

The concept of intelligent agent in business interactions: is virtual assistant an actor or a boundary object?

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Abstract

Purpose – Interactions are fundamental for successful relationships and stable cooperation in a business-to-business market. The main assumption in research on interactions, so obvious that usually not stated by researchers, is that they are set between humans. The development of artificial intelligence forces the re-examination of this assumption. This paper aims to conceptualize business virtual assistants (BVAs), a type of intelligent agent, as either a boundary object or an actor within business interactions.

Design/methodology/approach – Reference is made to the literature on business interactions, boundary objects and identity attribution to problematize the process of interpretation through which BVA obtains an identity. The ARA model and the model of interaction process is used to create a theoretical framework.

Findings – This paper contributes to the literature on business interactions, and to the core of the IMP discussion, in three aspects. The first provides a framework to understand the phenomenon of an artificial entity as an interlocutor in business interactions. While doing that a new type of entity, BVA, is introduced. The second contribution is the exploration and augmentation of the concept of a business actor. The third calls attention to BVA as a boundary object. These issues are seen as essential to move forward the discussion about the meaning of business interaction in the near future.

Originality/value – This paper conceptualizes the presence of a new entity – BVA – in the business landscape.

Keywords Boundary objects, Business interactions, Business actors, Business virtual assistants, Human-to-machine interactions, Intelligent agents, Artificial intelligence

Paper type Conceptual paper

Introduction

Recent technological advances in artificial intelligence (AI) research make it possible to replace human employees in business interactions with artificial, intelligent agents. What was just a fantasy of science fiction writers 50 years ago is now becoming a reality. In some circumstances, human actors can interact with intelligent agents as naturally as they interact with each other. This phenomenon can have consequences in all areas of our lives – including business interactions.

Digitalization in business-to-business (B2B) markets has been the focus of numerous studies in different streams of research regarding the impact of digital technology on business relationships: (Obal and Lancioni, 2013; Murphy and Sashi, 2018); Internet of Things, especially for its impact on service platforms in the industrial context (Löfberg and Åkesson, 2018); creating value capabilities (Momeni and Martinsuo, 2018) and use of technology in procurement (Osmonbekov and Johnston, 2018). AI has also gained attention in enterprise management studies (El Kadiri *et al.*, 2015) and for its links with suppliers (Value chains: Osmonbekov and Gruen, 2013) and users (sales automation: Ojala *et al.*, 2016). However, there still

seems to be a gap in investigating how the AI technology will affect the basic phenomena in business landscape – business interactions. This article aims to fill this gap and at the same time will hopefully start a discussion about the nature of AI from the perspective of the IMP concept of business interaction.

Business interaction is a means of handling business. As a basic process in the business landscape, interaction became the subject of focus for several important IMP models: interaction model (Håkansson, 1982) and actor-resource-activity model

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(Håkansson and Johanson, 1992; Håkansson and Snehota, 1995) as well as its extension presented in the model of interaction process (Håkansson *et al.*, 2009). According to Möller and Halinen (2017), these key models emphasize the importance of interaction and create the foundation of the “inherently descriptive and generic IMP network theory”. Within business interaction, actors seek to influence others’ thoughts and activities through communication or exchange acts. In this paper, the goal is to augment this concept, considering an intelligent agent as a boundary object or an actor in business interactions.

We focus on those applications of AI that combine the analytical and communications functions of AI in the form of a business virtual assistant (BVA). Although intelligent agents find more and more applications in the B2B setting, such as in advanced CRM systems, lead generation and predictive analysis, it is the BVA that is directly involved in the business interactions, and it becomes an interlocutor. Therefore, BVAs are used as an example of intelligent agents that can interact with actors from different organizations. The use of BVAs for business interaction leads to many possibilities and to important research questions as well: How can BVAs be conceptualized in business interactions in terms of the perceptions of human interlocutors? What implications do certain perceptions have on the interaction itself and the concurrent business relationships? Answering these questions requires establishing an ontological concept of AI in business interactions. This corresponds with calls to connect technological advancements with human-oriented research (Merkert *et al.*, 2015) as well as with one of the main B2B research streams identified by Mora Cortez and Johnston (2017), which refers to automatization of business processes based on human-to-machine interactions.

This paper starts with the consideration of intelligent agents from the perspective of business interactions. We examine a typical business situation when two business actors schedule their interactions with the assistance of BVAs. Then, in the process of BVA conceptualization, we problematize it either as an object or as an actor through the prism of acceptance, influence, position of control and interpretation-making. To create a theoretical framework, we use the ARA model along with the IMP model of interaction process. On this basis, the theoretical and managerial conclusions are presented.

Business virtual assistant as interactive intelligent agent

Towards interactive intelligent agents

Over the past 60 years, scientists have tried to develop an AI system that would be able to completely think the way humans do (Pan, 2016). The differences in understanding intelligence itself and the dynamism within which technology is developed have held them back in reaching an agreement on a single definition of AI. Based on computer science literature, research on AI concerns any device that perceives its environment and takes actions that maximize its chance to successfully achieve its goals (Russell and Norvig, 2009). Contemporary AI is a discrete system that performs selected functions in one of three areas: interactions based on natural language, image recognition and biometrics and learning systems. Developing advanced, multifunctional and flexible intelligent agents needs a great deal more research interest, which now has mainly been accorded to agents that perform only one narrow task (Adams

et al., 2012). Such agents can be applied to many areas within management, marketing and sales. AI systems can act autonomously and work towards new customer acquisition, replacing help desk employees and solving customers’ problems directly (Bughin *et al.*, 2017). However, it can be troublesome in a B2B environment, especially for companies that have large customers and a complicated sales process (Syam and Sharma, 2018) because interactivity with humans is not one of AI’s strengths. The limited common-sense reasoning is currently the Achilles heel of AI technology, the ability to make presumptions about the type and essence of ordinary situations encountered every day. These assumptions include judgments about the physical properties, purpose, intentions and behaviour of people and objects, as well as the possible outcomes of their actions and interactions (Davis and Marcus, 2015).

Intelligent agents are the AI systems that perceive and operate in a given environment through actuators (Russell *et al.*, 2015). Such agents are usually characterized on the basis of divergent attributes (Bhargava, 2017) that are linked with:

- interaction pattern: responsiveness to the environment, capability to interact with each other to solve problems, capability to move from one computer system to another; and
- intentionality: reasoning model, capability to control its state and actions, capability to show desired behaviour and capability to change behaviour and decision based on obtained knowledge and experience.

Possible combinations of these attributes lead to such a variety of intelligent agent types that attempts to generally conceptualize them were discontinued in the twentieth century (Franklin and Graesser, 1996). In this paper, we take the constructivist approach and focus not on attributes of intelligent agents but on the identity they could take on during business interactions. Social constructivism posits a subjective reality that is constructed by the individuals embedded in a social context (Guba and Lincoln, 1994). Following that notion, identity is an outcome of business interaction processes and its attribution is affected by the interacting parties, their features and the context they are within (La Rocca and Snehota, 2008). This perspective focuses more on the identity givers, in this case humans, than the AI itself.

Work on the AI’s common-sense reasoning has made some progress lately with an introduction of chatbots that are able to conduct simple conversation. Thus, AI researchers try to integrate understanding and communicating in natural language with other AI functions that will have a positive effect on intelligent agents’ interactivity. Modern, multifunctional agents are being introduced to the process of acquiring, interacting and managing potential and present customers. This human-to-agent interaction creates an extraordinary human digital experience. This experience has become a subject of a fierce discussion in human-to-machine interaction literature (Morgan and Piccinini, 2018) and practitioner-oriented media (Press, 2019) but seems to have been neglected in B2B literature.

Business virtual assistant

One application of intelligent agents, worth noting from the B2B point of view, is BVAs. BVAs are software agents that

perform specific tasks or services for their users. In the business world, BVAs integrate the interactivity of chatbots with the ability to schedule a meeting. Scheduling is a quite troublesome task that scientists and businesses have been trying to expedite for years (Glezer, 2002; Shakshuki *et al.*, 2008), yet the propositions made require some cooperation between actors, for example, by deciding to use the same software. BVAs introduce a different approach to scheduling meetings. Using an AI engine for natural language processing, BVAs are able to interact with humans not through some artificial interface, but in a normal business setting. The novelty of the BVA solution is that it does not require any software coordination between parties so it has become possible to use it to set up meetings with actors outside an organization, like customers, suppliers or potential employees. It works in a standard email interface, understanding text and responding just like a human assistant would. BVA always informs the user that it is an AI agent, but for the task and the contact pattern of scheduling a meeting, it is remarkably comparable with a normal human employee.

From the business point of view, three different actors are involved in business interactions with BVA: providers and two types of users – hosts and guests. The provider is a company that develops the BVA agent and sells it to the host. Hosts use BVAs to schedule meetings with guests and for other activities. Business interactions occur simultaneously at interorganizational and interpersonal levels (Tellefsen, 2002). Thus, the host on the organizational level is the company that implements a BVA, but on the individual level, it is the employees who give the BVA agent access to their calendars so BVA can learn their habits, preferences and perform tasks for them. Guests are all the actors who are not a client of a BVA provider, but who come in contact with BVA during scheduling activities with the hosts. For the conceptualization, the key interaction is between host and guest, as they will be the ones to give BVA its identity.

BVA differs from the popular personal virtual assistants available on consumer markets like Siri, Cortana or Alexa. These assistants also use AI technologies, but as an interface to interact with humans and accomplish tasks people used to do through the smartphone's screen or computer. In comparison, BVAs interact with people that have not hired the agent – both inside and outside of the host's organization. Its goal is to accomplish tasks that are usually done between people. Besides scheduling meetings, BVAs can be used in a variety of different contact patterns depending on the context: in sales, it can take over the initial communication to gather detailed information about a quote; in purchasing, it can collect offers in a tender; in customer service, it can assist clients in resolving simple issues with a service/product; in administration, it can communicate with hotels or airlines and gather invoices to assist in travel planning activities. In this paper, we are focusing on scheduling meetings, as this is something that has already been developed and is easily accessed (especially for actors in English language business markets). Besides, the comparatively simple context of scheduling meetings will help to expose the peculiarities of the use of BVAs in business interactions.

Business virtual assistant as an actor or an object

In the non-interactive approach, identity is regarded as something fully dependent and under the control of its possessor. On the other hand, industrial marketing research has argued that identity creation is an inside-out as well as outside-in process (Huemer, 2013). Identity is awarded by others based on the interplay of actors' features and the features of the actors that interact with them (Håkansson and Snehota, 2006). Therefore, the BVA's technical attributes may not be enough to understand its possible identity in business interactions. We see two potential types of identity that may be ascribe to BVA by the human actors – BVA as an actor or BVA as an object.

Ford *et al.* (2010) conceptualize interaction as:

[...] the substantive process that occurs between business actors through which all of the aspects of business: material, financial and human and all of the elements of business: actors, activities, and resources take their form, are changed and are transformed.

Business interactions are established with some initial framing – interpretations, expectations and goals, that refer to the possibility that the activities may become beneficial for each of the involved actors. When a single activity develops into multiple acts of prolonged communication or exchange, and then it has the potential to influence the actors' cognitive processes (Medlin and Törnroos, 2007). The researchers are pointing to the subtle shift in meanings, mental framings, interpretations and expectations, setting divisions of tasks, roles and goals for every actor (Aaboen *et al.*, 2013; Medlin and Törnroos, 2015). This way, every episode in an interaction process changes parties and moves their relationship to the next episode (Medlin and Saren, 2012), as actors, resources and activities are constantly interpreted and re-interpreted by the interacting parties. Thus, the identity of participants of business interaction is never fixed and given by itself (Håkansson *et al.*, 2009; La Rocca, 2013). Business actors acquire an identity from an interaction that is variable and “continuously changing, because even if the actor does not undertake any transformation, it is the interaction itself that changes” (La Rocca and Snehota, 2008). The actions and resources of an actor or an object are a concern of other actors (La Rocca, 2013) so the interacting party is interpreted based on its outcomes. Interpretations are related to a complex mental process in which all elements – actors, resources and activities – are considered together, as they only have meaning in relation to each other (Munksgaard *et al.*, 2017). Generally, the counterpart in the interaction bestows the other party's identity.

In sociology and social psychology, an actor is anyone who engages in intentional action with other actors. What constitutes a business actor? Håkansson *et al.* (2009) confront the traditional approach and the interactive approach with the concept of business actor. The traditional perspective has two assumptions: a business actor has a clear form and boundaries that are set by its properties, attributes and capabilities; an actor is autonomous in what he or she does and how he or she chooses what to do. The interactive perspective assumes that a business actor's identity is acquired through interaction, and its actions are of interest of others. The main difference between these two views is the actor's autonomy. The traditional view assumes that autonomy is given to an actor regardless of how it is perceived by others. The interactive view assumes that

“autonomy cannot be separated from the identity of those with which it interacts” (Håkansson *et al.*, 2009) and accepts that a business actor has individual intentions and is free to choose how to behave, or – to be precise – is perceived by others as agentive. La Rocca (2013) acknowledges that “since routine or ritual behaviours can have effects on others [...] an entity can be conceived as an actor without being capable of rational and purposeful behaviour”.

Because of its technical features, BVA can be assessed as autonomous (Russell and Norvig, 2009), therefore it should be assumed that it is a business actor. In addition, from the interaction’s perspective, BVA is a business actor as it has the ability to link its resources and activities to other resources and activities and the ability to acquire an identity. It is the contact pattern and intentionality – the ability to choose how to act and how to link its own resources with others’ what guides how human actors will perceive it. Thus, we assume that BVA could be interpreted as an actor when it occurs in host to guest interactions because both users can perceive it as being able to plan or intend how to act and react to others’ actions (even if it is somewhat just a standardized reaction), link its resources to others and affect other actors.

What if an entity is not perceived as an actor in an interaction but is still a part of it? BVA is basically a sophisticated software that fosters better communication across system boundaries, which is usually perceived as a resource (Pawlowski and Robey, 2004). Drawing from IMP, we see that something becomes a resource only in the hands of others, as tangible or intangible, material or symbolic elements can be considered as resources when use can be made of them. Moreover, from the interactive perspective, “resources are a result of activities as much as a condition that makes certain activities possible” (Håkansson and Snehota, 1995, p. 134). The human actors use BVA for the activity of scheduling meetings. This leads to the conclusion that BVA can be perceived by human actors not only as an actor, but also as a resource. Considering the nature of BVAs – interacting with different people across different organizations – and tasks such as scheduling, which is usually done by cooperation between people and positioned on the periphery of each actor’s boundaries. This setting could be explained by the concept of boundary objects developed by Star and Griesemer (1989). They describe objects as something people act towards that can be perceived as being on the periphery of an actor’s boundaries and used in collaboration with others. The perception of boundary objects by human actors is central to business interactions (Fremont *et al.*, 2019). By being interpreted by actors, they influence, stimulate or facilitate communication and coordination by eradicating possible points of confusion, but they also can be valuable assets in linking resources and activities (Harrison *et al.*, 2018; Corsaro, 2018) or even the actors involved (Harrison *et al.*, 2011). According to its technological functions, BVA can be interpreted as a boundary object, as it supports transferring, translating and transforming functions of business interaction (Carlile, 2004). It is shared between interacting actors to stimulate or facilitate direct or indirect interaction patterns and roles. It helps manage the activities of different actors in time as it coordinates their meetings and other obligations. BVA resonates with the concept of boundary object by providing data to the human actors, facilitating communication, coordinating their agendas and

simulating future scenarios (Alenius *et al.*, 2015; Harrison *et al.*, 2018). According to these features, BVA is similar to advanced CRM with some social functions presented as a boundary object by Corsaro (2018), mixing the boundaries between actors, where structural boundaries are becoming less important in favour of contextual boundaries. Consequently, to discuss the argument made in this paragraph, we will use the concept of boundary objects when referring to BVA as an object (but calling it ‘an object’ in other parts of this paper).

Conceptual framework of business virtual assistant in business interaction

Conceptualization of business virtual assistant

Business personal contacts are at the heart of interaction between organizations (Cunningham and Turnbull, 1982) and the quality of contact with a customer can mitigate the risk of choosing a supplier (Cunningham and Roberts, 1974). Drawing from Cunningham and Turnbull’s set of personal contact roles, we see BVA influencing the negotiation and adaptation role as well as social role, as it coordinates the activities of both parties and takes over certain parts of interaction. Business practitioners have voiced their discontent with BVA because it eliminates possible points of contact which allow them to socially connect with each other: “When I emailed the prospect, a bot answered. Why miss out on an opportunity to connect? [...] These touch points are invaluable in building lasting business and human relationships” (Fishman, 2017). If the style and intensity of personal contact does not meet the expectations of the other actors, it could be difficult to create a relationship and co-operate (Cunningham and Turnbull, 1982). Also, drawing from Cunningham and Roberts (1974), we see that there are different contact patterns depending on the context. To deliver high quality customer service, one has to acknowledge all the applicable factors and guide the interaction appropriately. Thus, the interpretation of BVAs by human actors who use them in business interactions and its implications attracts our attention. We understand that the crucial issue for the BVA’s identity is the perception of its intentionality and contact pattern. This concept shapes our conceptual framework for consideration of the identity of entities based on AI that are taking part in business interactions. BVA as an actor or an object – these are not the only two possibilities. They form extremes, but BVA can be also be perceived as a combination of them.

To conceptualize BVA in business interactions, we refer to two mental representations that denote a class of things in the business landscape. The first dimension is set by the interaction process defined by the ARA model and described by its layers: the actors, resources and activities of BVA[1]. The second dimension is the host’s or guest’s interpretation of a BVA interacting entity as an object or an actor.

The first dimension of BVA is conceptualized as follows:

- Actor: BVA is an AI agent who can manifest some features and can behave like a human; the Web of links in a network can be perceived as closed and defined by the provider of the BVA but also as developed independently by the BVA itself.

- **Resources:** the main resource of BVA is data, this includes access to memos, calendars, maps, preferences, past choices, history of interactions, places to meet; it includes data processing algorithms that foster the capability to collect, store and process huge amounts of data, capability to learn, capability to process signals and communicate with other entities. This creates a capability to interact with unlimited number of actors in the same time.
- **Activities:** tasks or services performed for their users (hosts and guests) for scheduling meetings, communicating with actors using natural language processing or email correspondence, handling multi-user situations, keeping track of different time zones, following up unanswered invitations, taking the user's personal preferences into account.

Each part of the ARA model is interpreted by actors using an actor–object dimension. If BVA is perceived as an object, then the rules and patterns that assign its actions and reaction are predefined by hosts and guests. Therefore, the BVA agency and the ability to set links to other actors join resources, and activities is dependent on the provider who delivered it and host is the one who is in charge of it. Perceiving BVA as an actor leads to a different interpretation in which the ability to define these elements is independent of provider or host. As the actor–object dimension is continuous, not dichotomous, the host's or guest's interpretation of BVA can be blended by features of both – actor or object. Nevertheless, it creates the interpretation of actor, resources and activity layers of interaction process with BVA.

The differences in perceiving BVA as an actor or an object can be concluded in four areas: acceptance, influence, control and interpretation-making (Table I). Every interaction requires the use of one's resources and involves costs (Håkansson *et al.*, 2009). To interact means to *accept* the costs and to see a purpose in the interaction. The interlocutor in an interaction has *influence* over its substance and form (Ford *et al.*, 2010). How one will act within the interaction is connected with the possibility of being *controlled*, or put in a dependent position, as behaviour can be influenced by others who have power over an object or an actor (Dahl, 1957). Finally, interactions are closely connected with the process of *interpreting* the behaviour of other actors (Håkansson *et al.*, 2009).

Actors participating in an interaction accept the use of an object, and they are unlikely to think about whether the object wants to be used. An actor, on the other hand, even as an artificially intelligent agent, if it is perceived as somewhat intelligent or human-like, can judge others' actions and act accordingly, and it chooses whether to interact with others. Therefore, perceived as an actor, BVA may receive more social responses. On the other hand, it can be easier for someone facing an object to disdain social responses and “trying to be nice”. So, a guest can be more assertive, and the motivation to compromise can be lowered, affecting the outcome of an interaction.

A BVA recognized as an object by host or guest will be perceived as something that is controlled by another actor, as it will be someone else's resource for use in their interaction. Therefore, one can be expected that it is fully dependent on the host, and that BVA's actions are primarily taken to satisfy the

Table I BVA as an object or actor of business interaction

Perception area	Object	Actor
Acceptance on the side of host or guest	Acceptance to use BVA as an object is needed from both sides	Acceptance to interact with BVA is needed from both sides
	As an object, BVA neither decides to be used or how it will be used	As an actor, BVA decides to interact and how to interact
Influence on interaction and outcomes	As an object, BVA may influence the form of interaction and interface, but human actors create the outcomes	As an actor, BVA influences both the form of interaction, interface and outcomes
	As an object, BVA influences interaction indirectly	As an actor, BVA influences interaction directly
Position of control	One or more actors possess BVA as an object and it can be used to exert power	As an actor, BVA decides on its own actions, even if its actions are limited because of interdependency with others
Interpretation-making	As an object, BVA can only be interpreted, it cannot be the interpreter	As an actor, BVA is being interpreted and is also the interpreter itself

host's needs and expectations. At the same time, its use may be associated with power, as BVA works on the basis of a host's calendar, and the host introduces BVA into a conversation on the host's initiative. So, the use of BVA may reflect the existing distribution of power in a given relationship.

Seen as an actor, BVA can be perceived as being more autonomous, even though it is still strongly linked to the host. Consequently, reactions to mistakes made by BVA will also be contingent on the object versus actor dilemma. It can be expected that a mistake will be seen either as a mistake made by a human who used BVA or BVA itself. In some scenarios, the blame may not even be associated with the host.

Conceptual insights into business interaction with business virtual assistants

We assume that interpretation of BVA by other actors influence how BVA's activity patterns, resource constellations and actor webs are involved in the interaction process in time and space. This structural positioning of layers of interaction within the dimensions of time and space shapes a framework for a conceptual insight into an interaction with a BVA. The model of interaction shows the interaction as a multidimensional process that involves shaping and being shaped by the activities and resources of interacting actors and the actors themselves. The three layers combine aspects of time and space in the following contexts:

- **Activity patterns:** single activities and their patterns evolve over time in a process of specialization, as actors specialize their activities, adjusting them to other actors'

expectations; in space, activities are connected to each other dimensionally so they become more and more interdependent.

- Resource constellation: development of resources in time has a specific sequence (trajectory, lifecycle) dependent on the potential of that resource to be developed, and its relationship to other resources; from the perspective of space, resources can be combined and their place in relation to other resources can be changed, which creates heterogeneity of resources.
- Actor webs: actors developing and handling their problems over time influence other interconnected actors and entail their development, co-evolving together; jointness of actors in business space defines the potential to create positive and negative outcomes as a result of mutual activities or joint resources (Håkansson *et al.*, 2009).

Thus, interactions with BVA will influence both the guest's and host's interpretation of their activity patterns, resource constellation and actor web in terms of space and time dimensions (Table II). In every case, BVA could be interpreted either as an object or as an actor.

The implications of this interpretation can be seen in the time and space dimensions. If BVA is identified as an actor, then it would be perceived as being able to intentionally adjust to others' activities, influence resources, path dependency and the evolution of actor webs over time, as well as having an impact on the interdependency of actors' activities, increase of resource heterogeneity and jointness of actors. However, if BVA is identified as an object, then it will be perceived as designed by other actors to support their intentions in all of these areas.

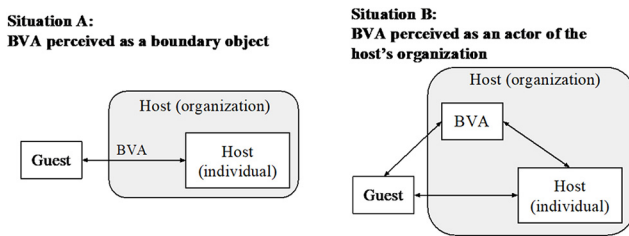
The time dimension shows how the history of previous interactions and one's expectations about future interactions influence present interactions (Håkansson *et al.*, 2009). We

believe that human actors' behaviour towards BVA will change over time. For most people, the interaction with BVA will be their first encounter with this specific form of AI. They will not have a history of previous interactions, so they will use their imagination about what AI is and what AI should be able to do. First interactions with BVA will probably have a tremendous impact on the perception of BVA and on the future interactions, as first times are easier to remember (Nęcka *et al.*, 2007). Taking into consideration the importance of the previous interactions between parties (Cunningham and Roberts, 1974), the conceptualization of BVA should not be applied to draw static pictures. Interaction has an influence on every actor and it forms shared conceptualizations or even shared worldviews. If we assume that an identity is continuously changing, then we should accept that BVA's identity will be constructed and reconstructed as a part of a sensemaking processes (La Rocca and Snehota, 2008). It involves experience and knowledge sharing across different people in an organization and beyond in an effort to impart meaning to something that seems novel (Weick *et al.*, 2005). At the same time, contextual factors may play a crucial role in the perceived identity and narratives created about the BVA (Pentland, 1999). The perception of BVA's identity as an actor or an object may differ not only in time, but even within the same business interaction, depending on the context. BVA itself is going to change over time, probably by adding new functionalities, including an improved ability to acknowledge the wider context of the interaction, as it supports the creation of relationships with human actors. Generations of new, AI-based agents will increase the heterogeneity of the business landscape, and actors will need to confront this state of the world with their expectations and figure out potential actions they can take in a particular situation.

The implications of the object versus actor dilemma for the space dimension are presented in Figure 1. Depending on the user's perspective, it will differentiate where BVA is set in the space dimension and how it is connected to others. If BVA

Table II Interpretation of business interaction with BVAs in time and space dimension

Time	ARA layers of interaction with BVA	Space
Specialization <i>BVA as an object</i> : the adjustment is an outcome of the host and guest negotiation on the use of BVA <i>BVA as an actor</i> : the adjustment is the outcome of BVA negotiation with host and guest	Activity patterns <i>BVA as an object</i> : provider or host (the one who controls BVA) defines activity patterns <i>BVA as an actor</i> : activity patterns are flexible, and BVA controls them	Interdependency <i>BVA as an object</i> : other actors who use it as a boundary object in their interaction fully control its activities <i>BVA as an actor</i> : is able to self-govern, analyze the correlation of its activities and others' reactions
Path dependency <i>BVA as an object</i> : is being handled and developed over time along the path <i>BVA as an actor</i> : is one of the handlers of resources, therefore it can be a force in combining and development of resources along the path	Resource constellations <i>BVA as an object</i> : resource constellations are limited to those defined by provider or host <i>BVA as an actor</i> : negotiates resource constellations	Heterogeneity <i>BVA as object</i> : is being combined with other resources to finish a task in pre-defined way <i>BVA as an actor</i> : is combining its own resources to finish a task
Co-evolution <i>BVA as an object</i> : can only be changed through the efforts of human actors <i>BVA as an actor</i> : changes itself autonomously in the course of following interactions	Actor Webs <i>BVA as an object</i> : constellations of actors are limited to what is defined by provider or host <i>BVA as an actor</i> : negotiates constellations of actors	Jointness <i>BVA as an object</i> : indicates new actors to interact with but it is the human actors who initiate interaction with said actors <i>BVA as an actor</i> : indicates other actors to set new interactions and initiates interaction with them autonomously

Figure 1 Space dimension of business interactions with BVA

is perceived as an object that is controlled by the host, the guest and the host will have a dyadic interaction (Situation A), because BVA will be seen as a boundary object that is used to expedite interaction. On the other hand, if BVA is perceived as an intentional actor (Situation B), then for some activities, we will see a network of three actors (two of which are human: guest and host). A guest could see his interaction with BVA as separate from his interaction with the host. At the same time, we can perceive Figure 1 from the perspective of contact patterns (Cunningham and Turnbull, 1982). Depending on the interpretation, BVA can be seen as an object that is used within an interaction or as something that creates separate interactions. Both scenarios influence the contact patterns between the guest and the host. Also worth observing in situation A and B, BVA is a part of the host's organization, which seems to be the usual setting for most of the current BVAs. However, to show the complexity of the space dimension, all possible situations should be considered. Both users (guest and host) can hire BVAs under the same conditions similarly to using a Skype application.

Conclusions and implications

Digitalization and the development of AI creates new entities in the business landscape. Thus, we believe that a framework that allows understanding of these phenomena is needed. This paper argues that other actors interpret an entity, and that this interpretation defines its identity in business interactions. If BVA is perceived as an object then actors would assign acceptance, influence, control and interpretation-making to the actors that are in charge of this object (the host in this case). However, perceiving BVA as an actor would assign these processes to the BVA itself. On this basis, the main proposition of this paper is to conceptualize BVA on an object versus actor dimension, taking the perspective of the ARA model and also to conceptualize business interactions with BVA in space and time dimensions. This leads to three conclusions that contribute to the literature on business interactions and also to managerial and research implications.

Our first conclusion is that the proposed conceptualization of AI in business interaction could be one of the starting points in a discussion about the presence of intelligent agents in business interactions. The decreasing cost of AI agents will lead to a rapid deployment of these solutions. At the same time, the dynamism of technological development will broaden the areas in which AI will replace humans, penetrating business landscapes more and more. The discussion about whether BVA will be treated as an object or as an actor needs empirical testing, as it is only through the eyes of others that we can

understand how it will work in a business environment. In other words, this dilemma could be addressed by asking if BVA, or even generally AI agents, will be perceived as replacing people, or the activities performed by people in business interactions. Nevertheless, the assumption that AI not only enhances the potential of human actors but also is an actor on its own calls for a conceptualization of BVA in business interactions, which has been never done before using the interactive approach. The object versus actor identity attribution can affect how the technology is being used, how the interactions will proceed and what expectations actors will have about each other and to the technology itself.

The second conclusion is in regard to the underspecified concept of business actor (Munksgaard *et al.*, 2017). This paper intends to augment the concept by introducing BVA, a potential business actor that is based on AI, which is far different from entities that are human beings or organizations. If we perceive BVA as an actor (and further, if we perceive some other AI agents as actors), then it implies that a new type of business actor should be taken into consideration for discussion about business interactions and networks. The business interaction/network approach emphasizes the role of human actors, which distinguishes it from the systems approach (Andersen and Medlin, 2017). However, the human actor will increasingly be exposed to an interactive world where AI agents will play a part. Thus, we should accept that humans can perceive machines, which are able to interact and create social situations intentionally, as actors.

The third conclusion is that BVA might be considered as boundary object. This is in line with the conclusion from Corsaro (2018), that it "would be interesting to understand further how boundary objects are used to cross boundaries between humans and non-humans". BVA has some features that distinguishes it from boundary objects discussed in the literature so far. This calls attention to the situation that the research on boundary objects applied to inter-organizational relationships in digital contexts is still preliminary (Corsaro, 2018). BVA is designed to perform boundary tasks in business interactions so it has the potential to translate, coordinate and align the perspectives of different actors who use it in their interactions. Moreover, BVAs are designed for the global economy, so they can bring about some standardization to activities and resources engaged in interaction.

The conceptualization of BVAs also calls for managerial implications. BVA providers, host and guest can have different interpretations of this AI agent and its role and place in business interactions. Managers could refer to this conceptualization to understand and influence others' interpretation of BVA on individual and organizational levels, as business interactions occur on both levels simultaneously (Tellefsen, 2002). On the provider side, we can expect the development of BVA to either enhance its autonomy or increase the host's and guest's control. Already, the way BVA interacts can be shaped to provide more incentives for the users to see it as an object, or as an actor. This can be done in various ways – by creating an appropriate image (from a standard software to humanoid form), voice (artificial or humanlike), time of reaction (instant or more humanlike). When it comes to placing BVA in the host's organization, we can expect BVA to strive to emulate the host's norms and structures. It is made possible by imposing specific work hours

during which BVA can interact, setting the policy on preferred locations for meetings, airlines and hotels. One thing is also crucial, the organization that hires BVA for their employees will need to conduct proper training to standardize how these assistants are used. In other words, to teach employees the *savoir-vivre* of using such agents within their interactions. For the guests, the problem could be in facing a *fait accompli* when the interaction with BVA starts. The guest can still choose to decline interaction with a BVA, but the host implements BVA in the interaction. Therefore, it is important to consider the implications for the guest–host relationship when one side imposes the use of an artificial entity along with the security risks when dealing with the BVA agent. When a host will introduce BVA to set a meeting, the BVA agent gets access to the content of emails between the guest and the host.

The conceptualization of BVA brings some implications for further research. First of all, it can be used by researchers when conducting studies on AI agents, by pointing out that the AI agent should not always be considered a resource, and also by emphasizing the importance of the interpretation and identity giving. It also demonstrates potential paths for further research mainly connected to the influence of BVA on the structure and substance of business interactions, as well as on interacting with AI agents. How will the way BVA is interpreted as an object or an actor affect the flow of interaction between host and guest? What contextual conditions will affect identity distribution and in what way? How will actors behave when a human actor is supported or replaced by BVA? Can we expect that BVA will influence the host's propensity to interact with others, as it is related to the amount of time and the resources that a host can devote to an interaction? Generally, how will it influence business interactions, relationships and networks and how will it change and challenge them? These questions define interesting objects for further studies where conceptualization of BVA could be applied.

Note

- 1 Please note the distinction between BVA as an actor and the actor layer in the ARA model. We use the model as a framework for analysis of BVA as an actor and as an object. Both actors and objects will have their actor webs and resource constellations and activity patterns.

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