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# **Virtual assistants support customer relations and business processes**

## **Introduction**

Research lead in artificial intelligence, human-computer interaction and e-business resulted in the creation of virtual assistants - intelligent humanoid interfaces functioning within e-commerce environment. Unlike traditional programs, virtual assistants are supposed to be autonomous, proactive and adaptive. These advantages make them particularly useful in e-commerce environment, where they establish and maintain Internet-based customer relations and carry out e-business processes. Virtual assistants currently experience a renaissance and have a wide range of applications. They perform their functions in various areas, but mostly they act as virtual representatives of their employers, kind of a showcase with humanoid face. Their possible applications are extensive: from being customer service consultants responding to any inquiries regarding companies' products and services, through advising and supporting sales processes in electronic stores, surveying customers and maintaining friendly relations with them, to being a tool for discovering customer preferences and expectations related to products and services.

## **1. Virtual assistants**

Virtual assistant constitutes an embodied conversational entity (ECA) implemented on a website. Along with the popularization of the Internet and rapid development of technology to create websites, virtual assistants have been implemented on numerous websites. They function as talking guides available persistently on-line helping users to navigate websites. Virtual assistants independently perform their tasks and lead conversations with any number of users simultaneously. Their job is to talk freely on a particular topic or range of topics. The communication between a virtual assistants and a user proceeds in a very spontaneous way: through casual conversation, which is a typed text dialogue. The user types on the keyboard his/her questions and comments in natural language, and the virtual assistant provides answers, which should be logical and intelligent continuation of the conversation leaded.

Virtual assistants expansion is not only due to the worldwide development of Internet, which has become a universal channel of modern communication. Enormous progress has also been made in computational linguistics, the field of artificial intelligence focusing on natural language processing. Many discoveries have been made in soft computing, especially in Data Mining and Text Mining fields. Development of automatic speech recognition, text-to-speech transformation and speech synthesis were crucial as well. In result of that research, computers perform tasks requiring linguistic knowledge and human speech skills, which improves human-machine communication by processing automatically text and/or speech [Jurafsky, et al., 2008, pp. 8-9].

Virtual assistants in their present form are equipped with an advanced text analysis mechanism, so they can lead dialogues in natural language. They also have a graphical representation, called visualization, therefore they gain a new dimension - body language which results in nonverbal communication, and more real, almost physical, relationship with the user. This enables an emotional contact with the user and the ability to behave according to perceived image [Brooks, 1991, p. 584]. The role of visualization is to emphasize the interaction with a virtual assistant similar to a "conversation with a friend" instead of an impression of "using a program." Looking on a virtual assistant, users realize that they are talking to "somebody" and not "using something" [Loyall, et al., 1997, p. 111]. Thus emerges a new channel of communication between a company and its customers.

## **2. Customer relations**

Attracting customers to a company and maintaining long-term relationships with them is a very important policy goal for every company, yet difficult to achieve. One of the methods used by companies to retain customers on their websites and to encourage them to return is a loyalty program, which should result in a closer connection between the firm and its customers, and their strong emotional attachment [Gregor, et al., 2002, p. 286]. A large variety of loyalty programs are no longer a novelty for customers, and therefore do not cause their emotional reactions. As a kind of rescue tool may serve virtual assistant, which attracts customers, generates their excitement and encourages them to repeat their visits on the website. Virtual assistant enriches the traditional, direct user-website interaction by exhibiting an anthropomorphic visual interface [Shneidermann, et al., 1997, p. 44]. Therefore, original concept of a static website gained human features and became more natural to interact with [Maes, 1994, p. 36]. When a user speaks with a virtual assistant, he/she assigns the virtual assistant a distinct, almost "human" identity with its own personality. Such a perception of uniqueness of the virtual assistant gives rise to the creation of a relationship that is similar to typical interpersonal relationships [De Angeli, 2005, p. 1].

During conversations with virtual assistants, users act in accordance with rules of social courtesy and perceive them as social entities. Studies conducted on various types of visualization of virtual assistants show that a humanoid

form causes an increase in agreement between the user and virtual assistant [Zimmerman, et al., 2005, p. 235]. Moreover, studies performed by McBreen and Jack suggest that virtual assistants represented by three-dimensional human figures are better perceived by users than their two-dimensional counterparts [McBreen, et al., 2000, p. 5].

The "body" of a virtual assistant is more than just an esthetically looking photo, animation or video sequence. Visualization of virtual assistant provides an additional channel of communication resulting in new e-business relationships with customers, enriched by nonverbal visual signals. In the process of communicating nonverbal signals play an equally important role as verbal communication does. Verbal and nonverbal components are strongly interrelated, and perform a common communicational goal. Nonverbal layer of a conversation is essential for people in order to fully interpret the interlocutors' intentions [Jarmolowicz, 2003, pp. 1-2]. Therefore gestures and facial expressions of virtual assistant provide real-time multi-layered perception that leads to establishing a relationship between the user and the virtual assistant [Cassell, 2001, pp. 78-79].

The integration of a virtual assistant's visualization with conversational ability may be represented, similarly as conversations between people, by various communicational behaviors. For greater clarity, examples of conversational functions and their corresponding communicational behavior of the virtual assistant are summarized in the following table.

**Table 1. Examples of conversational functions and respective communicational behavior of a virtual assistant**

<b>Conversational functions</b>	<b>Communicational behavior of a virtual assistant</b>
<b>Starting and ending a conversation</b>	
- responsiveness	- brief look
- encouraging a new conversation	- longer look, smile
- welcome	- look, head nod, raising eyebrows, waving hand, smile
- pause in the conversation	- looking around, browsing a virtual newspaper or simulating busyness
- goodbye	- look, head nod, waving hand
<b>Order of expression</b>	
- user's turn	- look, raising eyebrows
- waiting for turn	- hand gestures
- virtual assistant's turn	- look, start talking

Source: own elaboration based on Bickmore T., Cassell J. (2004), Social Dialogue with Embodied Conversational Agents, in: van Kuppevelt J., Dybkjaer L., Bernsen N. (ed.), Natural, Intelligent and Effective Interaction with Multimodal Dialogue Systems, Kluwer Academic, New York, p. 3

Another important aspect concerning e-customer relations is quality of the website and the ability to personalize the website content and geo-locate users. Cross-sectional data combining user groups focused around similar interests or preferences allows identification of the target user group important from the viewpoint of the decision of expanding the online service [Dyba, 2004]. Collection of cross-sectional data and other information about users delivers a more in-depth knowledge of customers, a better fit of company offer to customers' expectations and a valuable insight into the motivation of the website users. Such information (about themselves) users give very reluctantly, mostly because it requires from them a devotion of their precious time to set up an account and fill out an online form with some basic questions. In the case of a virtual assistant, the whole process of data collection takes place seamlessly during an "ordinary" conversation. The user is more willing to disclose information about himself/herself to "someone" like virtual assistant, who skillfully collects data while leading the conversation. For this purpose virtual assistant fits perfectly.

As we have shown, virtual assistant is a tool that contributes to the field of electronic customer relationship establishing and management. It provides the human dimension of the website, which has been perceived so far as a rather static creation. As it turns out, most users culturally welcome and say goodbye to virtual assistants, and yet paradoxically - which user nowadays says goodbye to the Google search engine? Moreover, time needed to contact a virtual assistant is disproportionately shorter in comparison to often long queues in offices where customers wait in order to be served. Anyone entering the site is immediately greeted by a virtual assistant and invited to the conversation without queuing at the office or ringing the busy helpline, whereas answers provided by a virtual assistant to a visitor are immediate, thus time-saving [Dawlat, 2007].

Depending on needs and scope of the company, virtual assistant can be implemented not only on the corporate website of his "employer", but it may also promote and encourage contact through other channels of communication. Virtual assistant may communicate with users through instant messaging (as an alternative to a web browser), via mobile phone network or in mobile devices (serving as a personal digital assistant). The dialogue with virtual assistant is also possible in off-line information terminals and electronic points of sale.

### **3. Business processes**

A business process constitutes a sequence of related activities that accomplish a specific organizational goal, such as delivering a specific service or producing a specific commodity product for particular recipient. According to Davenport processes produce value for company's customers and they imply adopting the customer's point of view [Davenport, 1993, p. 127].

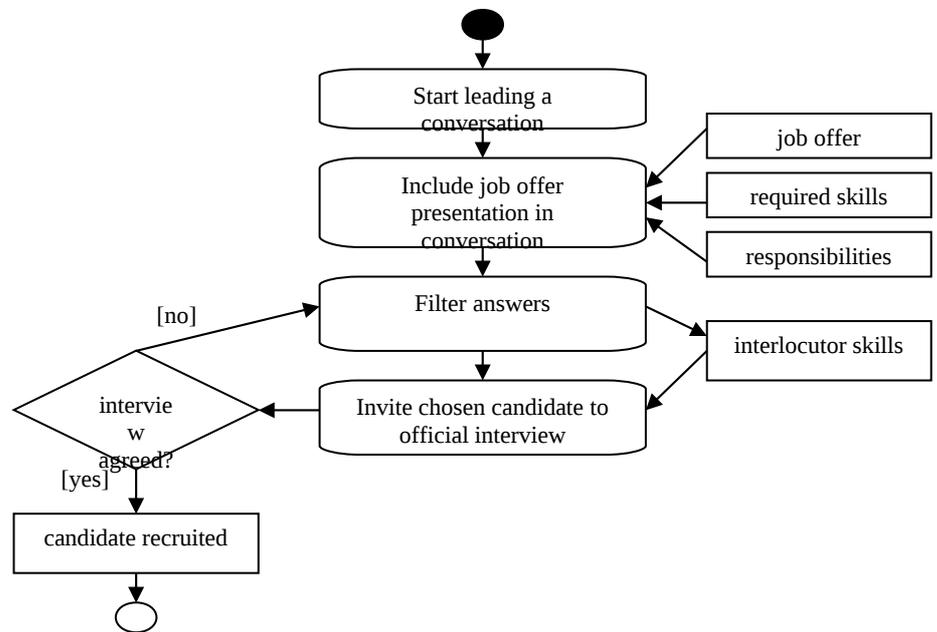
Among business processes one can distinguish supporting processes, including for example call center, recruitment and technical support, which support core operational processes that create the primary value stream. Virtual assistant may be included in such supporting business processes. As we know,

virtual assistant integrates well in a wide-ranging activities of electronic customer service. Virtual assistant not only accompanies a visitor during his/her visit to the website, but also its front-end is connected to a company's database and CRM system. Depending on a defined set of tasks assigned to the virtual assistant's post, one can appropriately model its workplace [Pawlak, et al., 2005, pp. 156-157]:

- searching information - a virtual guide on the website,
- customer service (call center, help desk) - virtual consultant,
- e-shop – virtual salesman,
- public relations - virtual spokesman and representative,
- e-marketing – virtual interviewer,
- human resources - virtual recruiter.

Depending on the intended role for the virtual assistant, its functions can be tailored to the needs of the business process in question. A basic example of such business process concerning recruiting new employees is presented on the following figure.

**Figure 1. Virtual assistant's role in business process of recruiting new employees**



Source: Own elaboration.

Virtual assistants may be included as well in modeling knowledge-management processes, as companies have to face these processes in the context of the information technology [Al-Zayyat, et al., 2009, pp. 1-2]. Virtual assistants are

not only a tool designed to talk with users and share information about the company, its products or services. Additionally, virtual assistants' technology serves to collect data and information about users. Every conversation carried out by a virtual assistant is recorded in a specially designed admin panel. Company can use this panel to make changes in configurations or updates of virtual assistant's knowledge-base. Furthermore, the panel is also a tool of gaining insight into the information given to the virtual assistant by users during conversations. The most important of its functionalities is the system that monitors various parameters of virtual assistant conversations, such as:

- daily number of conversations,
- quantity of conversations in relation to the number of page loads,
- minimum, maximum and average length of conversation on a given day,
- identification of discussion topics,
- identification of the most common user queries,
- identification of comments concerning the website or virtual assistant expressed by users,
- quantity of positive/negative feedback about the website or virtual assistant expressed by users,
- quantity of conversations completed with positive response of the user,
- quantity of conversations completed with negative reaction of the user,
- data given by users: names, e-mail address, locations, dates of birth, genders, etc.

Every information found in recorded conversations can be analyzed by a company from various angles, both in descriptive form, and in the visualized form of charts, graphs and diagrams [Kuligowska, et al., 2007, pp. 65-71]. Admin panel can be therefore considered as a unique and exceptional tool giving the company a valuable information about their users, which might be useful in establishing knowledge-management processes of the company.

## **Conclusion**

Virtual assistants are not supposed to replace human consultants, but certainly are an important option to relieve customer service. This allows the company to increase the capacity of contact with customers and create new customer relationships. Through the diversification of interaction methods virtual assistants increase customer satisfaction by offering innovative services that are a hallmark of the company. This is particularly important in the context of constantly increasing both the quantity and complexity of customer inquiries along with their interactions with companies.

Virtual assistants allow a comprehensive customer service, support direct on-line services and contribute to the rapid exchange of information between the firm and its clients. Virtual assistants address the key issues of customers, offer services desired by customers, and give websites a live touch. As a result, customers more often visit such a website, visit it longer while absorbing more information, and carry out more on-line transactions.

In the jungle of online business information virtual assistants are becoming personal guides which enable to quickly obtain the desired information. They can be characterized by their unlimited potential of adjustment to the field of use. Except websites of businesses related to electronic services such as e-commerce, e-consulting, e-learning, e-marketing or electronic banking, virtual assistants are also applicable in the public sector, offering their services on the websites of ministries, government institutions and tax offices, as well as on websites of scientific and educational institutions.

### **References**

1. Al-Zayyat N. A., Al-Khaldi F., Tadros I., Al-Edwan G. (2009), The Effect of Knowledge Management Processes on project Management, *IBIMA Business Review*, Vol. 3.
2. Bickmore T., Cassell J. (2004), Social Dialogue with Embodied Conversational Agents, in: van Kuppevelt J., Dybkjaer L., Bernsen N. (ed.), *Natural, Intelligent and Effective Interaction with Multimodal Dialogue Systems*, Kluwer Academic, New York.
3. Brooks R. A. (1991), *Intelligence Without Reason*, Proceedings of the 12th International Joint Conference on Artificial Intelligence (IJCAI-91), Sydney.
4. Cassell J. (2001), Embodied Conversational Agents: Representation and Intelligence in User Interface, *AI Magazine*, No. 22(3), AAAI Press.
5. Davenport T. (1993), *Process Innovation: Reengineering work through information technology*, Harvard Business School Press, Boston.
6. Dawlat S. (2007), e-CRM et agents conversationnels, *Marketing-etudiant.fr*, 09.06.2007, <http://www.marketing-etudiant.fr/actualites/e-crm-agents-conversationnels.php> accessed 06.2010
7. Dyba A. (2004), Pomiar skuteczności działań w Internecie, *IDMnet.pl*, [http://www.idmnet.pl/pub/files/artykuly/0304\\_pomiar\\_skuteczności\\_1z2.pdf](http://www.idmnet.pl/pub/files/artykuly/0304_pomiar_skuteczności_1z2.pdf) accessed 06.2011
8. De Angeli A. (2005), To the rescue of a lost identity: Social perception in human-chatterbot interaction, Proceedings of the joint symposium on Virtual Agents Symposium AISB'05.
9. Gregor B., Stawiszyński M. (2002), *e-Commerce*, Oficyna Wydawnicza Branta, Bydgoszcz-Łódź.
10. Jarmołowicz E. (2003), Komunikacja niewerbalna: rola gestów ilustrujących w komunikacji, *Investigationes Linguisticae*, t. X, Poznań.
11. Jurafsky D., Martin J. (2008), *Speech and Language Processing: An Introduction to Natural Language Processing, Computational Linguistics, and Speech Recognition* (2 ed.), Prentice Hall, New Jersey.
12. Kuligowska K., Lasek M. (2007), Wirtualny asystent - sztuczna inteligencja w statystyce?, *Wiadomości Statystyczne, Czasopismo Głównego Urzędu Statystycznego i Polskiego Towarzystwa Statystycznego*, No. 12(559), Warszawa.

13. Loyall B., Bates J. (1997), Personality-Rich Believable Agents That Use Language, Proceedings of the First International Conference on Autonomous Agents, ACM, California.
14. Maes P. (1994), Agents that Reduce Work and Information Overload, Communications of the ACM, No. 37(7), ACM Press, New York.
15. McBreen H., Jack M. (2000), Empirical Evaluation of Animated Agents In a Multi-Modal E-Retail Application, Proceedings of AAAI Symposium on Socially Intelligent Agents.
16. Pawlak A., Wolski M. (2005), Wykorzystanie technologii internetowych chatterbotów w nowoczesnych działaniach marketingowych, IV Konferencja Entuzjastów Informatyki, PWSZ, Chełm.
17. Shneiderman B., Maes P. (1997), Direct manipulation vs. interface agents, Interactions, No. 4(6), ACM, New York.
18. Zimmerman J., Ayoob E., Forlizzi J., McQuaid M. (2005), Putting a Face on Embodied Interface Agents, Proceedings of DPPI05, Kluwer Press, Eindhoven.

### Summary

In this article we present the subject of virtual assistants, which constitute computer applications based on artificial intelligence technologies (such as Natural Language Processing, Computational Linguistics, Speech Synthesis etc.) that are implemented on companies' commercial websites. We present virtual assistants features, and we discuss their important aspects. We point out contribution of virtual assistants in establishing and maintaining customer relations, and we analyze a possibility of modeling business processes using virtual assistants. Finally, we draw conclusions and some open lines about further research on virtual assistants' functioning on electronic markets. Nevertheless we are aware, that this field still requires further research and in-depth studies on virtual assistants and their functioning on electronic markets.