Business Modeling Innovation Using Artificial Intelligence Technology

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Abstracts

Startups embracing artificial intelligence (AI) as a component of their business models are quickly emerging right now. The application of AI technology in business has been going on for a while, even though recent research reveals that new or alternative business models are being implemented. The distinctiveness of these business models could be questioned given that AI technology has allegedly been used to business models for a very long period. This study contrasts the business models of AI firms with traditional IT organizations in order to better understand how they can be different.. The first step is to create a taxonomy of business models for AI businesses using a sample of 162 Worldwide Stratup, from which four archetypal business models are derived: Deep technology researcher, data analytics supplier, AI product and service provider, and facilitator of AI development The following are three main elements of startup business models for AI firms that are discussed based on this descriptive analysis: (1) new value propositions made possible by AI, (2) Various uses of data to create value and (3) How AI technology affects general business reasoning. By defining their key purposes, common instantiations, and distinguishing features, this research adds to our fundamental understanding of the AI start-up business model. This study suggests intriguing directions for further investigation in the field of entrepreneurship. À It is structured to foster entrepreneurial activity. Taxonomies and models are actually instrument.

Keywords: Entrepreneurship, Artificial Intelligence, Taxonomy

1. Introduction

Undoubtedly, the corporate and scientific worlds are noticing the impact of artificial intelligence (AI) Multiple technologies are referred to as AI It can now "perform cognitive processes" [1]. because of this often link observation, logic, learning, and even creativity with the human mind AI technology has the potential to be an external accelerator and to present numerous business opportunities. Actually, its witnessing a tremendous rise in the number of startups focused on artificial intelligence (AI) that incorporate the technology into both there are goods and services A product or service that incorporates AI technology [2]. For instance, almost 35,934 businesses focused on artificial intelligence are listed in the Crunchbase. By September 2022 [3], the database will be updated to reflect startups focused on artificial intelligence. well-known instances The search company OpenAI and the startup for business automation called UiPath are examples of common [4]. A lot of investors and venture capitalists are showing interest in these AI start-ups. persen of venture capital invested in AI firms [5], frequency of interesting objects being recognized. Any technology's successful commercialization depends on a solid business model [6], which embodies a company's fundamental business principles [5], [6], Research from recent years indicates that Worldwide Startups are employing novel or

distinctive business strategies. A new generation of goods [7], services, and business models will be developed thanks to the application of AI technology and its distinctive qualities, according to economists. The successful exploitation of AI presents substantial problems for information systems (IS) [7].

business model innovation for an Worldwide Startup. For instance, it has long been understood that the utilization of data is essential to generating value from AI in research business models (such as in computer science). In addition, a lot of business models, including those of suppliers of digital platforms, implicitly place AI technology [8]. at the heart of their operations. This prompts the query of whether new or different business models are being employed by Worldwide Startups. To improve understanding of how startup business models operate, it would be helpful to clarify these potential distinctions [9]. is changing startup company strategies in contradict preexisting theoretical precepts. new ventures with business plans that might contradict accepted theories [10]. Furthermore, In order to develop new business models that utilize AI technology or to assess startup business models, practitioners need have a fundamental awareness of worldwide startup business models [11]. Businesses that use artificial intelligence (AI) or that analyze, evaluate, and finance startups in the field. There is, however, little research on business models related to AI [12], and the research that does exist on start-up AI models is still in its infancy. The topic of what distinguishes Worldwide Startup business models from traditional IT-related business models remains unanswered since existing understanding of their characteristics is inadequate. It is therefore prioritized to conduct more study in this field on the business models of AI firms. The following research questions are our bets to close this gap in knowledge: What distinguishes the business strategy of an Worldwide Startup from that of a traditional IT firm [13].

In order to answer this question,(1) List the salient features of emerging business models for artificial intelligence, and then (2) draw attention to those features that stand out within the context of earlier research on computer business models. Initially, it will use the method outlined in for taxonomy creation to create a business model taxonomy for AI firms keeping this in mind. For novel unstructured phenomena like the business models of AI firms. such an analytical approach is especially helpful. Create a Dataset of 162 Worldwide Startups as cases to create a taxonomy. the Worldwide startup dataset, chosen at random. Then use other data sources to create a triangulation. sources of data. Using an iterative development approach, theoretical ideas from the literature are combined with practical findings from a sample of 162 AI Stratup. A conceptual depiction of their business model guides the taxonomy of Worldwide Startups. hierarchical cluster analysis is then used to determine four typical business models by applying the resulting taxonomy to a sample of 162 Worldwide Startups. Last but not least, On the basis of prior research on business models connected to IT, it will analyze the particular of artificial intelligence startup business models and advise additional research.

In the areas of entrepreneurship and business models in the IT industry, this take part in the expanding research on artificial intelligence [14]. It begins by contrasting startup AI business models with conventional IT business models, then in the discuss how AI technology has an impact on business models. Second, future AI [15]research in entrepreneurship may find some interesting new possibilities as a result of the descriptive study. Finally, one of the first comprehensive analyses of business concepts used by Worldwide Startup. In order to lay the groundwork for further investigation,taxonomy and model highlight essential global startup company models' qualities and implementation models in general. Organizational taxonomies, as described by Rich, provide the framework for successful research by categorizing the continuous world of organizations into distinct and collective categories." Appropriate for indepth study by utilizing AI technology, the taxonomies and models may be applied in practice as organized tools to promote startup creation and business model innovation. Additionally, it helps By giving them knowledge of the complex and diverse ecosystem of global startups, startups may aid investors and venture capitalists in their endeavors.

2. Research Method

We determine 1) the key business characteristics to address our study questions. model of Worldwide Startups and 2) our company Specificity in previous research Previous research on general business models related to information technology. First, we First, we compile 162 global startups as cases [16]. Then, create a taxonomy of business models for Worldwide Startups. The essential elements of the Japanese business model should be identified using. worldwide startups' business plans Third, conduct an ancient hierarchical analysis that yields four common business models [17]. A typical business model that provides additional information General instantiation of business models for Worldwide Startups. in previous research Finally, distill the distillate. Worldwide Startup business models and offering characteristics Guidance for research in the area of entrepreneurship.

2.1 Creating Case Dataset

To gain empirical insight into our research topic, Created a case dataset for Worldwide Startups. used Kaggle to identify companies [18], owing to the fact that it is one of the world's largest startup databases. kaggle widely used in research, A valuable source of information to identify startups. Retrieved October 22, 2020 All Kaggle startups using the term "Artificial Intelligence" or "Machine Learning". A description of "intelligence" or "machine learning. It turns out that similar concepts also apply to other AI-related fields including deep learning, natural language processing, computer vision, and robotics. these circumstances [4], [19]. It used four selection criteria to narrow the sample to startups that matched the survey questions (Table 1).Excluded are the following startups: Have stable working conditions and receive $1 million or more in funding [2]. Following a preliminary analysis of the data, this criterion was helpful in removing a large portion of the data from the sample, such as those related to unfinished items or services, Uncertain and either previously existing or emerging business model. Additionally, we intended to cover firms launched in 2022, therefore we eliminated startups founded after 2022. new developments in AI technology. A sample of 8076 AI-related businesses was provided [20].

Table1. Choosing factors for startups

Subject	Criteria	Rationale
State of Operation	Having obtained more than $1 million in total finance and not been in financial difficulty	Check to see if the sample contains well-established startups with a clear business plan.
Year of Founding	After 2022	Streamline sample to reflect current companies in accordance with the recent upsurge in AI technologies
Website	accessible and offered in either German or English	To properly classify the startup, make sure there is enough information.

Business model	As the primary component of the good or service, artificial intelligence	Only include companies that are relevant to the study topic in the sample

For each startup excluded at this stage, A different startup was re-screened until it case base included a sample of 164 global startups that satisfied all requirements. The complete list of startups taken into account in this analysis is included in Table 1 of the. To gather thorough data about each firm, we made use of a number of data sources. Included are: (1) websites; (2) business portals like Kaggle; (3) white papers; and (4) investor interviews. Each startup received an average of 3.8 data sources. By triangulating the data from the source, many data sources helped us to prevent data skewness.

2.2 Literature Review

Existing research that links AI with the concept of business models mainly focuses on how internal processes for value generation are affected by AI technology. Because of this, operations may be automated using AI, inform decisions, and provide new ways to interact with customers and employees. For instance, artificial intelligence (AI) technology may help with non-routine and routine work in the legal sector, and make operations more efficient. The use of automatic language processing to enable automatic analysis of documents is expected to play an important role in this area. As another example, the healthcare sector is using his AI technology to improve service quality. This makes it easier to detect diseases such as cancer, for example. It draws attention to the new dangers that adopting AI technology poses to business strategies. For instance, inaccurate or biased decisions made by AI solutions can have a negative impact on value creation . AI technology not only impacts operations, but also enables the development of new products and services. However, it should be noted that existing research has not yet fully recognized the new goods and services that might be produced with AI technology. In particular, there is little investigate the underlying business models that are employed to market these goods and services. As a result, a thorough analysis of global startups in the healthcare industry is occasionally done. They discovered that startups throughout the world are aiming for a variety of value categories. Management of patient lifestyle, patient safety, or operational effectiveness strategies for healthcare providers. This is distinguish between his two archetypes of business model. This is distinguish between two archetypes of business models. Startups that provide information or aim to connect several parties. They also identified three deployment strategies that are utilized by global startups. Software as a service, the platform model, and the multimarket business mode), These include platform as a service and software as a service. Research on the Industrial IoT sees opportunities to combine AI technologies to deliver new services. Predictive maintenance. In this way, In order to develop new value propositions, data-driven analytics are used in conjunction with established business models that use physical machinery. In conclusion, research into AI-related business models is still in its early stages. The potential of AI to enhance internal processes received the majority of attention. However, there is a significant underutilization of business models where AI technology is a key element of goods and services. Therefore, it is unclear at this point how the business strategy for an AI firm would vary from the business model for all of IT. However, it can help you gain a fundamental comprehension of startup company concepts. This research topic is consequently addressed by this work.

2.3 Development of Taxonomy

Using the proposed taxonomy development method, it developed a taxonomy of Worldwide Startup business models. This technique made it possible to systematically link previous theoretical ideas with knowledge from real case studies. Moreover, by applying this method, it aim to improve the value of the generated taxonomy and decrease the possibility of

adopting arbitrary dimensions [20][21]. In IS research, this methodology is already frequently applied. establishing taxonomy for different business models.

The definition of meta-features is the initial stage in this process. It "shall be the most extensive characteristic that serves as the foundation for feature selection in the categorization," according to the specification [22][23]. Meta-characteristics of conceptual business model representations were utilized to categorize Worldwide Startups. Value creation, delivery, capture, or proposal of value. Phase Two Contains definitions for the final requirements for the taxonomy's development. The suggested objective and subjective output conditions have an impact on this. The Worldwide Startup business concept must have been shown to it first [24]. In order to accurately characterize the Worldwide Startup business mode, the dimensions and aspects of the taxonomy must be mutually exclusive, extensive, and holistic. Third, the sample object must include each feature at least once. Fourth, no measurements or characteristics The most recent round of taxonomy development included additions, deletions, and modifications. Fifth, by mandating that the taxonomy be succinct, resilient, full, expandable, and descriptive, it adds subjective output requirements.

The taxonomy's iterative development is the following process. A concept-experience approach or an experience-concept approach must be decided upon before each iteration. It is advised to use a concept-based or empirical method if the researcher is already familiar with the area of interest. predicated on having initially grasped the idea [28], The basic dimensions and traits of the taxonomy were derived using this method. The Business Model Canvas first received new dimensions, including important partners, crucial activities, crucial resources, crucial interactions with customers, crucial channels, crucial client groups, crucial cost structure, and crucial income streams. Customers, financial arrangements, and sources of income The business plan The business model of Canvas sacrifices certain important elements, yet it is extensively applicable to all circumstances and is largely acknowledged in research. This makes for a positive beginning. A new business model is being promised here. Data architectures, data ownership, AI technology, and other related topics are added. The 25 startup designs on the case's size and characteristics were checked and assessed. Primary taxonomy-related dimensions and design elements.

After the first iteration, the taxonomy was further developed using a conceptual approach from an empirical approach. This approach proposes to derive common characteristics of similar and groupable objects. First, a portion of the dataset representing Worldwide Startups was extracted for each iteration. After that, based on the taxonomy, two of the writers independently assessed, contrasted, and grouped the startups. In order to add, subtract, or alter dimensions and features, the findings were then considered and merged. It raised the sample size of worldwide startups, validated the previously established termination rules, and started the following company after each iteration. It launched the subsequent iteration and was provided by an AI business. This process might be altered by adding, removing, and changing a number of dimensions and characteristics after being repeated three more times. Feature. The categorization dimensions' growth is seen in Picture 1.

The taxonomy was reassessed using the previously established termination criteria after the fourth cycle, which involved looking at 164 global startups. The 164 companies in this sample could be ranked since the taxonomies were mutually exclusive and universal. At least one example Worldwide Startup is attributed to each property. Furthermore, there was no requirement to add, remove, or modify any dimensions or properties. This implies that a very representative sample of startups from around the world may have been examined. Additionally, it examined if the research's taxonomy was sufficiently succinct, solid, all-inclusive, descriptive, and expandable. declared among the study team, with the conclusion coming down in favor. Consequently, every circumstance The creation of the taxonomy was completed by defining the previously mentioned objective and subjective criteria.
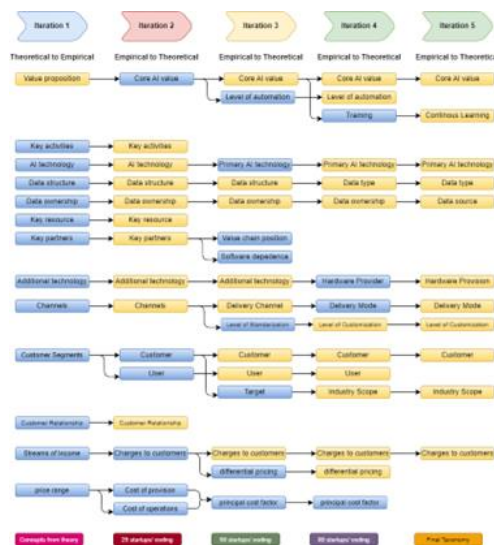
Picture 1. Dimensions for a business model taxonomy are developed iteratively

3. Findings

The results part of this investigation consists of two parts. First, it present the resulting taxonomy of commercial Worldwide Startup models. It provides greater information on each aspect and function. Four typical business models are shown in the second section for Worldwide Startups and provide illustrations. it will present typical business models for Worldwide Startups and provide representative examples of each model.
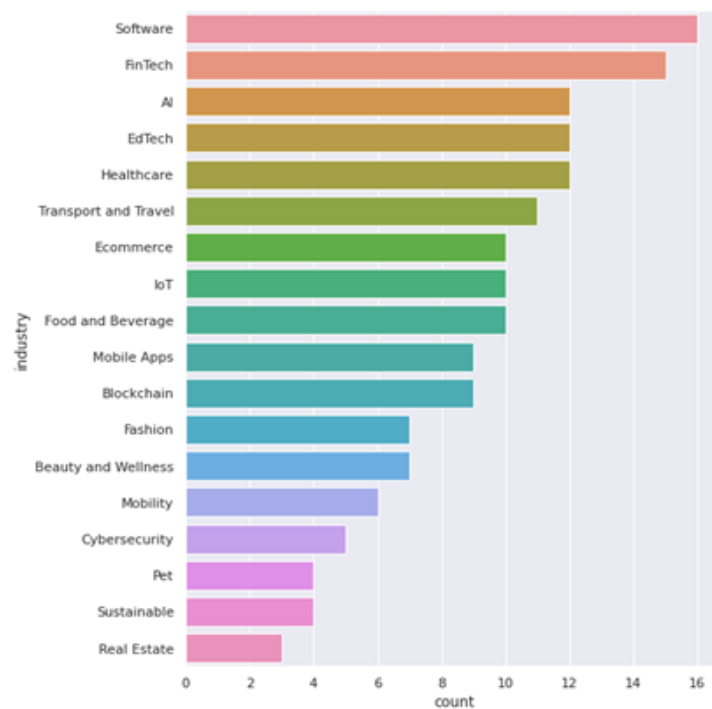
3.1 Problem

Business Model Classification of Worldwide Startups, Based on a conceptual description of the business model, the resultant taxonomy has 11 dimensions and 39 attributes. A fresh instance of the Worldwide Startup business model is created for each combination of features across the dimensions. Taxonomies Table 2 provides the taxonomy. Below, there is a detailed description of each aspect and feature. It was discovered that there are two main categories of value proposition for Worldwide Startup company models: two examples are the AI value basis and ongoing learning. The AI value base, in the first place, symbolizes the value that each AI solution deployed by Worldwide Startups in their goods and services creates. Startups incorporate AI technologies into their offerings for goods and services. In order to produce cognitive insights, monitor and identify anomalies in data streams, and perform tasks using either robots or people, these programs analyze enormous amounts of data, typically unstructured data. self-sufficient robot. As an illustration, the company Zebrium examines log data from several platforms and spots irregularities in real time. real-time anomaly detection and platform support Added illustration: To automate packaging processes, the firm Osaro provides industrial robots with computer vision. The next section of continuous learning explains the learning capabilities of each AI system. Over time, the associated AI solution might pick up additional data. So, as part of the value pitch, certain AI solutions could eventually become more accurate. Though certain AI technologies will improve The applicable AI solution may steadily increase its accuracy as part of the value proposition. Unlike some AI solutions that are enhanced at the provider side through centralized learning and updates to the customer base, other AI solutions acquire knowledge independently from the provider at the consumer side. But AI businesses aren't always able to provide this feature.

3.2 Research Implementation

There was discovered that the four categories of In order to classify Worldwide Startup business models according to their value propositions, the principal AI technology, data kind, data source, and hardware provision may be employed. First, principal AI technology is a term

used to describe the AI technology that, from a functional and marketing perspective, is most important to the firms' AI solution. There are three categories in which these artificial intelligence technologies fall: typically used machine learning (which includes shallow and deep machine learning for numerical or mixed data), Robotics, which covers individual robotic components and autonomous vehicles, computer vision, and natural language processing (which includes production, analysis, and both) (which includes analyses and the generation of documents, texts, and voice). The lemmatization of textual data or the use of sensors and actuators for robotics are instances of extra or additional components that go beyond "conventional" machine learning that they also entail, even though the latter three categories of AI technology predominantly rely on machine learning. Therefore, it was believed that this was a useful and applicable categorization method. Second, the data type indicates whether a Worldwide Startup handles well-structured sensor and numerical data, textual data (excluding dialogues), spoken language data, visual data (including videos), and mixed data types as its primary data processing activities. Third, the information used to train the AI solution is explained by the data source. The data might either be self-generated during the startup stage, acquired from outside data providers, obtained from publicly accessible sources, or given by the customer, it was revealed through analysis of prior data. With respect to the latter case, a relevant distinction between data that the client provides on demand and data that the client continually supplies was found. For instance, whereas the business Super Annotate uses batches of client data that are given on demand, the company Axonize offers a platform that continually analyzes consumer data. Fourth, the capability of a startup to offer hardware, Its business approach is said to include having hardware provision, such as robotic components, drones, or cameras. The firm, for example, offers a platform for data analytics and a range of sensors for data collection. Elemental Machines.

Picture 2**.** Data Visualization of the Worldwide Startup

Dimensions		Characteristics				
Value proposition	Offering	Software		Software and services		Software, services and physical products	
	Key activity	Decision and strategy	Energy storage	Maintenance and safety	Energy consumption efficiency	Investment and trade	Co-creation
	Monetary value	Cost saving		Cost saving and additional revenue	Additional revenue	Intangible value	
	Customer segment	B2B		B2C		B2B and B2C	
Value architecture	AI technology	Data processing (processing data related to power consumption, market, finances, other business information)		Computer vision (processing image or video data)	Robotics	Natural language processing (processing text-based or audio files)	
Value network	Supply chain segment	Energy generation-/supply- oriented		Consumption-oriented	Distribution-oriented	Overarching (not restricted to a segment)	
	Energy system	Decentral		Central		Independent	
Value finance	Revenue stream	Product- and license-based		Subscription		Performance-based and case-by-case based	

Picture 3. Business model taxonomy of AI startups

There was discovered that the four characteristics of value delivery mechanism, level of customization, client, and industry scope can be used to categorize Worldwide Startup business models. The delivery mechanism first explains how the customer receives the value. Startups either provide software in a variety of formats (such as online, desktop, either offer configurable user interfaces at the code level, or they offer software as a service (on-premise, cloud, and mobile) (such as application programmable interfaces). interfaces and SDKs (software development kits), platforms as a service, or just the base technology alone, without any other elements Applications for software or programmable interfaces (such as lines of code and particular algorithms). Hugging Face, for instance, is a business that offers thorough application-programmable interfaces for NLP. On the other hand, some startups only offer the products that AI produces; they don't offer their consumers any software or hardware. The startup Cyclica, for instance, does not provide its consumers with direct access to its technologies. Instead, it offer outputs from artificial intelligence (AI) for finding novel drugs. The amount of customization, on the other hand, describes how the startup's good or service can be adapted and customized to meet the demands of various clients.Startups either offer the opportunity for full customisation, supply standardized goods or services without additional modification, or provide the potential for customization or individualization through parameterization or custom model training (e.g., in the case of fully programmable interfaces). Third, the client Indicates Whether the startup sells its goods or services directly to consumers, businesses, or both (B2C). Fourth, the industry's breadth reveals whether the startup's product or service is limited to a particular industry (industry focused) or whether it satisfies customer demands across sectors (industry agnostic). For instance, Notable provides a solution for the healthcare industry, whereas Wisdom AI provides a customer service solution that can be used in a range of organizations.

It has been shown that the dimension of customer charge may be utilized to classify Worldwide Startup business models according to how much value is captured. Startups throughout the world either give away their products and services for free, charge a one-time price, or use a transactional, subscription-based, or transactional business model. For instance, while the startup Fakespot provides a free plugin, the company Kubit offers a number of membership levels for its service.

4. Conclusion

Startups are very swiftly developing that use AI technology into their products or services. Despite their keen interest in global startups, venture capitalists and investors must ensure their long-term success and survival, These businesses will eventually need to find a successful business plan. On the one hand, recent study prompted researchers to believe that AI enterprises do utilize unusual or unique business models. The majority of what is presently being sold as AI, however, has been there for a while, according to the solid evidence that was also found. Since a fundamental explanation would be essential for both study and practice, the question of how potential Worldwide Startup business models may vary from usual IT-related business models has been raised. A business model taxonomy for AI enterprises was developed in order to address this research issue and highlight the key elements of these business models. Further application of the taxonomy and cluster analysis led to the identification of four archetypal business model categories for AI enterprises : Deep Tech Researcher, Data Analytics Provider, AI Product/Service Provider, and AI Development Facilitator. With regard to the background of the current study on business models connected to IT, it further condensed the distinctive characteristics of Worldwide Startup business models. There are three key findings: (1) AI capabilities open up new chances for value propositions; (2) data plays many roles and is typically—but not always—important to value creation; and (3) AI technology has the potential to have unique impacts on business logic as a whole. furthermore discussed many intriguing directions for future research on AI in business.

These add to the growing body of research on entrepreneurship and artificial intelligence-based business models. The first distilled the distinctive qualities of Worldwide Startup business models in order to increase understanding of how AI technology would effect entrepreneurship and business models. provided intriguing avenues of inquiry to guide further research on AI in entrepreneurship, second. gave one of the earliest comprehensive assessments of commercial concepts including artificial intelligence. The taxonomy and patterns emphasize the key characteristics and features of global startup business models as well as their typical expressions. Practitioners can utilize the taxonomy and patterns as a tool to promote entrepreneurial behavior. Additionally, help create a broad and diverse global startup environment.

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