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The Consequences of Artificial Intelligence and Deep Learning in a World of Persuasive Business Models

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INTRODUCTION

Sensors, wireless, and persuasive technologies in our everyday life have increased and developed exponentially [8]. Today and increasingly over the last 5–10 years, business and academia are once again standing at "the foot of the mountain" while new technology is "racing" ahead. While practitioners are playing with these technologies, business, and academia are still struggling to decide what to do and where to climb the mountain next? They are wondering how and where to embed these technologies into their business models and how to use them in their communications with their customers, employees, and network partners. How and where do these new technologies fit into the business model?

In other words, there is a knowledge gap in the business world about these new technologies and a strong need to understand the impact these technologies are having now and the potential impact they will have on future business models and on business model innovation (BMI). A conceptual framework model can be used to organize the concepts so that businesses and academia can digest the information and take advantage of the new technologies in their future experimental work with BMI. However, first it is essential that our business communities agree upon a common and standard business model language [1], [3], [6], [9], [11]. Table 1 presents the benefits a common agreed-upon language would provide to the discussion of business models and the advance of knowledge about business models and the practice of BMI. The table is adapted from Lindgren, 2016 [7].

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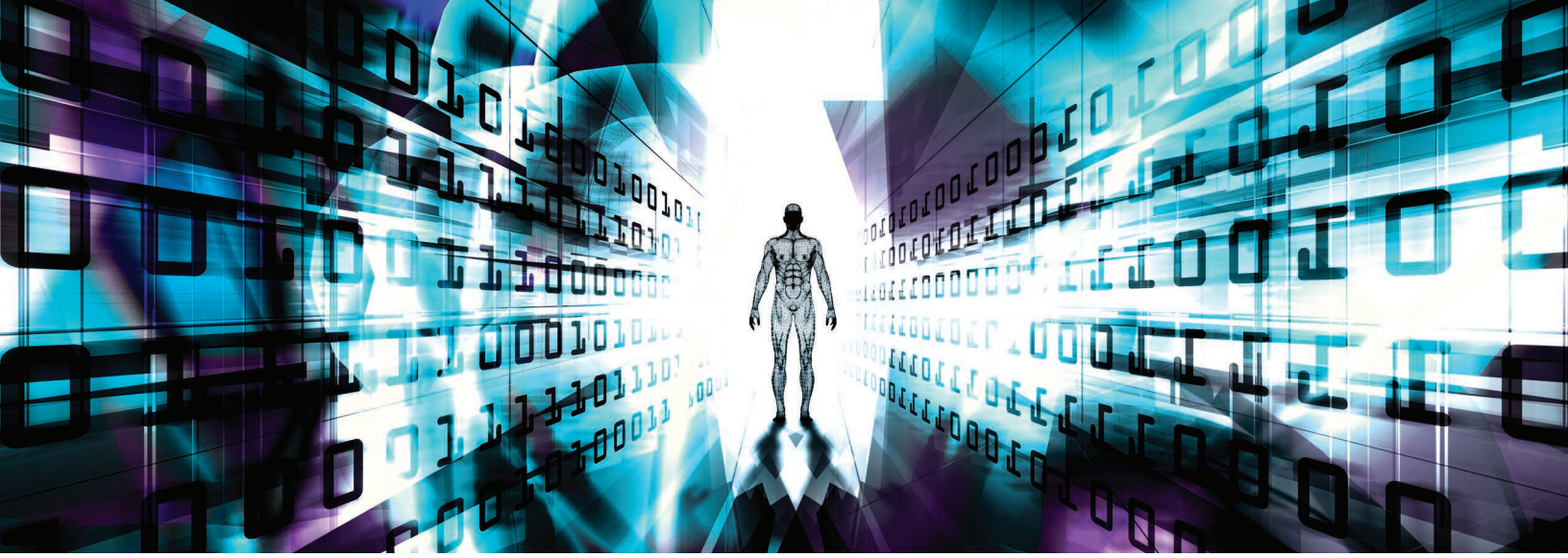
Very few have realized and accepted that business models do not function and will not function in the future purely in the realm of products, services, value chain functions, and organizational systems. Nor do they realize that business models do not and will not function only on behalf of and with humans. Business models are now becoming and will in the future be based on a mix of human and machine interactions. And, it is the machines that are expected to take over more of the innovation in the business model, not just routine and incremental innovation, but also radical and disruptive innovation.

Business organizations do not realize that BMI has to be carried out very differently from the previously accepted norms, forms, and types of BMI, called here "stage-gate types of BMI innovation models". Stage-gate business innovation is a process. Ideas are researched in stages and decisions to go forward or not are made at gates along the way to full implementation. Future BMI will be much more dynamic, agile, and particularly complex [12]. Innovation will likely be quite disruptive to previous business models, made in big leaps, and driven by groups of users. Further, business innovation in the future will not be based primarily on a single or closed business model [13], [14], but more on multibusiness models and on open business models because innovations to single business models will be less effective or efficient and will not provide businesses with enough competitive advantage.

The proposed conceptual model in this article is a first attempt at creating a conceptualized overview of the knowledge, insight, and possibilities that lie within the digitalization of the business model concept. Many fear this evolution, because they cannot or do not "see" and "sense" the real potential of these complex BMIs that will be embedded with and supported by new and persuasive technologies.

THEORETICAL BACKGROUND AND CONCEPTUAL MODEL

BMI—both closed and open BMI [5], [14]—has been and still is a hot and popular topic for businesses and academia to discuss. One indication of the increasing interest in this concept is the dramatic increase in the number of publications referring to the concept since the late 1990s and early 2000s [7]. The total number of scholarly publications containing the keywords "BM" amounted



to 383 in 1995, it skyrocketed to 3,850 in 2000, to 11,500 in 2005, and to 22,000 published items in 2011 [7]

However this previous discussion of business models has not been related to business models embedded with persuasive and sensing technologies. Persuasive technology has been defined as: "Technologies designed to influence human beliefs and behaviors". The definition inspired by B. J. Fogg [2] talks about machines or business model technologies designed to influence human beliefs and behaviors that can be transferred to the business model and BMI "arena" as: business models designed to influence the "beliefs" and "behaviors" of humans, things, and business models. In other words, humans and machines interact with each other, exerting influence and persuasion.

More research on persuasive technology related to humans, things, and business model behavior change can create much more insight into how persuasive business models (business mod-

Table 1.

Benefits of an Agreed-Upon and Common Language for Business Models and Business Model Innovation (BMI) [7]	
Benefit	**Description of Benefit**
Interoperability	assist in the ability of devices and business models to work and innovate together
Government Oversight	produce governmental oversight in the form of regulations, legislation policy and standards governing the business model, intellectual property rights, and patents for protecting user and business interests
Interdisciplinary Innovation	increase interdisciplinary BMI across vertical and horizontal business model ecosystems because they will be able to talk to and understand each other
Learning	allow learning and improvement in the areas of business models and BMI because knowledge could be shared in a dependable form
Economies of Scale	provide economies of scale for businesses and suppliers by allowing the confident agreement upon a basic product, an innovation to make upon that product, an investment strategy to mass production the product
Development	encourage business model (device) development and business model (device) innovation based on a firm knowledge what is the norm and what is an advancement relative to that norm or standard
Awareness	expand awareness by communicating technical developments, initiatives, and advances within the BMI technologies
Market Variety	provide more choices, more features, more options for users and consumers which would enhance the portion of the daily BMI that is user or consumer driven
Safety and Reliability	enhance safety and the customers', users', stakeholders', and networks' perception of reliability by clarifying specifications and product descriptions thereby increasing sales and the acceptance of or trust in new technology
Advance Innovation	advance innovation by providing a solid foundation from which research, learning, and new knowledge of business models and BMI practices can launch

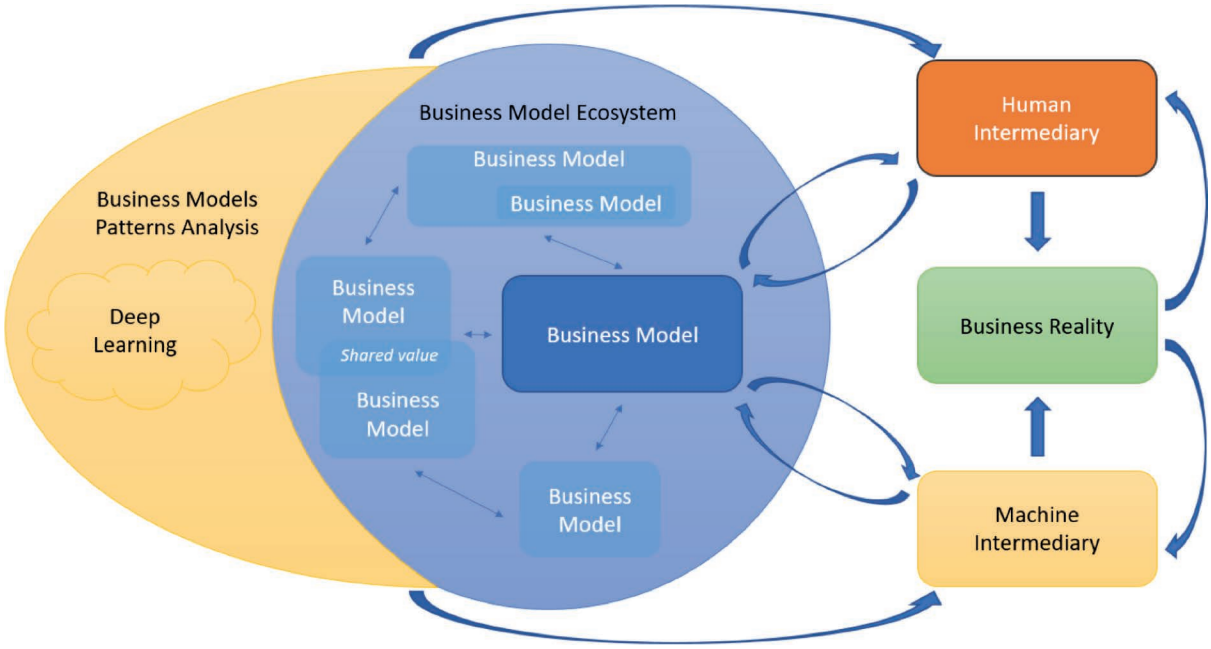


Figure 1.
Conceptual model overview adapted from Valter, Lindgren, and Prasad, 2017 [11].

els embedded with persuasive technologies) can be designed and innovated. From an advanced BMI perspective, this brings in a new agenda of how business should create, capture, deliver, receive, and consume the business model's values [16]. Businesses therefore have to change their BMI approach now, moving away from simple ideation of the business model and simple strategizing with yesterday's innovation frameworks and take "one step up" to match the level of "the technologist" and take advantage of or appreciate the real potential of these new technologies for their business model. Business must realize that persuasive business models are a realty now and while you are reading this article, they are being rolled out with high speed. This means that a business must accept and realize that business models can act and "persuade" anywhere, anytime, with anybody and anything—maybe not in an advanced way yet—but soon they will be able to do this, and fast.

It is therefore highly urgent that the business community change their previous BMI mindset—while persuasive technology still grows to maturity—and quickly develop a deeper understanding of how businesses models really work and can work, how they are constructed, and what they really can do when embedded with advanced sensor and persuasive technologies. The new technology itself provides us with "a helping hand" in this journey of both operating and innovating business models. However, we need to agree first on a standard business model and BMI language—otherwise it will be very difficult to communicate about business models, or to act like a business model, and perform BMI.

The conceptual model proposed in this article (Figure 1) was adapted from Valter, Lindgren, and Prasad, 2017 [11] and examines the business model through the lens of different possible BMI interactions. It consists of four main parts, the Human Intermediary; the Machine Intermediary; Business Models Patterns Analysis, and the Business Model Ecosystem [4]. The intent with this conceptual model is to provide an overview in combination with deeper knowledge and insight into the possibilities that emerge with the digitization of the business model concept. Therefore when the term business model is used, it is a digital representative of the business model that is referred to. Even though it would be possible to use parts of the conceptual model on nondigital representative business models, the conceptual model is based on a digital representation of business models.

THE HUMAN INTERMEDIARY

The first part of the conceptual model is the human intermediary section, where all the interactions between the business reality and the business model that are facilitated by human beings are represented. In Figure 2, the human intermediary business model interaction is marked with red arrows within the red circle. Each of the four archetypes in the human intermediary business model section are described separately and in detail below and in Figure 3.

Archetype 1. Business Reality to Human Archetype: A person observes the business reality. The conceptual model clearly distinguishes between the actual business reality and a business model as a representation of the business reality. It's important to emphasize that the interpretation of the observed business reality easily can vary based on the interpreter's area of expertise and other characteristics of the observer.

Archetype 2. Human to Business Model: A person updates the model with his understanding of the business reality. It's important to emphasize that the business model is not only limited to one person's understanding of the business reality, but could also represent different observers, each with different areas of expertise and understanding of the business reality

Archetype, 3. Business Model to Human: A person interprets the business model and this interpretation of the business model

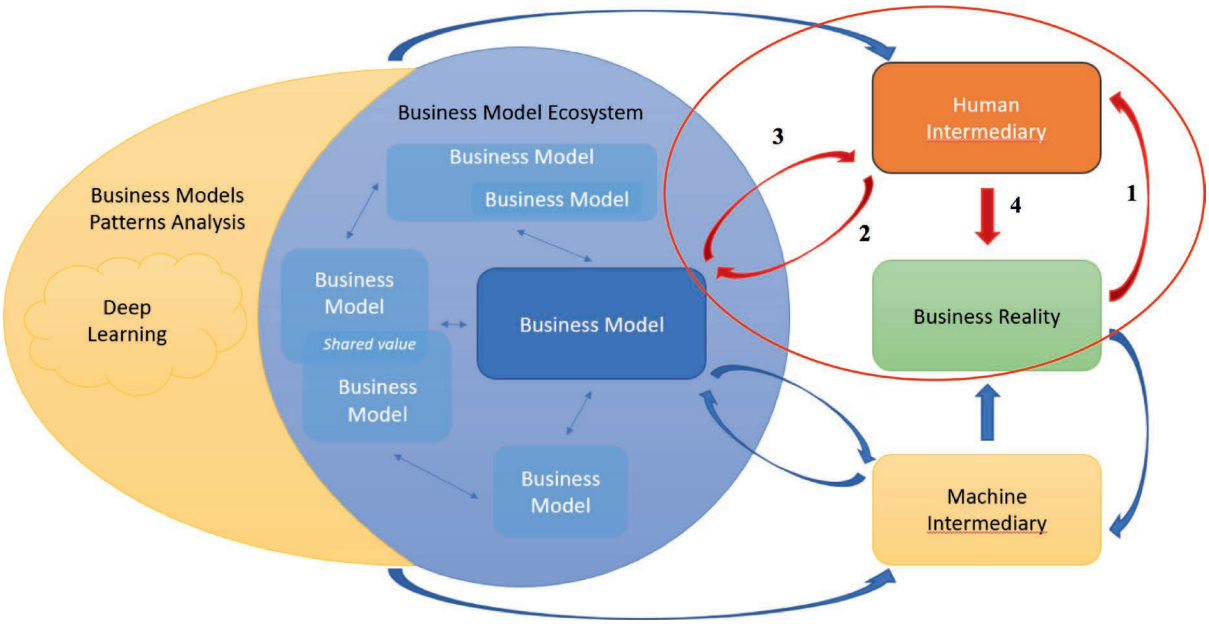


Figure 2.
Human intermediary business model interaction adapted from Valter, Lindgren, and Prasad, 2017 [11].

can give new understanding. Remember as emphasized at Archetype 2, the model can consist of knowledge from serval different areas of expertise which provides opportunity for potential new cross-boundary knowledge generation and understanding.

Archetype 4. Human to Business Reality: A person implements a change into the business reality based on the newly generated knowledge and understanding of the business model. As in Archetype 1, it is also important to emphasize that interpretation of the business model easily can vary based on the interpreter's area of expertise and other characteristics, and therefore affect the final implementation.

Archetype Patterns

Each of the human archetypes have interaction patterns associated with them.

- Archetype Pattern 1, Interaction Pattern. Physical World: Interaction occurs between you and the physical world where you, a person, are interacting with something physical like a keyboard.
- Archetype Pattern 2, Interaction Pattern. Augmented Reality: Interactions in this pattern are called augmented reality, where you a person or persons are interacting with three-dimensional (3D) virtual objects that are blended with reality.
- Archetype Pattern 3, Interaction Pattern. Virtual Reality: Interaction in this pattern are called virtual reality, where you as a person are able to join others within a virtual room for real-time collaboration in 3D virtual representation despite being separated in reality by great distances.

While human intermediary Archetypes 2 and 3 in Figure 3 have patterns in common, the archetype types are concerned with

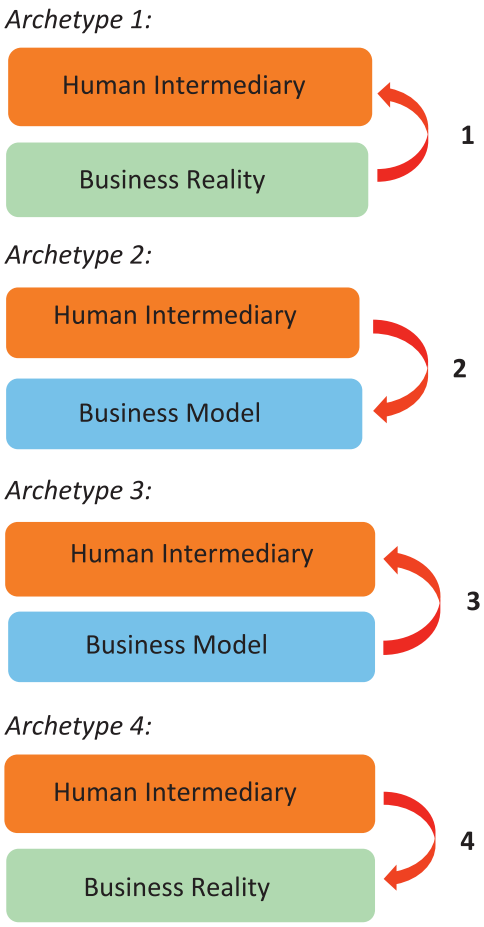


Figure 3.
Human intermediary business model archetypes.

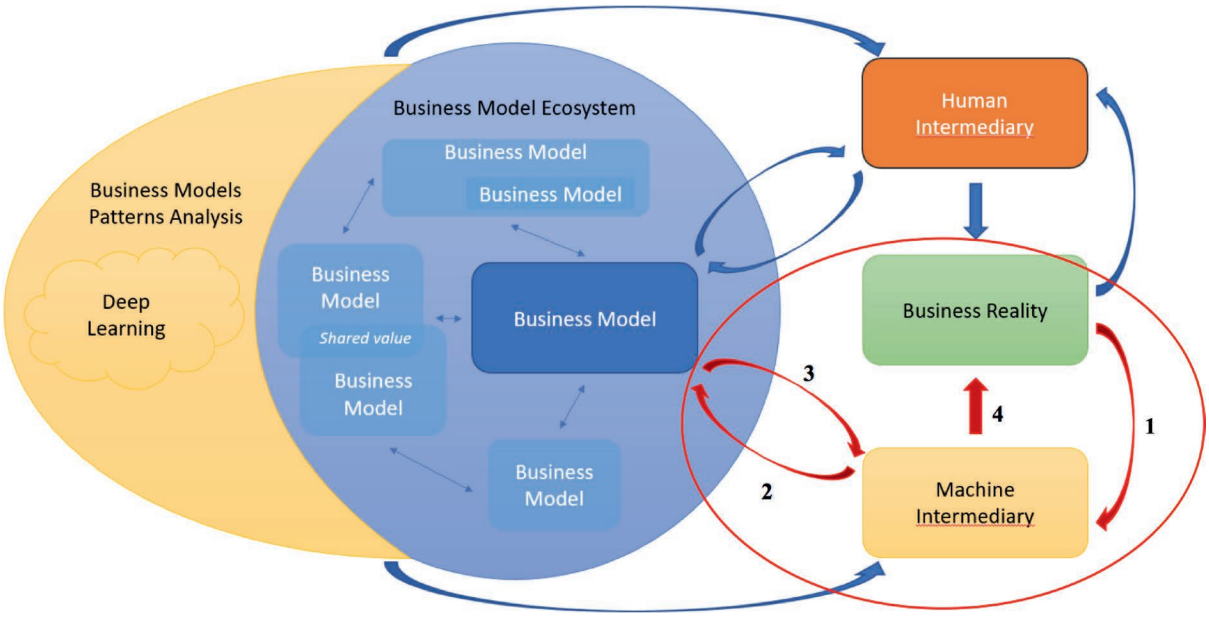


Figure 4.
Machine intermediary business model interaction adapted from Valter, Lindgren, and Prasad, 2017 [11].

interactions between the human, the business reality, and the business model, while the archetype patterns are concerned only on interactions between the human and the business model.

MACHINE INTERMEDIARY

In the second part of the conceptual model, the machine intermediary section, all the interactions between the business reality and the business model facilitated by machine are represented. In Figure 4, the machine intermediary business model interaction is marked with red arrows within the red circle. The machine intermediary has four archetypes that are explained separately and in detail below and in Figure 5.

Archetype 1. Business Reality to Machine: A machine observes the business reality. This could be any observing Internet-of-Things device or computed input like location based devices, heat maps, data input robots, etc. One simplified example could be customer counter input devices that are distributed out within a store to measure the behavioral patterns of customers' actions within the store.

Archetype 2. Machine to Business Model: A machine updates the model with a new measurement from the business reality. Here it is important to emphasize that the business model is not only limited by the machine input from the business reality, but could also represent different peoples' understanding of the business reality, each coming from a different area of expertise.

Archetype 3. Business Model to Machine: A business model triggers one or more events through the machine intermediary. One simplified example of this could be that a business owner would like to have a certain number of customers in his store within a specific time period. Triggers could be defined within the business

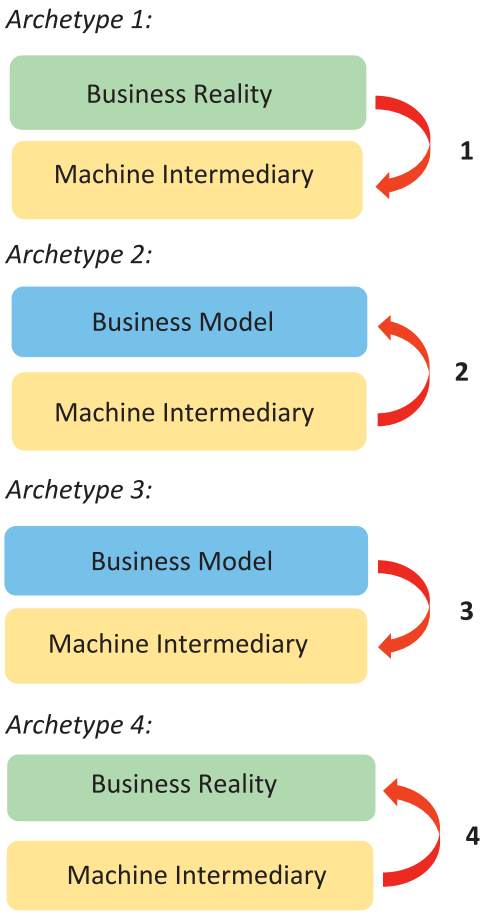


Figure 5.
Machine intermediary business model archetypes.

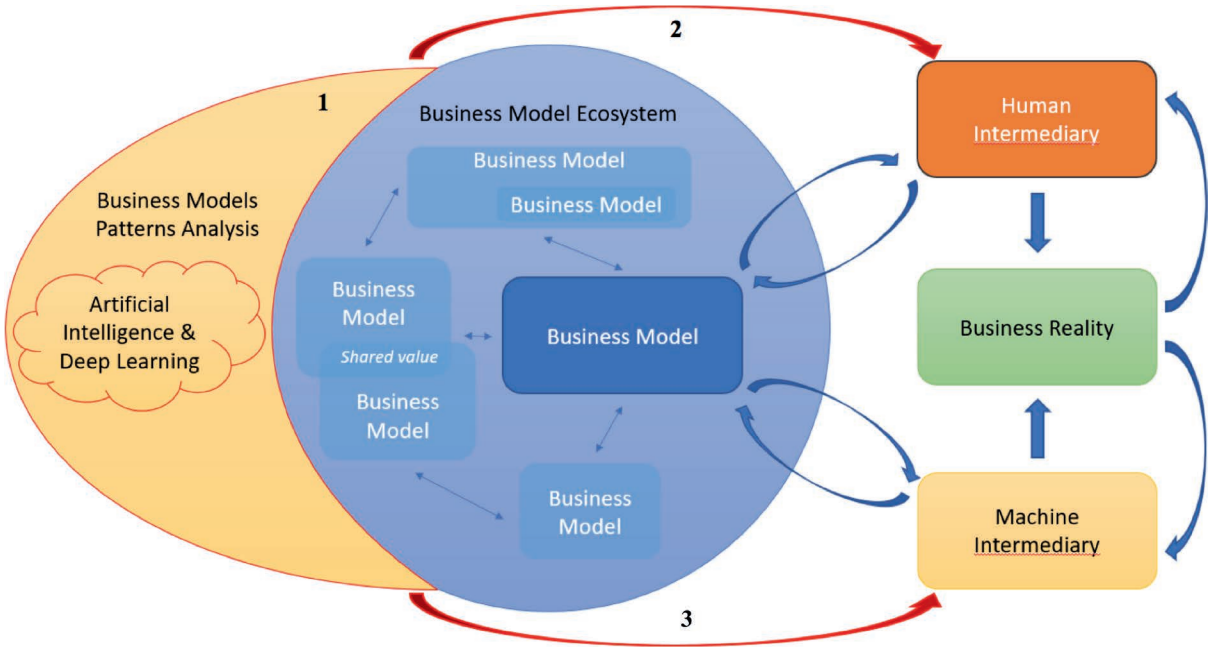


Figure 6.
Business models patterns analysis with artificial intelligence and deep learning adapted from Valter, Lindgren, and Prasad, 2017 [11].

model (based on the current numbers of customer inside the store at a given time period) to lower or raise prices on special offers displayed on digital signage outside the store.

Archetype 4. Machine to Business Reality: A machine implements a change into the business reality based on new event triggered from the business model as presented in Archetype 3. A simplified example of this could be that a person decides to change the business model to give away a product for free or extremely cheaply in order to create earnings on related products, like get a printer for free and when you buy ink and paper. When the person updates the business model all the digital signage automatically changes to represent the new business model. The person could even apply the new business model to only a subset of the whole enterprise to get measurements on its performance before applying it onto the whole enterprise.

Archetype Patterns

Each of the machine archetypes have interaction patterns associated with them.

- In Archetype Pattern 1, Internet-of-Things Sensing: Sensors are sensing the business reality. This is pure Internet-of-Things input based on devices that are sensing the business reality.
- In Archetype Pattern 2, Internet of Things Applying: Sensors are modifying the business reality. This is pure Internet-of-Things output based on devices that are manipulating the business reality.
- In Archetype Pattern 3, Robotics and Drones: More advanced forms of interaction take place in the form of robotic devices and drones manipulating and/or sensing (input and output) the business reality.

While machine intermediary Archetypes 1 and 4 in Figure 5 have patterns in common as described above, the archetype types are concentrated on the machine as intermediary between the machine, the business reality, and the business model; the archetype patterns are solely concentrated on the interactions between the machine and the business reality.

BUSINESS MODELS PATTERNS ANALYSIS

In the third part of the conceptual model, the business models patterns analysis section, which is performed by the artificial intelligence and deep learning, all the interactions between the deep learning patterns analysis engine and the business model, the human, and the machine are represented. In Figure 6 the business model's patterns analysis with artificial intelligence and deep learning is marked with red arrows and a red outline. The interaction archetype patterns for the artificial intelligence and deep learning algorithms include the archetype patterns discussed below and illustrated in Figure 7.

Archetype Patterns 1. Artificial Intelligence on Business Models and Ecosystems: The artificial intelligence and deep learning algorithms analyze all business models and business model ecosystems with the aim of optimizing existing business models and suggesting new business models based on the success of other business model ecosystems.

Archetype Patterns 2. Artificial Intelligence to Human Intermediary: The artificial intelligence and deep learning algorithms suggest new business models directly to the responsible person in the organization based on the success of other business

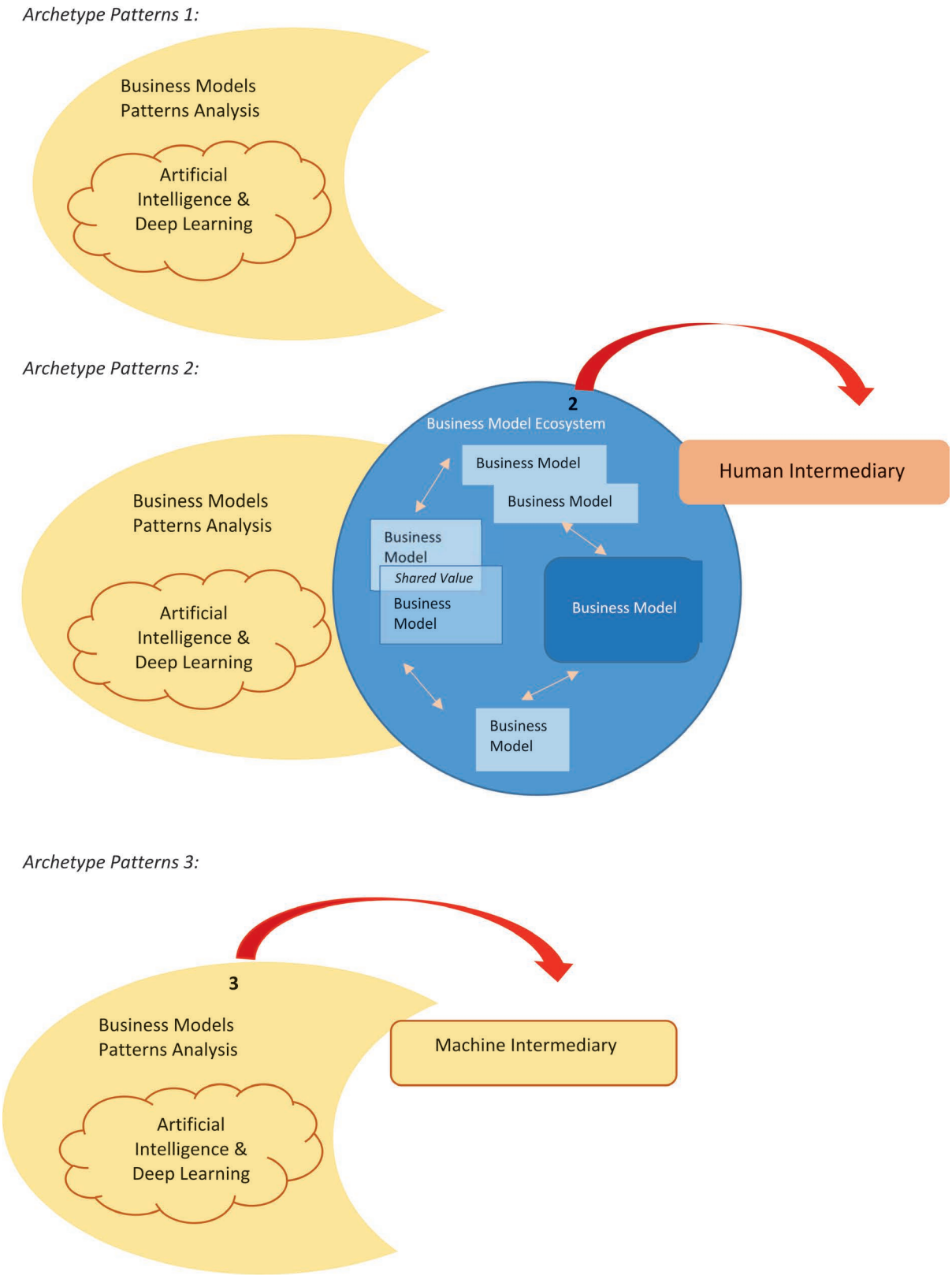


Figure 7.
Interaction archetypes patterns in business models patterns analysis with artificial intelligence and deep learning.

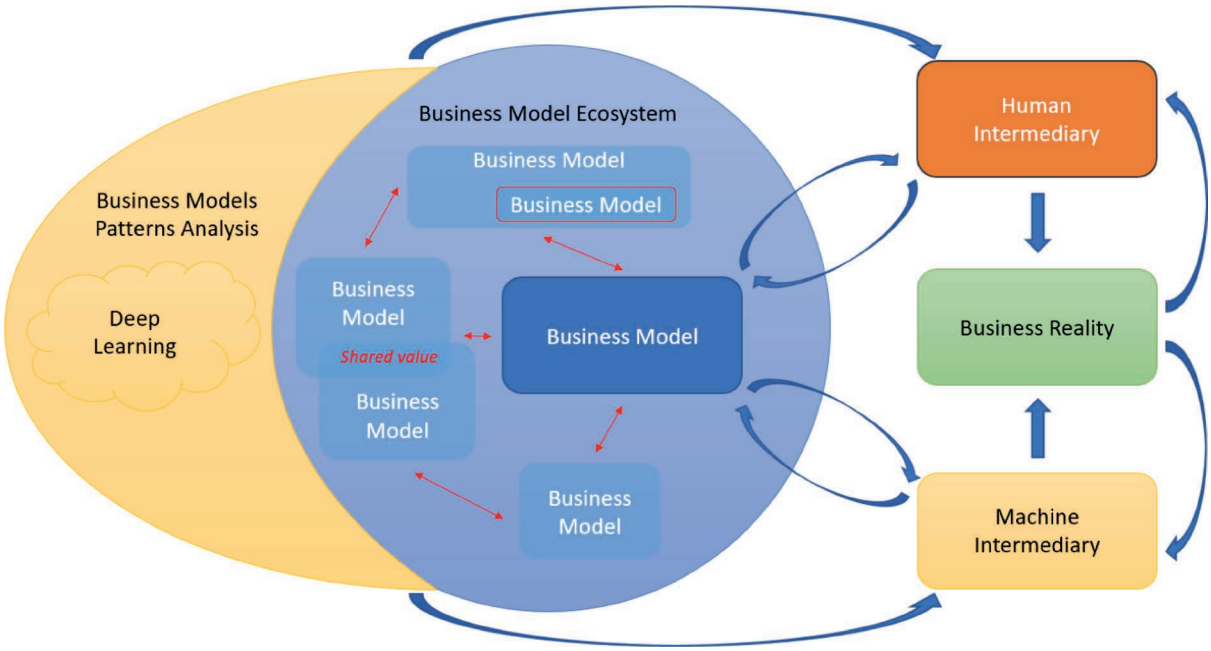


Figure 8.
Business model ecosystem interrelated business model interaction adapted from Valter, Lindgren, and Prasad, 2017 [11].

models in other business model ecosystems. Here it is important to emphasize that this could potentially open a path for cross-boundary knowledge generation and facilitate understanding of other business models that exist in other business domains and could potentially be beneficial elsewhere.

Archetype Pattern 3. Artificial Intelligence to Machine Intermediary: The artificial intelligence and deep learning algorithms implement change into the business reality based on its analysis of the success of other business models in other business model ecosystems that was carried out in Archetype 1. A simplified example of this could be that the artificial intelligence and deep learning algorithms apply small changes on a small subset of the whole enterprise and measure the success of the change. If successful changes are identified, they can be rolled out to the rest of the enterprise.

BUSINESS MODEL ECOSYSTEM

The fourth part of the conceptual model is the business model ecosystem section which represents all the interrelated and contributing business model relationships and interactions, shared business model values, and hierarchical structures within the business model ecosystem (Figure 8). Here is where the business relationships that affect each other overlap and create common business values. In Figure 8, the business model ecosystem's interrelated business model interactions are marked with red arrows within the red circle. Each business model ecosystem archetype is discussed below and illustrated in Figure 9.

Archetype 1. Interrelated Business Model Relationships: This is where the relationships between business models are defined. A simplified example is that of a movie theater's business model and the business model of the parking lot in front of the movie theater. These two models are connected since the same customers uses both services and a big change in one of the business models would affect the other business model. For example if the parking fee is raised considerably, the users would be more likely to find another movie theater.

Archetype 2. Shared Business Model Values: This is where shared business model values are defined. A simplified example is that an organization measures customer satisfaction at one sales locations by having two buttons, one a happy smiley face, and the other an angry smiley face. This aggregated value over time would potentially be a shared value between multiple business models, since several business models could potentially effect the value. This would make it a share value.

Archetype 3. Business Models Hierarchy Structures: This is where a business model's hierarchy structures are defined. The lowest level is all the entities and their relationships that fulfill a business model. Higher levels consist purely of logical grouping of lower levels.

DISCUSSION

Businesses, "technologies", and humans will eventually—at an optimum—have to develop new and persuasive business models, today the supporting tools and environments for developing new and persuasive business models are limited and nondigital of nature. The proposed conceptual model presented in this article is a first attempt in creating a conceptualized overview of the knowledge, insight, and possibilities that lie within the digitalization of the business model concept.

CONCLUSIONS

This article proposed a conceptual model to organize future BMI and operations so that it can meet the challenges of the future.

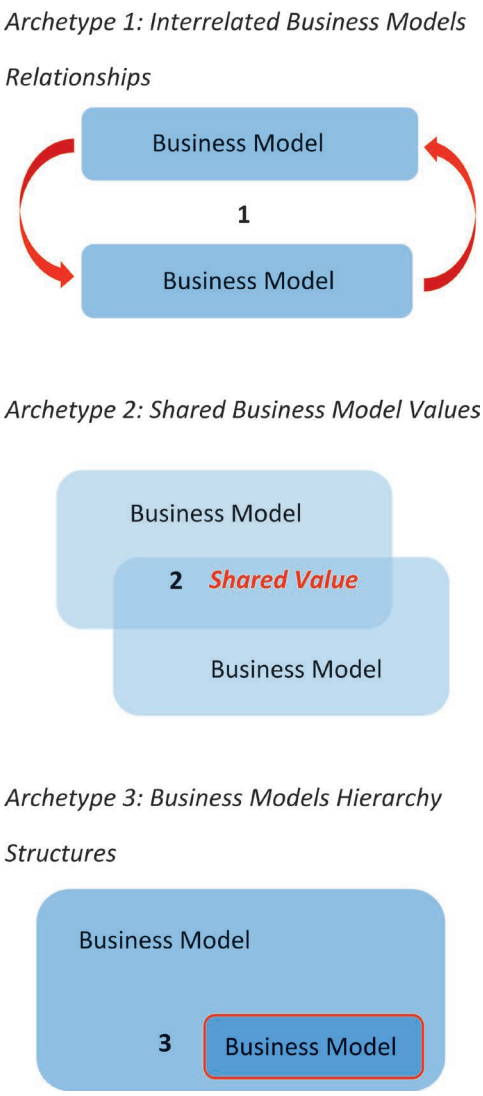


Figure 9.
Business model ecosystem interrelated business model interaction archetypes.

This article also describes the current relationships between the humans, machines, business models, and business model ecosystems embedded with advanced technologies. Some of these embedded technologies may be disruptive sensors and persuasive technologies that will be increasingly integrated into more advanced business models. Persuasive business models can operate in the physical, digital, and virtual layers of BMI and within business model ecosystems. Through these pathways, they will create completely new agendas for communication between humans, machines, and businesses in all their myriad combinations. Everything points to great change coming rapidly to the bonds between humans, between humans and machines, and between machines and machines. It is possible that the human bond or relation to business models will vanish and be taken over by machines. This evolution will heavily influence the ability of humans and machines to "sense" each other, "relate" to each other, and "communicate" with each other. It is possible that the human's ability to sense as it is today will change, or in some cases even vanish. However, it is probable that new sensing abilities will evolve and be learned by the human.

BMI will also be challenged in the future as the world may be dominated by persuasive business model ecosystems and persuasive business models that move rapidly, adapting to and changing business reality. In a future paper, we will further investigate the impact of COmmunications Navigation Sensing SErvices (CONASENSE) on the exponential growth of the disruptive technologies discussed in this article. ◈

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