recognize emotions or have an opportunity to interact with customers using this information. This type of Assistant does not have any kind of intelligence.

The main difference between Analytical Virtual Assistant and Expert one is in existence of cognitive intelligence. This Assistant takes into consideration past experiences which affect its future decisions. Furthermore, Analytical Virtual Assistant can generate a cognitive representation of the processes of a real world. (Kaplan and Haenlein, 2019, p. 18).

Human-inspired Virtual Assistant differs from the Analytical one in the case that the first Assistant has emotional intelligence, but at the same time there are elements from cognitive intelligence. This is why such an agent has all the functions of Analytical Assistant. Thus, Human-inspired Virtual Assistant can understand people's emotions, which affects its decision-making. (Kaplan and Haenlein, 2019, p. 18). According to Kendra Cherry (2018), such an assistant has a conversational skill. This means that Human-inspired Virtual Assistant could be an attentive listener and an effective interlocutor. Moreover, Human-inspired Assistant can understand the reaction on its sayings and make a conversation based on the emotions of a person, as well as simulate human emotions (Cherry, 2018).

Nowadays, Humanized Virtual Assistant is still on the stage of development and is not presented. This Assistant is considered the most elaborate type of Virtual Assistants, as it is supposed to combine all the available types of intelligence for assistants: cognitive, emotional and social. The Assistant will obtain all the functions of the aforementioned three types of Virtual Assistants. In addition to these, Humanized Assistant will have the ability of social intelligence and will be able to be self-conscious and self-aware. This means that such an assistant will

communicate with people on an advanced level. (Kaplan and Haenlein, 2019, pp. 18–19; Morin, 2018).

It seems obvious from Table 2 that two types of Virtual Assistants — Analytical and Human-inspired — have one issue in common: cognitive intelligence. As was stated above, this means that such assistants have the ability to analyze past experiences and learn from them, avoiding previous mistakes. Andreas Kalpan and Michael Haenlein state that for this defining element there are three main types of learning processes. They are:

- **Supervised learning** — Virtual Assistant is given certain inputs and outputs as an example, based on which there will be made similar tasks by assistant.
- **Unsupervised learning** — Virtual Assistant is given only inputs without examples of outputs, but there are certain rules, following which the system should understand on its own the appearance of outputs.
- **Reinforcement learning** — Virtual Assistant receives only outputs with description of actions that could be taken to achieve these outputs in order to create a solution to maximize these outputs. (Kaplan and Haenlein, 2019, p. 19).

Owing to this, on this stage of progress, four types of Virtual Assistants are defined, three of which are existing now and one is still in developing. The last type of Virtual Assistants is supposed to appear in the near future as a main tool to manage enormous amounts of previous experiences to gain a better interaction with people and probably with other assistants without human involvement (Massai et al., 2019, p. 70).

3.3   Virtual Assistant Technology from the company's perspective

Nowadays, Virtual Assistants are presented in almost all industries, especially those that provide various services and sell products. Further certain examples of implementing the Virtual Assistant Technology according to the types that were defined in the previous sub-chapter are given.

The example of Expert Virtual Assistant is a system that can help a company and its warehouse managers in the inventory sphere. This Assistant is able to monitor the number of products in stores according to the algorithm "If – Then". Thus, there is a database with special codes of each good and the desirable numbers of each item that should be located in the storage. The system could review the availability in the store: if the Assistant can find the code, then it will review the number of products. If the number is larger than the minimum, then the Assistant displays that everything is under control and additional orders are not necessary. In the other case, if the system could not find the code of the product, then it shows that there are insufficient items in the storage, and additional orders are needed.

When it comes to Analytical Assistants, the examples of the company usage are the following. Such a technology is implemented in Human Resource Management: special algorithms are used in order to help with scanning curriculum vitaes and selecting appropriate candidates. One more example can be found in the financial sector: Analytical Assistants are there to help in analyzing the financial transaction data and then give forecasts based on previous experiences. In the sphere of marketing and sales, Virtual Assistants can analyze customers' experiences and the data about the customer on his personal account, which can provide him with personalized communication and better targeting. What concerns the customer services, chat bots are used for generating responses to customers' questions. (Kaplan and Haenlein, 2019, pp. 20–21).

An example of Human-inspired Virtual Assistants can be found in a shopping center. Assistants are working in some Walmart stores, activities of which are based on the face recognition technologies. Such systems are installed near automatically check-outs and identify the mood of the customer. In case of an unhappy customer, there could be given a small candy to make the customer happier. This act can create a positive association in the customer's mind and will probably increase loyalty of that customer. A future example in the online-retailing sphere is the following. Such Virtual Assistants will create personalized

recommendations, taking into consideration the emotional attitude of the customer to the commercials, given in the past. For this reason, a front camera of a smartphone, tablet or computer can be used to identify users' emotions. (Kaplan and Haenlein, 2019, pp. 20–21). Moreover, in the future Assistants that could help customers with paying processes can appear. They will use special algorithms to recognize if a customer has some problems with the interface and give appropriate follow-up help for him (Digneo, 2018).

One more example of Human-inspired Virtual Assistants is found in Shanghai. Generally, China is considered as one of the countries with well-developed technologies, this is why it is expected to see almost fully integration of technologies into the Chinese lives. There was opened a smart hotel, powered by WeChat and InterContinental. This hotel has no human staff, except for cleaners. Everything is made by visitors via a special app on their phone: room reservations, check-in processes and smartphones are used as a personal key to enter the suite. Unfortunately, this hotel failed due to the lack of development of Virtual Assistants and relayed technologies in that sphere. (Liao, 2018).

As for Humanized Virtual Assistants, although they are not presented now, an example in the retailing sphere could be considered. Virtual Assistants are regarded as untouchable systems, but they could be installed into moving robots that could play a role of a shop assistant in the retail store. Such Assistants could replace humans in that sphere as they will be able to interact with customers exactly in the same way as people. (Kaplan and Haenlein, 2019, p. 20)

Taking into consideration all stated above, Virtual Assistants of different types are used by many companies in two cases: for some processes inside companies and for interaction with customers online and in real stores. According to Lorenzo Massai et al. (2019, p. 73), the usage of Virtual Assistants will continue growing due to the cost effectiveness of applying such programs and the ability to work 24 hours per day for the company's needs, which gives certain advantages compared to human resources.

3.4 Virtual Assistant Technology from the customer's perspective

Due to the reach of the Internet and the availability of portable devices, most people have an access to the World Wide Web, which is the main aspect of the workability of Virtual Assistants. A smartphone is considered as the main device for using the Assistants by customers. In this sub-chapter, as in the previous one, the examples of Virtual Assistants are shown that could help in creating better customers' experiences.

The main idea of Virtual Assistants from the customer perspective is to make his engagement with the company more personalized. One of the objectives of Expert Assistants is to provide customers with the necessary information at any time. This technology is used in online chat bots to give answers to questions. For example, there is an online chat bot KOKOBOT in Telegram by the company Koko.by for finding entertainment in Minsk. First, a user is given several alternatives to choose from, such as cafes in the city and out of it, delivery of food, most popular events and thematic articles on the company's website. Then the user clicks on one of the variants and the next list of alternatives appears. For instance, the case with city cafes: after selecting this point, then the alternatives of food are displayed: pizza, craft burger, pasta, steak, seafood, Belarusian cuisine, vegetarian, Chinese and fast-food. Then the user selects one of the options, and the list with the suggested cafes appeares. Moreover, there is an opportunity to click on the name of the café which is a direct link to the company's webpage with the review on this place with photos, menu and opinions of the company. («Kokobay» zapustil Telegram-bot. On pomozhet vam vybrat' zavedeniye, 2019).

Expert Assistants are used not only as chat bots, but also as help bots. The example is a Virtual Assistant, created by the collaboration of Byron and Microsoft Word. The objective of that Assistant is to provide users with necessary help anytime. This Assistant follows users' movements on the screen and offers tips to improve the working process. Moreover, this Expert Assistant has an opportunity to show special videos inside the document that the user is editing in real time. Owing to this, small videos appeares above the document, showing

some hints. Usually such a system is used by non-proficient users in order to improve their skills in that program. (Benson, 2018).

The technology of Augmented Reality together with Expert Assistants is used in AR-glasses by such companies, such as Microsoft, Amazon, Vuzix, North, Solos, Everysight, DreamWorld, Nordstorm, Vue and VSP. These glasses present the information in front of the person wearing this device. For example, engineers use HoloLens AR-glasses on the stage of developing new projects, as such a device could help in the visualization of drawing in real time. What is more, smart glasses are used by designers creating new interior in order to show customers new variants of decoration of a place. (Sumra, 2019).

An example of Analytical Virtual Assistants are Voice Assistants. They are widespread nowadays and are installed almost in all devices. The most popular among users are Siri by Apple, Bixby by Samsung, Alexa by Amazon, Google Assistant by Google, Cortana by Microsoft (McLaughlin, 2018). These assistants have various functions that will be discussed in detail in the following chapter.

One more example of the technology that is used in Analytical Virtual Assistants in the sphere of retailing are special fitting rooms with virtual sensor mirrors. Customers could choose something to try on and they will see themselves in the mirror wearing the chosen cloth in real time. Moreover, Artificial Intelligence inside could predict customers' wishes and suggest them one more item to try on which fits to that one. Using the ability of analyzing past experiences, the system will be developing constantly to make predictions more accurate. (Mirsch et al., 2016, pp. 9–10).

In order to make predictions personalized for each customer in the aforementioned example, the technology that is used in the application ColorGenius by L'Oreal could be integrated. The system in this application identifies the colortype of a person on a picture. According to this application, people are divided into four types: winter, spring, summer and autumn people. For each group certain colors are suitable. The decision of a suitable color is

made depending on the color of skin, hair and eyes. The objective of the application is to select a suitable color in cosmetics. In the case of fitting rooms with virtual sensor mirrors, such a technology could be used to decide suitable colors in clothes, taking into consideration the color type of a person. (Metzke, 2012).

Human-inspired Virtual Assistants are presented in the car industry by Volvo and NVIDIA. The technology DRIVE AGX Xavier is integrated into new cars in order to improve security system. In this case, cameras inside a car scan a driver's face to recognize his emotional condition. For example, if the driver is becoming sleepy while driving, the system could make special vibrations inside the steering wheel in order to wake him up. If the system could not wake the driver up, special mechanisms will stop the car on the side of the road. Another example of Human-inspired Assistants are those one in game-playing. The system is able to analyze the style of playing, the reaction speed of the player and can use a front or web camera to detect tidiness of the player and his mood in order to select the appropriate level of the game. (Goasduff, 2018; Green, 2018).

Humanized Virtual Assistants can appear in the future as online interlocutors. It could be an advanced version of a chat bot, but users could communicate with them as if it was a real person. Technologies like voice and face recognition will be used. Assistant could analyze the volume and understand the emotional state, as well as using cameras of the devices could clarify its predictions based on face analyzing. Such Humanized Assistants will have the ability of real speech as if the person is talking with his friend via a mobile phone. The deployment of that technology can be applied in the health sphere, as such Assistant could play a role of a psychologist. (Augmenting Virtual Assistants with Personality and Personalization, 2018).

All in all, Virtual Assistants are used both by companies and customers. This technology is becoming more complex and accurate, and it will continue developing.

4   INTEGRATION OF THE VIRTUAL ASSISTANT TECHNOLOGY INTO THE OMNI-CHANNEL APPROACH

4.1   Current situation on the market

Nowadays, Virtual Assistants are enabling a more human-oriented approach of engaging the information from a World Wide Web by utilizing Big Data, machine learning and Artificial Intelligence (Stjepanovic, 2018). One of the key factors of growing such a technology is a high adoption of mobile devices (Benson, 2018).

Virtual Assistants are used by companies as a helpful tool for the company's need, as well as for customer service. Key players in this field are Amazon, Google, Apple, Microsoft, Samsung Electronics, Intel, IBM, Oracle, Nuance Communications and Inbenta Technologies. Renee Morad (2019) in the research states that the percentage of the companies on the market is the following:
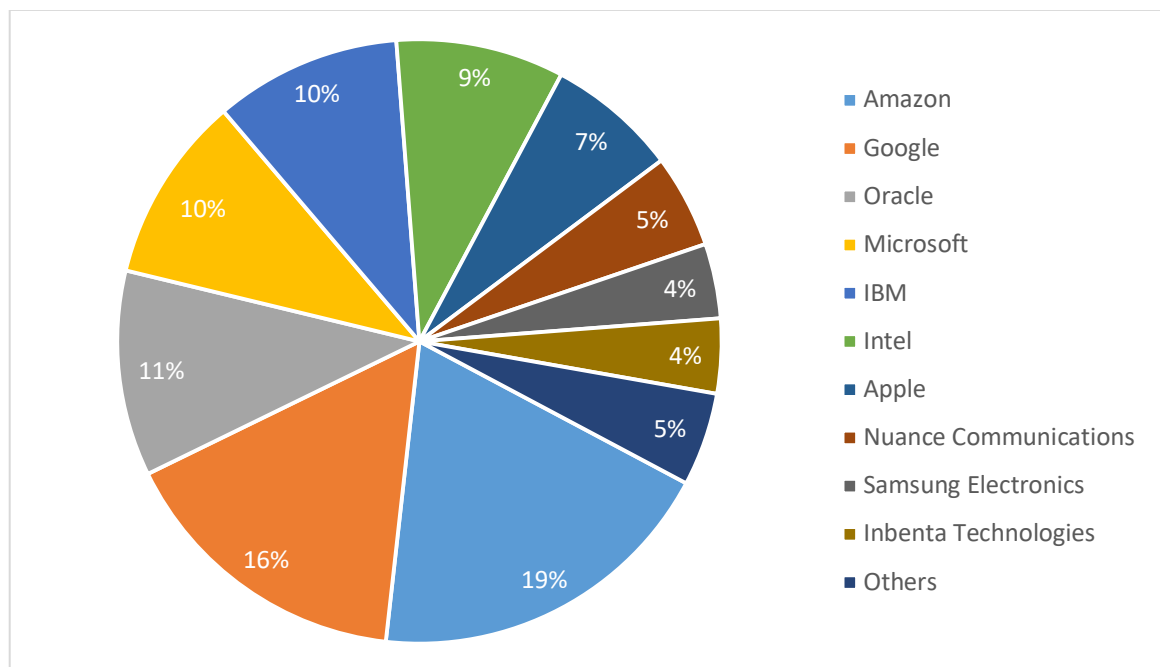
Figure 7. Percentage of the key players on the market (Morad, 2019)

Taking into consideration the examples of using Virtual Assistants in different spheres of business, described in the previous chapters, the objectives of using such a technology for business are to optimize working processes, to increase productivity and to reduce costs (Swaffield, 2016).

Fiona Swaffield (2016) highlights in the research the main types of the tasks performed by Virtual Assistants:

- **Customer service**. Assistants are able to response customers' questions and provide them with more personalized experiences.
- **Marketing**. Assistants could analyze customers' journeys and choose suitable commercial to their wishes.
- **Administration and management**. Assistants have the ability to manage e-mails, schedules and confirm appointments, as well as record information from meetings.

According to Sacha Stjepanovic (2018), at the beginning of 2018, the number of users of Virtual Assistants in the consumer sphere was approximately 1 billion, and this number continues growing. Moreover, opportunities for using such agents in the logistics sphere continue to reveal due to the increasing base of users (Stjepanovic, 2018).

There are certain advantages of utilizing Virtual Assistants: the cost for using these agents is cheaper than hiring people, the ability of working 24 hours 7 days a week and the possibility to complete repetitive and monotones tasks. On the other hand, there are disadvantages. First of all, it requires time to invest and to create an assistant for the individual needs of the certain company. Moreover, communication challenges include cultural differences, adaptation and translation of the functionality of Assistants. This means that, for example, a voice recognition technology cannot understand some accents. (Smit, 2015).

The largest market users of Virtual Assistants are the United States, UK, North America and Japan. On the contrary, in Europe there are only few people using such a technology due to the lack of localization of these agents, as most Assistants are oriented to the key markets where the language is mostly English. (Smit, 2015).

All in all, nowadays, Virtual Assistants are considered as a trend in the business sphere, and companies are implementing such a technology into their processes in order to increase the efficiency of working processes. (McLaughlin, 2018).

4.2   Challenges of Virtual Assistant Technology

Despite all the advantages of Virtual Assistant Technology, companies might face some challenges while implementing such intelligent agents, as well as users could face some problems while interacting with Assistants.

The security of private data is considered the most significant problem of Virtual Assistants. In order to ensure the functionality of activating Assistant by voice, the device should constantly listen to the owner. Although companies insist that Virtual Assistants remember only the information that comes after special phrases which are needed to activate Assistant, there is a threat that data could gathered without consent of the user. Moreover, some Virtual Assistants require access to the GPS position. In this case, there is a possibility that Assistant will track users' movements and collect this information without informing the user. What is more, once the user agrees to give access for Assistant to the photo library, e-mails, calendar, then all the highly personal information might be under the threat of being declassified. (Hoy, 2018, p. 85).

One more challenge of Virtual Assistants is connected with a gender inequality. Most often, Assistants with the ability of talking have only female voices, such as Alexa, Alisa and Cortana. What is more, these Assistants have even female names. According to the desingners of these companies, such names were chosen because of a phonetic clarify: the soft vowel sounds contrasted with the clear consonance made their names easier to recognize by natural language processes (Loideain and Adams, 2018, p. 7). Notwithstanding, technologists from the agency Virtue tried to solve the problem of gender inequality and introduced Q — a gender-neutral voice for Voice Assistants (Dellinger, 2019).

Another challenge of Virtual Assistants is the replacement of the human workforce by such Assistants. For examples, in the future companies might reduce drivers and replace people with self-driving cars. (Kaplan and Haenlein, 2019, p. 24). On the other hand, this challenge could become an advantage for workers, as this technology might help them in routine tasks, which can raise productivity (Manyika et al., 2017, p. 15).

4.3 Best practices of integrating the Virtual Assistant Technology into omni-channel approach

Virtual Assistant Technology is widely spread among companies. In this chapter, the best examples of the integration Virtual Assistants into the omni-channel model will be presented.

4.3.1 Navigation and inventory: retailing and warehousing

Nowadays, the model "buy online and collect in the store" is the key for retailers (Robots in Retail — our processes and features, 2019). This model is commonly used by omni-channel customers. The most challenging aspect for the customer is to find the item inside the store. In order to help customers in these situations, an autonomous retail service robot LoweBot was created by Lowe's Innovation Labs in 2016 in the United States. The aim of this robot is to help customers with finding products within stores and optimize his picking route. The components of LoweBot and the robot itself are presented in Figure 8:

Figure 8. Components of the Lowe's robot (Robots in Retail — our processes and features, 2019)

LoweBot has a speech recognition system of multiple languages so that customers can chat with it as with a real human (Robots in Retail — our processes and features, 2019). The robot uses Wi-Fi to connect a Deep

Learning-based classifier (the database of the store) and inspect the availability of products. In order to move in the store, the robot is equipped with several cameras and sensors (NVIDIA Jetson Partner Stories: Fellow Robots — LoweBot, 2017).

LoweBot provides the customer with the following information on the screen to improve their experiences:

- product information in the chosen language
- exact product location
- advertisements promoting products
- route to the chosen product
- loyalty program (Robots in Retail — our processes and features, 2019).

What is more, LoweBot helps not only customers, but also workers in stores or warehouses. The robot uses machine learning, computer vision and artificial intelligence to help with inventory and scanning products (Robots in Retail — our processes and features, 2019). Such robots could both give personalized assistance services for customers in large stores and help workers with their routine tasks (Kraemer, 2015, p. 9).

Almost the same technology is used in the robot AndyVision made by the Intel Science and Technology Center (ISTC). Contrary to LoweBot, this robot could work only inside retail stores or warehouses for the needs of the company. AndyVision is not as smart as LoweBot, as it does not have any smart sensors to engage with customers. This is why this robot is cheaper than LoweBot and is chosen by companies to help with the daily retail inventory. AndyVision robot could move autonomously with the help of obstacle avoidance sensors and use the map of products and shelves to recognize the location of them. (Kraemer, 2015, p. 9). This robot could send notifications to the store staff via the special application about the lack of products on shelves. AndyVision uses contextual object recognition for counting items in real time with the help of machine-learning algorithms (CMU's AndyVision Robot Is in Your Store, Doing Your Inventory, 2012).

Another example of robotics in retailing is the robot Pepper made by SoftBank Group Corp. Because of the appearance, this robot is regarded the most human in that sphere (see Figure 9). Pepper is used as a supporting tool for the existing personnel of the company mostly in retailing, but could also be used in banking, education and healthcare due to its hospitality (How Robots Can Bring Your Omnichannel Retail Strategy to Life, 2019).
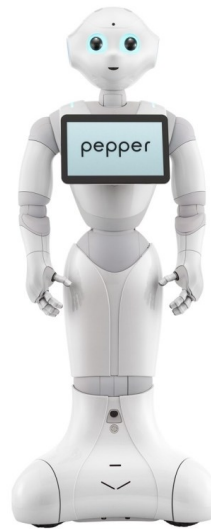

Figure 9. Pepper (How Robots Can Bring Your Omnichannel Retail Strategy to Life, 2019)

Pepper is used in the Business to Customer (B2C) model in order to give general information to the customers about the company and its products. This robot can understand and answer routine questions and collect the information that can be used by companies for analyzing customers preferences and most common questions. (How Robots Can Bring Your Omnichannel Retail Strategy to Life, 2019).

A helping tool for inventory processes is a multi-sensor RFID wristband xBand created by Ubimax in 2017. This wrist was made to optimize manual processes connected with picking and inventory. The main functions of xBand are innovative barcodes scanning and voice recognition. The wristband is now used by many companies, and this device has earned a great number of awards such as MHI Innovation Award 2017. Moreover, xBand has more opportunities working in a pair with smart glasses xPick that will be discussed later. (Widmer, 2018).

4.3.2 Voice Assistants

The complexity and accuracy of a voice recognition technology and Voice Assistant software have grown in the last few years (Hoy, 2018, p. 86). The most popular Voice Assistants among users are Siri by Apple, Alexa by Amazon, Google Assistant by Google and Cortana by Microsoft (McLaughlin, 2018). In Figure 10 the popularity of Voice Assistants for finding and purchasing products is shown among the users in the US in 2018. These assistants allow users to ask questions and issue commands to computers in their natural language (Hoy, 2018, p. 87).
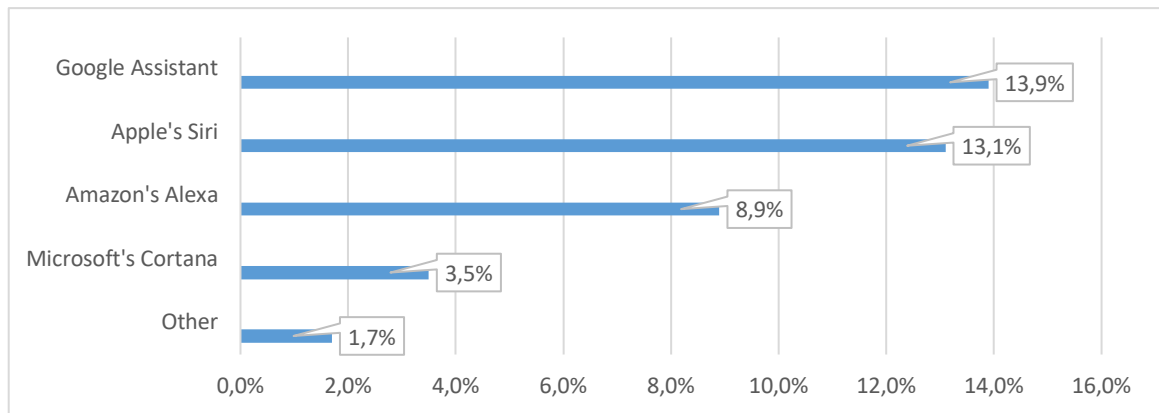
Figure 10. The popularity of Voice Assistants for finding and purchasing products among users in the US (Sanghvi, 2018)

The technology of voice recognition in the sphere of retailing is relatively new and appeared first in 2014 when Domino's Pizza introduced the possibility of making voice orders via their mobile application. Such a way of communication with customers is considered by companies as another channel of interaction to improve the customers' journeys. (Caperdoni, 2018). Another example of integration Voice Assistants into the customers' journeys is the collaboration of Siri and Uber. Owing to this, the user could order a taxi directly via his smartphone. (Lior, 2016).

In May 2018, Google introduced a new Voice Assistant Google Duplex that works with the help of Google Assistant. Google Duplex could communicate with people through AI-based voice. The idea of this assistant is to help people make appointments through the phone. For example, the user can make a reservation

at a restaurant. In order to do this, he enters all the necessary information about the appointment and let Duplex make the conversation instead him. (Callaham, 2019).

Moreover, such assistants are integrated in new cars. For example, BMW launched Intelligent Personal Assistant as an option for new car models. These agents provide a driver with all the information about his car. Another scenario of interaction with Assistant is cooperation with a navigator. For example, the driver could ask the assistant to create the road to his home. (May, 2018).

According to the research of Bret Kinsella (2017), in the sphere of retailing customers use Voice Assistants in special applications before, during and after shopping for the following tasks:

- research the information about the product
- add to shopping list or cart
- track a package
- make a purchase
- provide ratings or overview
- contact support
- reorder items

Convenience is one of the major reasons why customers adopt Virtual Assistants. Using these agents, customers have the ability to make tasks hands-free, which makes their lives easier. (Caperdoni, 2018).

4.3.3 Collaboration with Augmented Reality

Virtual Assistants often work together with other systems. IKEA is an example of a company that provides customers with omni-channel interaction based on Augmented Reality.

In 2015, IKEA launched the application IKEA Place that allows customers visualize furniture inside their own home. The user scans and maps the desired space through the smartphone camera. After this, he chooses suitable furniture

from the catalog and add it to the place on the screen of his smartphone. The application places a 3D version of the object on the live screenshot of the room. There is a possibility to move around this object, rotate it and change its position. (Cornic, 2018).

Another example of the collaboration of Virtual Assistants and Augmented Reality are smart fitting rooms. The Ralph Lauren Polo flagship store in the US uses interactive mirrors created by the company Oak Labs inside such fitting rooms. These mirrors use special sensors with the help of which customers can change the light around. This is made to help customers understand how their appearance in the clothes changes depending on the environmental lights. Moreover, Virtual Assistant there recommends other products to customers which suit them. In addition to this, there is an opportunity to send a shopping assistant the request for another size of the item. One more feature of these fitting rooms is that an RFID-scanner is installed inside. The system automatically recognizes customers' choices and provides all the details about the items on the mirror. (Tagiev, 2017).

One more example of the collaboration of Virtual Assistant Technology with Augmented Reality is a product of the aforementioned Ubimax. This company created smart glasses xPick as well. This device displays the information about chosen products in front of the users' eyes. A combination of glasses xPick and wristband xBand is a unique technique that provides an optimal hands-free manual solution. In this combination, the main advantage is that the person can see all the necessary information that was collected with RFID-scanner simultaneously doing his inventory work. Certain benefits of xPick and xBand connected together are a more flexible and mobile person, the increased speed of inventory and the reduction of errors due to real-time access to the data and a censor controlled. In Figure 11 there is an example of using such a combination. On the left, the displayed information in front of the user from xPick is shown, and on the right, what this person sees while scanning an RFID-code with the help of xBand. (Bleeker, 2017).

Figure 11. A combination of xPick and xBand (Bleeker, 2017)

All in all, Virtual Assistants are applied by companies in order to improve omni-channel engagement with the customers. Usually Virtual Assistants are combined with other technologies to achieve better results.

4.4 Perspectives of integrating the Virtual Assistant Technology into the omni-channel model

As was stated above, the number of users of Virtual Assistants in the consumer sphere was approximately 1 billion at the beginning of 2018. According to Matthew Hoy (2018), this number will increase to 7.5 billion users by 2021.

Taking into consideration the fact discussed in the previous chapters that buyers use digital channels more frequently, Virtual Assistants are expected to occur in various services, so that to give more opportunities for automated self-service (Zirn, 2018). The percentage of using Virtual Assistants in different spheres by 2021 is shown in Figure 12:
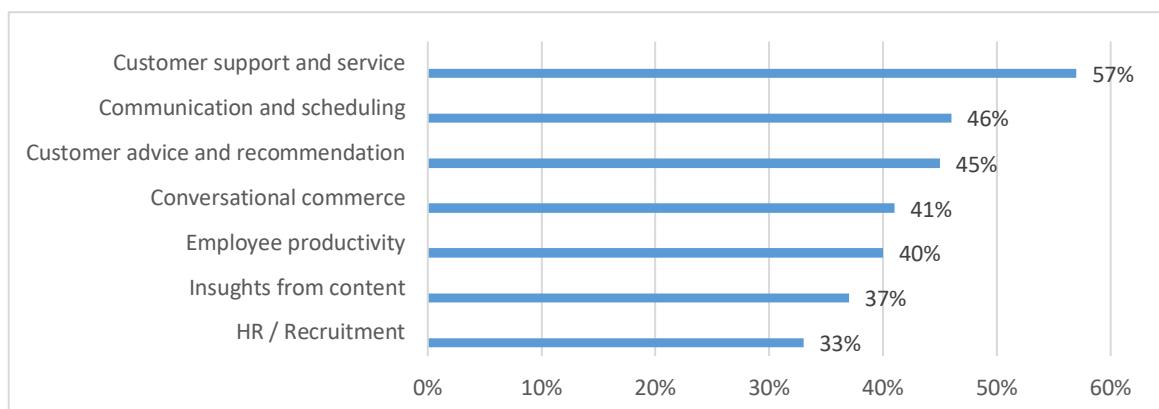
Figure 12. Spheres of usage of Virtual Assistants by 2021 (Pieters, 2018)

It seems obvious from the figure above that customers' support and services, as well as communication and customer recommendations will be the key points in the usage of Virtual Assistants.

What concerns Voice Assistants, these agents have potential to change customers' ways of interaction with computers and their portable devices, and, as a consequence, the way of communication with companies (Hoy, 2018, p. 85). Figure 13 presents the predicted usage of different Voice Assistants till 2021:
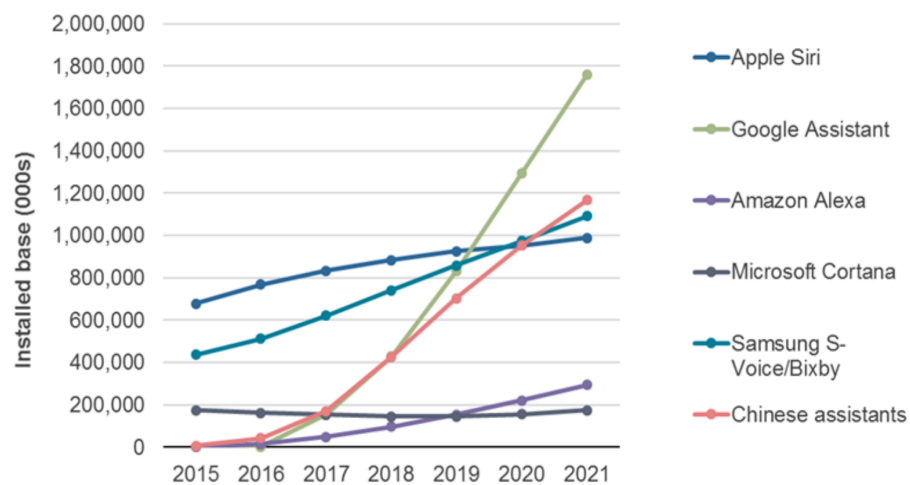

Figure 13. The number of Voice Assistants till 2021 (Hoy, 2018)

The ability to read and type is a barrier for accessing information for some users. In this case, Voice Assistants could be personal agents which will help with gathering the information for such buyers. (Hoy, 2018, pp. 85–86).

Chat bots, despite their simplicity, have great potential. This system will help companies increase effectiveness of communications with customers. (Bilous, 2018).

All in all, the adaptation of Virtual Assistants continues to grow and this technology will become an essential part of people's lives. Such agents will be integrated by companies, as they will manage to solve problems instantaneously, outperform humans in all areas and in all types of intelligence. These Assistants will be beneficial for all business spheres and communication with customers will be performed on an advanced level. (Kaplan and Haenlein, 2019, p. 16).

5   CONCLUSION

Nowadays, the reach of the Internet and the increasing number of portable devices in most people's life is significant. The best solution for companies in order to be on the top of the market is to provide customers with various alternatives of communication, as well as enable seamless switching between channels via omni-channel approach. Furthermore, customers expect personalized real-time engagement with a company and immediate support with the purchase. For this reason, the implementation of Virtual Assistant Technology as personal agents for customers that are able to answer all possible questions and communicate with customers at any time will give the company competitive advantage on the market.

In the present study the integration of Virtual Assistant Technology into the omni-channel approach was examined. The study gives the answer to the main research question of how Virtual Assistant Technology could help to make a business process more profitable in the omni-channel model both from the customer's and the company's perspectives, and the chosen sub-questions were considered. Thus, the objective of the thesis was reached.

First, the study has shown the evolution of logistics approaches towards omni-channel model of doing business, and the comparison of the models of communication between companies and customers was made as well. This comparison makes it possible to identify certain advantages and disadvantages of each model of communication.

Second, the essence of Virtual Assistant Technology was revealed and four types of Virtual Assistants were distinguished. Moreover, the implementation and benefits from using Virtual Assistants both from the company's and the customers' perspectives were studied on certain examples divided according to established types of agents. These results were taken into consideration to evaluate the current situation on the market. However, the challenges of introducing Intelligent Agents into omni-channel approach occurred and the study

defined the main ones of them. Finally, in this thesis, the perspectives of using this technology were identified.

The qualitative method, secondary data analysis in particular, for the survey was conducted. The purpose of the survey was achieved through a deep analysis and comparison of reliable sources, the main of which were reports and surveys of leading companies in the sphere of omni-channel approach, journals and conferences related to the topic of Virtual Assistant Technology.

The logical conclusion, based on the results of this study, is that Virtual Assistant Technology is a trend in the omni-channel means of communication with customers and has great potential for the future development. Further research could consider Humanized Virtual Assistants as this type of agents are currently not presented on the market. A good idea for this research could be the identification of a certain scenario of using this technology in a certain company case. The challenges of implementing these Humanized Virtual Assistants and possible solutions to overcome them could be considered, and benefits for the particular company could be reviewed.

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