A Business Model Template for AI Solutions

Iuliia Metelskaia
GSOM SPBU
Volkhovskiy Pereulok 3
Saint-Petersburg, Russia
+7 921 181-76-79
yuliya_met@mail.ru

Olga Ignatyeva
IPERF Institute Otto-Suhr-Allee 18/20 Berlin, Germany
+7 962 7033854
olga.ignatyeva@iperf.eu

Sebastian Denef
Fraunhofer IAO & Innopolis University
Hardenbergstr. 20 Berlin, Germany
+49 163 1613773
sebastian@denef.com

Tatjana Samsonowa
GSOM SPBU
Volkhovskiy Pereulok 3
Saint-Petersburg, Russia
+49 170 2244402
t.samsonowa@gsom.pu.ru

ABSTRACT

In this paper, we present a canvas that describes the building blocks of business models for AI solutions. As startups, spin-offs and existing corporations increasingly transfer AI research and technology into commercial products and services, AI engineers can benefit from focusing and positioning their work within the overall strategy of such ventures. We designed the business model canvas for AI solutions based on existing research, nine cases from secondary sources, as well as five case studies that we conducted ourselves. Our research highlights the most frequently used elements in each block of the business model canvas, such as common characteristics in the value propositions, multi-sided platforms in company segments, automated service in customer relationship, social networks in channels, investors in key partners, R&D in key activities, human resources in key resources and Software-as-a-Service in revenue. We designed the canvas as a tool useful for anybody creating or analyzing AI solutions. On a larger perspective, our study contributes to the existing literature on business model and business model innovation by consolidating existing practices of AI sector and emphasizing on important patterns.

CCS Concepts

• Social and professional topics→ Professional topics→ Computing and business.

Keywords

Innovation; Business Model; Business Model Canvas; Artificial Intelligence.

With the evolution of AI research, AI solutions are increasingly moving out of research labs to become commercial products and services. As the AI market is predicted to reach $60 billion dollars in the year 2025 [13], big corporations and their high-level executives put great attention on the development of AI solutions, realizing the potential of AI and opportunities for disruptive business innovations based on AI solutions. Venture capitalists and technological giants, such as Google, Apple or Facebook are rapidly funding AI startups. In October 2017, Venture scanner was tracking 1951 AI companies in 13 categories across 70 countries, with a total of $23.3B in funding [23].

Although technological developments contribute greatly to the success of these ventures, the design of AI solutions needs to be closely aligned with the development of new business models that leverage the technological possibilities and translate them into business value. Business models describe how firms create and deliver value for their customers and partners [20]. Scholars emphasize the importance of business models, as a powerful way to make strategic choices. Business model innovations have shown to result in the high financial growth and are often driven by new technological possibilities [18].

The high hopes on AI change the relationship between AI research and business. While AI was mostly ignored by the industry from ca. 1990 until 2010 [2] and driven by academic, open source models [3], the situation is different today. In entrepreneur and intrapreneur programs, engineers are faced with an increasing pressure to perform technology transfer, to create business value out of AI research investments. The ability to position and focus AI research in the larger scope of a business model, allows engineers to ensure that their research makes a meaningful contribution and receives sustained funding and also increases their strategic reach.

With this paper, at a technology-driven AI conference, we aim to start building a bridge between technological solutions and their application, by developing a special version of the business model canvas for AI solutions that enables AI researchers to align their work with technology transfer processes.

With the goal of the research to summarize the main patterns of business models in the AI sector, we formulated the following research question: What are common building blocks of business models applied by companies developing artificial intelligence solutions?

The paper has the following structure: First, we discuss related work, explaining the business model concept, presenting existing business models in related fields and identifying the research gap. Second, we explain the triangulation methodology that we applied, including literature review, the analysis of secondary data and our case studies based on semi-structured interviews. Third, we present the results, by walking through the blocks of the business model and highlighting insights from literature and our own data. Finally, we discuss the findings, their theoretical and managerial implications as well as areas for further research.

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1. RELATED WORK

Looking at research that relates to our work, we first provide the theoretical underpinnings to the concepts of AI solutions and business models that are central to our research, before looking at business model research related to our work.

For AI solutions we follow the understanding proposed by the Oxford dictionary, describing artificial intelligence as "the theory and development of computer systems able to perform tasks normally requiring human intelligence, such as visual perception, speech recognition, decision-making, and translation between languages" [17]. AI solutions comprise AI algorithms and applications of AI. Among others, AI algorithms include machine learning. Applications of AI include e.g. computer vision, content generation, speech processing, recommendation engine, categorization, natural language processing (NLP), and anomaly detection.

For *business models*, researchers show that while there is no generally accepted definition, they can be described as a "a representation of a firm's underlying core logic and strategic choices for creating and capturing value within a value network" [18]. A business model is "a conceptual tool containing a set of objects, concepts and their relationships with the objective to express the business logic of a specific firm" [16]. Therefore, it should feature several business categories and their relationships and vividly describe value provided to customers, in particular how it is created and with which financial consequences.

One way of describing business models is the *business model canvas*, a tool that we apply for the purpose of this research. Created by Osterwalder and Pigneur [15], it has become the most popular tool to describe business models. A business model canvas presents a holistic view on the business model of the company, built up from nine building blocks:

The *Customer Segment* block defines different groups of people or organizations the company aims to deliver value to. The *Value Proposition* describes specific products or services, which are creating value for the particular customer segments. The value can be either quantitative (e.g. price, performance, brand) or qualitative (e.g. customer satisfaction, design, user friendliness). *Channels* describe the ways how the company is planning to reach the customer to deliver the value proposition, for instance, through distribution and sales or marketing channels of direct or indirect, online or offline types. *Customer Relationships* stand for different types of the relationships the company builds up with its customer segments in order to acquire new clients or to sustain existing clients. *Revenue Streams* represent the ways how the company monetizes its product offering and is generating the cash from each customer segment. *Key Resources* show the assets the company has to acquire in order to support the business model. Assets may include human, intellectual, financial or physical resources. *Key activities* are those activities performed by the company which make the business model work. They are based on the business model and support each of its blocks. *Key Partnerships* are created to make alliances with non-competitors or cooperation with competitors and set up reliable relationships with suppliers. Finally, the *Cost Structure* describes the operating business costs incurred by the entire business model. Generally, there are two types of the cost approaches: cost-driven business models focus on minimizing the costs, value-driven business models focus on increasing the value delivered to the customer and costs are of secondary importance [15].

Since the business model mostly is the product of the new technological economy, Chesbrough and Rosenbloom [4] define its role as a mediator between technical and economic value connecting technical potential with the realization of economic value and ensuring that the technological core of the innovation delivers value to the customer.

Applying these business model concepts to AI solutions, scholars have been especially focusing on variations of the Software-as-a-Service (SaaS) concept that has changed the ways in which software companies create value.

Key to the SaaS model is "the premise that the productivity of an enterprise is proportional to the size of the workforce and therefore software can be distributed based on headcount" [19].

With AI at the core of new SaaS products, an alternative to seat-based pricing is to price based on performance. The next wave of enterprise SaaS vendors will begin offering new pricing models that align with their AI products and scholars expect a shift away from per seat models toward models that promote ROI and utilization [19].

In recent years, large enterprises as well as startups have started to offer AI-as-a-Service (AIaaS). These services are supposed to lower the entry costs for other companies to use Artificial Intelligence. While previously companies required a lot of time and money to build up the technical know-how and infrastructure to develop AI applications, AIaaS can reduce the development time and improve the Time-to-Value significantly. AIaaS allows keeping the same investment level to lower the risk involved [22].

Corea [5] presents another evolution to SaaS in a framework that classifies business models used to implement and monetize AI-related projects. The framework distinguishes between (1) *Academic Spin-offs*: Long-term research-oriented companies which tackle problems that are hard to break with teams that are experienced and consist of breakthrough innovators. (2) *Data-as-a-service (DaaS)*: Companies which collect huge datasets and create new data sources, implementing a cloud strategy used to facilitate the accessibility of critical data in protected and affordable manner. (3) *Model-as-a-Service (MaaS)*: The most widespread class of the companies are commoditizing their models as a stream of revenues, combining the benefits of cloud computing technology and IT infrastructure monitoring solutions [1]. (4) *Robot-as-a-Service (RaaS)*: This class consists of virtual and physical agents that people can interact with, in technical terms it is integration with robots and embedded devices in cloud computing and web environment [5].

Beyond this focus on adoptions of SaaS models in the AI context, scholars are analyzing business models and proposing business model canvases for different sectors that are related to or have overlap with the field of AI: Internet of Things (IoT) and computer vision solutions.

Dijkman et al. [8] analyze business models for IoT applications. The scholars identify the value proposition as the most critical building block in IoT business models and the customer relationships and key partnerships, as highly relevant. Within the value proposition block, the points *Convenience*, *Performance*, *Getting the Job Done*, *Comfort* and *Possibility for Updates* were indicated as most important by the survey respondents.

Also for IoT, Ju et al. [14] aim at developing a generic business model framework for IoT businesses based on literature analysis and interviews. To test the proposed business model framework,

the authors undertake case studies of current IoT companies and conclude that the capability for data analytics is an essential element for an IoT service. Also, open ecosystems help companies to provide new integrated service that offers greater value for consumers. Scholars also identify the "Sensor as a Service" model as a new pattern, which suggests collecting, processing and selling sensor data for a fee [9].

For computer vision solutions, as another AI related field, scholars discuss the most frequently used revenue streams. Gassmann et al. [11] describe how Software-as-a-Service (SaaS), Technology licensing and royalty, One-time payment (One-time Sale) as well as Pay-as-you-go and services (Pay per Use) are applied for computer vision solutions.

In summary, the previous research shows the dynamic in business modeling and its increased relevance for technology-driven ventures, making business models increasingly important when it comes to AI solutions.

While scholars investigated specific business models aspects for AI, building blocks for overall business models only exist for technology domains with partial overlap to AI solutions. Due to significant differences of customer segments, to start with, an investigation into AI solution business models has the potential to reveal new insights.

With this paper we therefore propose to go the next step by learning from the existing results and comparing building blocks of business models that cover AI solutions as a whole.

2. METHODS

Following the goal to identify patterns in building blocks for business models targeting AI solutions, we apply the method of data triangulation, striving for accuracy and generalizability of the findings [7]. Our process was further driven by a grounded approach to theory development [12], during which a theory emerges iteratively during data collection through constant comparison of the incremental results. In three steps, we combined different sources of data, compared for patterns and gradually saturated our findings.

First, we reviewed the aforementioned literature on business models in sectors that are AI-related. Osterwalder's nine business model building blocks served us as an analytical lens. For each aspect reported in the literature that matches one of the nine blocks, we checked if the aspect is relevant for AI solutions and began to develop a first version of an AI-specific business model canvas.

Second, we compared our findings to business model canvases of existing companies available in secondary data sources.

To identify companies for investigation, we developed three criteria for choosing the companies: (1) Companies should have a product that sells. We excluded start-ups in early stages of product development that have not yet started selling or do not have a working service. Our rationale here was that the business model should have proven itself on the markets. To avoid business models that are not directly connected to AI, we ensured that (2) the AI solution should be the core product. Finally, to avoid niche solutions that do not have wider applicability, we (3) looked for companies that serve more than one industry.

Based on these criteria, we formed a list of companies from secondary data. Our sample include nine business model canvases (see Table 1) from Vizology.com, a platform that holds a grand collection of business model canvases of companies from different industries. We compared these canvases to our initial findings.

Table 1. Secondary data company sample

Company	Country	Product
NVIDIA	USA	AI computing
Modivius (Intel)	USA, Ireland	On-device deep learning and computer vision
Cylance	USA	AI cybersecurity
Kensho (S&P Global)	USA	Scalable machine learning and analytics systems
Shield AI	USA	AI citizen protection
PrecisionHawk	USA, Canada	AI business intelligence
WayBlazer	USA	Big Data analysis in travelling
Algorithmia	USA	Algorithms for scalable applications
TheTake.AI	USA	Neural network for visual recognition

Third, we further evolved our model using a multiple case studies [24] approach, gathering data via semi-structured interviews. This methodology is used when the research "investigates a contemporary phenomenon within its real-life context, especially when the boundaries between phenomenon and context are not clearly evident" [24].

Following our company selection criteria, we selected a number of companies of different sizes operating in Europe and America. We chose the companies from different countries to achieve more representative results. We selected 5 case studies (see Table 2), as a sufficient number to test our framework and finalize it with the help of empirical research [6].

For each case, we conducted a semi-structured interview with one representative from the company talking about their business model. Each interview was recorded, then transcribed, translated, synthesized, and then sent to the interviewee for validation and possible corrections.

The companies comprised OWN.space, an AI Marketplace, where customers can hire AI agents capable of solving knowledge worker problems; VCV providing the service of video recruitment with the help of AI Bots; Insilico Medicine a biotechnical company offering innovative AI solutions for drug discovery and aging research; Cherry Labs with their product Cherry Home, the system of home security caring also about the people; and Sarafan,

a platform for monetizing the content of bloggers, as well as promoting fashion brands by recognizing the clothes on the photos.

Table 2. Primary data company sample

Company	Country	Interviewee
OWN.space	Germany	CEO
Sarafan	Russia	Executive Director
Cherry Home	USA	Project Manager
VCV	Russia	Head of Business Operations
Insilico Medicine	USA	Executive assistant of CEO

As we will detail in the following results section, combining all the collected data allowed us to identify aspects for each building block of the business model canvas.

3. RESULTS

Figure 1 shows the resulting business model canvas with the prominently identified categories in bold. Below we detail every of the nine building blocks. We emphasize the concepts on the canvas and provide additional explanations.

3.1 Customer Segments

Whereas big corporations are set on the customer segments they are serving (e.g. *multi-sided platforms*, *mass market*, *diversified*, *niche market*, *segmented*), smaller startups are struggling in how to identify the target audience and find a profitable way to release new innovative products [5].

The case studies show that customer segments include big groups of consumers: *business customers (B2B)* with different industries such as agriculture, insurance, construction, entertainment, auto making and fashion; *research institutes and academia*; *other developers*; *government bodies* such as defense departments as well as *consumer (B2C) end users*.

While in corporate settings the customer segments are referred to in a general and descriptive manner, in startups the labels are more specific with exact customer groups and industries.

3.2 Value Proposition

Overall, customers value *newness* and innovativeness of the solutions. Barnes [2] provides the concept of "AI-First" business model, which is about using data and algorithms for three main things, all of which contribute to category leadership:

1. Create better products, thereby becoming leaders in product adoption
2. Optimize processes by augmenting humans, thereby becoming leaders in product pricing
3. Reduce costs by replacing humans, thereby becoming leaders in workforce efficiency

Beyond these three strategies, the user experience, *design* and *brand/ status* are highly relevant for AI sector, which leads to the necessity to allocate limited resources between engineers, business, and design at an early stage of company development [5].

These findings are in accordance with the research on IoT business models, which shows that *convenience/usability*, "*getting the job done*", *cost and time reduction*, and *customization* are valuable features for customers. Yet, AI-specific literature suggests new entries, such as *optimization*, *automation* and *improving decision making*.

Our case study results confirm that the core value proposition is related to fast better decisions or solving complex problems and providing end-to-end solutions. Therefore, it allows companies to optimize the processes and resources, save time and money. Since the AI sector is developing now, most of the companies have unique value propositions and provide new and revolutionized ways of '*getting the job done*', ensuring *safety* and *security*. All products are characterized by high usability for customers and the possibility to customize it.

3.3 Channels

AI companies use a great variety of possible channels, therefore this building block is not specific for the AI sector, rather, it is aligned with the current trends. According to the literature and case studies, the following channels are used for marketing and/or sales: *social networks*, *mobile apps*, *website*, *online shop*, *conferences*, *partner sales*, *press*, *distributors*, *vendors*.

More innovative channels are actively used by AI sector. Social and corporate networks act as both platforms for advertising and selling, depending on the product; mobile apps, website and online shops serve as selling points for AI solutions. More traditional media, namely, press and face-to-face communication with partners, distributors and vendors often at conferences on AI topic remain an important pipeline for generating new contacts and supporting old connections.

3.4 Customer Relationships

The case study companies followed different approaches with their customers. Some prefer *self-service*, where the customers are alone in the customer journey, sometimes this is accompanied by *personal assistance* or *customer support*, as we know it. In other cases the services are *automated*, representing new ways of human-machine collaboration as a practice. As a variation here we have *customized service*, which implies automated service for different customer groups.

Finally, a wide spread strategy describes the creation of a *community* around the product, which is valuable for the customers as such, and enables servicing a group instead of individuals. Group dynamics also allows for *co-creation*, which is a tool for engaging the audience and bringing new ideas into the company innovation funnel.

3.5 Revenue Streams

As already evident from IoT and computer vision business model research, the most wide spread revenue stream is *Software-as-a-Service* with its variations, which was a major business model innovation in tech industries. Yet, there are other revenue streams used, such as *startup investments*, *licensing & royalties*, *usage fee* ("*pay as you go*"), and more traditional ones, namely *product sales* and *advertising*.

Our case studies confirm that the leading revenue stream types are *Software-as-a-Service*, *one-time sale* and *licensing*. One of the companies has reported a new revenue stream - *cost per click*, which refers to a payment system that is typical for advertisement. The company gets paid every time the client lands on the ad provider's website through their channel.

3.6 Key Resources

AI is the sector where the team value prevails, that is why after the acquisition the entire team is usually retained. According to the research of Tencent Research Institute, there are just 300,000 "AI researchers and practitioners" and around 1,000 people with 10+ years of AI experience in the world, who are able to translate business requirements into AI-based solutions, and then lead projects from beginning to end in a way that meets those requirements [10]. The estimation of AI Element research is around 10,000 qualified people, including engineers and researchers, i.e. qualified AI experts who have skills and experience that allow them to effectively mediate the various constraints of science, business, and industrial-grade software [10]. Analyzing different estimations, the main conclusion is that talent is in short supply in the AI industry. Our case studies confirm that *talent* is indeed the most important resource for AI companies.

Intellectual Property (*IP)* was referred to as one of the key resources accompanied with *Patents* and *Know-How*. Among key resources is also technological know-how and access: *deep learning/ machine learning algorithms*, *big data/ databases*, *cloud technologies*, *technologies* and *core products of the company*.

3.7 Key Activities

Key activities based on the related literature are rather general. These activities include *R&D*, which is often long and expensive for AI solutions [5], *product development*, *platform development*, *customer development/ support*, *customer development*, *marketing & sales*.

Our case studies confirm that AI companies build on the edge of IT, business, engineering and design. *R&D* and *engineering* are the most important activities, whereas *marketing & sales* and *software development* hold second position. Our studies also add to the canvas other frequently mentioned activities such as, *operations*, *data management*, *IT maintenance/operations* and *design*.

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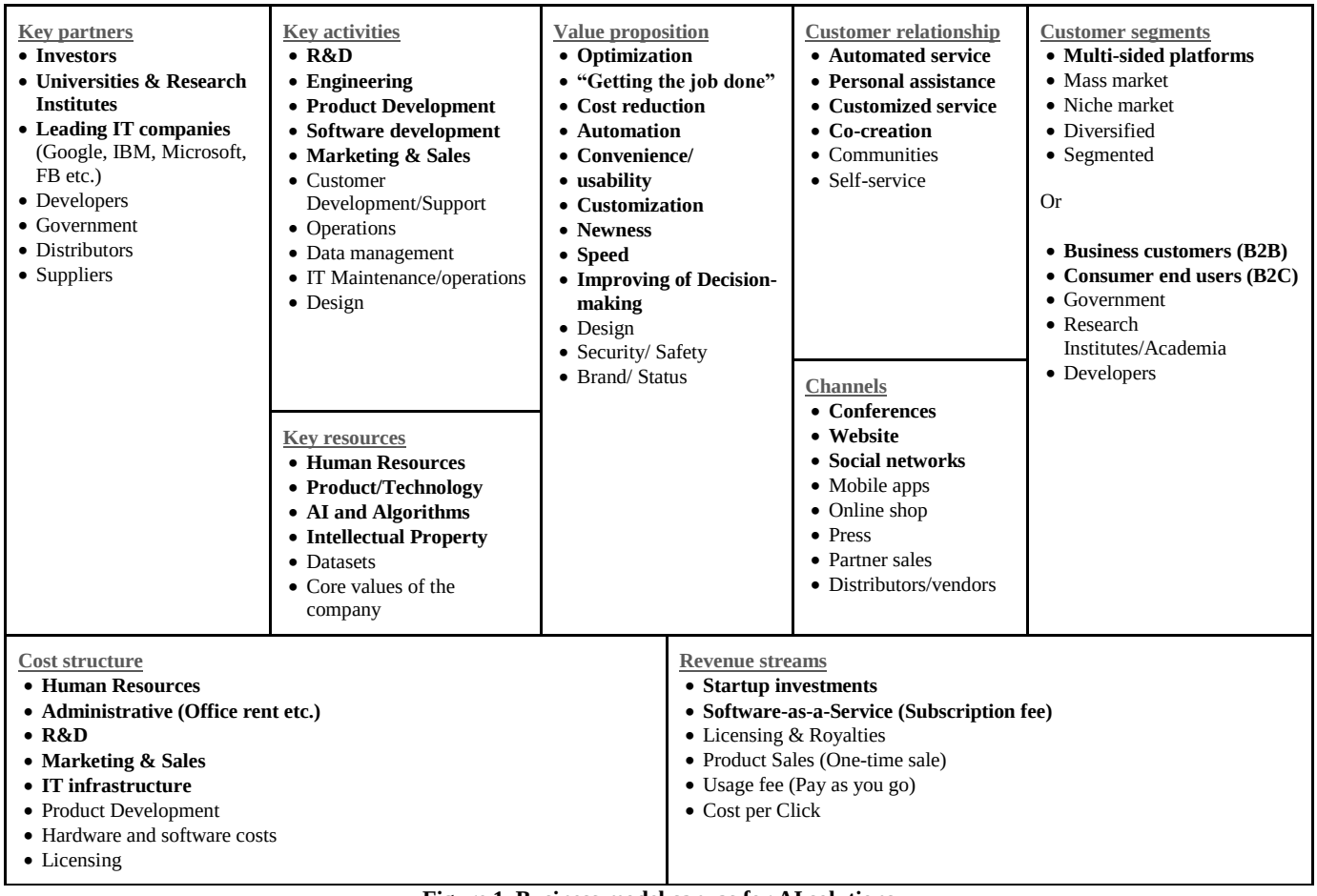

Figure 1. Business model canvas for AI solutions

3.8 Key Partnerships

Many startups in the AI sector are often struggling with financially related and data access challenges. Key partnerships need to be established with specialized investors that increase the value of a company beyond financial investments e.g. with large dataset [5]. Due to these challenges *investors* are extremely important as key partners from the very beginning.

The Open Source model [11] is of great importance in AI development. Therefore, other *developers* along with *universities and* research *institutes* become key partners for AI companies.

As the growth model of AI sector is changing, the "DeepMind strategy", named after Google's acquisition of the company DeepMind describes an aggressive acquisition strategy instead of competing with emerging startups. Startups are purchased by the

large enterprises when they are on the early stage, while they are mostly focusing on people and pure technological advancements rather than revenues [5]. Accordingly, *large technology corporations* become important partners for AI startups. In addition, large enterprises also provide AIaaS offerings that startups can benefit from. As a result, large enterprises have startups and acquired companies as important partners. Vice versa, small companies have *leading IT and AI giants* as their key partners.

Additionally, *government* and *government companies* can become key partners. Among the less frequently mentioned key partners are *suppliers* and *distributors*.

3.9 Cost Structure

Related research shows that the major cost items are *human resources*, *product development*, *IT*, *marketing & sales* and *administrative*. This structure is applicable to any technology company and lacks specificities.

Our case studies show that AI companies have *human resources* costs as employee salaries, the next cost category is *office rent*. Half of the companies have *R&D* costs, *IT infrastructure*, *software costs* and *marketing*. Some companies also have *hardware* and *licensing costs* as major cost items

4. DISCUSSION

The findings of this study highlight the differentiating points of business models for AI solutions. In the following we discuss key aspects that characterize the resulting model and set it apart from other sectors.

Since AI technology has high potential for disruption, the radically better solutions that have great *value propositions* are expected both from the partner network, such as developer communities, research institutes and academia, as well as from customers. Driven by high expectations, customers are pulling from the market technologically robust and user-friendly solutions.

Customer segments are very diverse, yet difficult to identify, especially for small start-ups. Often starting the venture from the technology development itself, companies face a challenge of adapting their products to customer needs. Therefore, the target audience is frequently chosen by chance, depending on personal relationships or conference contacts.

Customer relationships are revolutionized by the opportunities presented by AI. Instead of traditional call-center support, AI startups look for the ways to automate the services without losing quality. Moreover, new ways of customer communication become a part of value proposition for AI companies. Consequently, we see automated solutions and human-machine services introduced into the customer service processes.

Unorthodox *revenue streams* of AI companies present major business model innovation. Products based on the new technologies ask for new approaches in marketing and selling, where pricing plays an important role. Compared to software ventures, SaaS and its variations become increasingly popular, whereas business model based on advertising is less used. Additionally, the strategy of developing companies that do not focus on generating revenue to be bought by large enterprises also can be attractive for investors.

Key partners include a new category: partners for future acquisition. The AI sector got used to IT giants acquiring early stage startups, so the companies are proactive in nurturing such relationship from the very beginning. AI startups seek for contacts with corporations for investment, whereas big companies scan the startup market for the new stars.

Key resources of AI companies go beyond the existing literature. Scholars typically argue that protected IP does not play a big role for AI solutions, as AI was largely ignored by the industry from around 1990 until about 2010. Corporations did not have intentions to lock-up the progress, so most algorithms were open. The progress in AI happened in a kind of radically open "AI commons" where the governments and companies, academia and universities contributed data, algorithms and research results no matter if they were competitors or partners [2]. Today, we find a new situation regarding IP. IP is mentioned as a key resource, including both patents and know-how. These findings contradict the claim about high importance of Open Source model and support the argument of Bostrom [3] that AI companies are not really open.

To our surprise, core values of the company are also quite often referred as the key resource, while for example, partnerships and developer communities were mentioned only rarely.

Finally, R&D is at the center of *key activities* for AI ventures, which stems from the fact that these companies are often created by IT experts. These findings are in line with Corea's [5] notion that the AI sector is similar to biopharma industry: both have expensive and long R&D, long investment cycle; low-probability enormous returns; concentration of funding toward specific phases. In comparison with the pharma industry, AI benefits from faster and more painless experimentation phases and the absence of a patenting period, which forces AI businesses to continuously evolve and use alternative revenue models.

Coming to the practical usage of business models by AI companies, we saw in our sample that this tool is not yet used frequently. As AI companies are often founded by the tech-professionals, they often lack business knowledge. With our model, we aim at closing this gap, by providing a simple tool for practitioners to configure the AI company business model.

In many industries, business model tools are increasingly used on the stage of technology transfer, i.e. the process of packaging a technological innovation into a feasible and profitable product that is needed on the market. Business model tools help practitioners to identify the major logic behind their venture and serve as a check-list to cover all important elements of successful product creation.

The business model canvas presented in this paper, however, is not the only component for business modeling in technology transfer processes. Instead, it should be considered as a tool for snapshots of a dynamic and iterative process:

Even though we provide solutions that work for companies on the market, usually each building block is based on assumptions that need to be tested for the given case. The identification of these assumptions (e.g. for customer value propositions, market situations, available channels) is an important factor influencing the success of the innovation process. Having identified the critical assumptions, practitioners can formulate them as hypotheses that can be validated in form of prototypes and specific experiments. In this way, practitioners can validate early on what will work on the market. Iterative development and repeated experiments further increase the probability of success in the market.

As the business model evolves over time, practitioners can also incorporate continuous development and learning to measure how customers respond to new initiatives. In this way, the hypotheses are constantly determined and adjusted in the market context on the basis of actual data and support pivots in the business model.

5. CONCLUSION

In this research, we created a business model canvas template for AI solutions, focusing on the most important categories in each building block. Moreover, we identified the types of business models inherent to AI sector and confirmed it by empirical research.

This study contributes to the topical discussion on business model innovation that implies packaging cutting-edge technology into valuable product. Innovative products and services, often, cannot be sold using traditional business models. Therefore, the investigation of business practices in the IT sector inevitably leads to business model innovation.

This study is of exploratory nature, which means that the results have not been statistically confirmed. This is a well-known downside of case study approach. As a direction for further research we suggest to carry out a quantitative analysis to test the findings of this study on a representative sample.

We also highlight the applicability of the findings as a hands-on instrument for practitioners, yet, we did not conduct any testing of the tool and leave that space open for future research. Seminars with AI practitioners would produce feedback for the usability and applicability of this framework as a tool to launch or manage AI solutions.

Taking the unconventional approach to submit a business study to a technology conference, we hope to contribute to narrowing the gap between AI research and AI business and to empower AI engineers and researchers with greater strategic reach.

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