

DATA VISUALIZATION OF INVESTMENT AND VALUATION IN GLOBAL STARTUP COMPANIES

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Abstract

This study aims to analyze and visualize trends in funding, valuation, and investor activities across global startups. Using a descriptive analysis with a quantitative approach, the research involves data acquisition, processing, visualization, and interpretation of data. Power BI is utilized as a data visualization tool, creating an interactive dashboard to facilitate exploration and identification of funding and investor activities. The study leverages a Kaggle dataset that includes 5,000 startups from ten different industries in different nations between 2000 and 2023. The study finds that HealthTech startups receive the highest total investment of \$1.64 trillion. This investment came from 17,682 investors with a total of 685 startups or around 13.5% of the total existing startups. A correlation coefficient of 0.88 indicates a strong relationship between valuation and investment, suggesting that investors prefer high-valuation industries. In other words, industrial sectors with high valuations attract investors to invest. In addition, Australia is a major global investment destination with the largest startup growth and number of investors. This research shows the importance of utilizing data visualization to support understanding and strategic decision-making in the startup ecosystem at the global level.

Keywords: Investment, Valuation, Startup, Data Visualization, Power BI, Decision Making

INTRODUCTION

In today's digital era, startups play a crucial role in driving global economic growth (Likhacheva et al., 2018). These companies are growing rapidly by leveraging technology to deliver innovative, efficient, and market-driven solutions (Kamboj, 2024). Investment and funding are also key indicators in measuring startup growth, both in early and later stages (Nazir & Tbaishat, 2023).

Globally, startups contribute significantly to job creation and innovation acceleration (Rong, 2025). With the increasing adoption of digital technologies and the internet, the startup ecosystem is becoming more dynamic and spans across sectors such as information technology, health, education, finance (fintech), and renewable energy (Putra et al., 2025). As stated by Autio et al. (2018), digital ecosystems and technological affordances play a crucial role in shaping startup emergence and innovation dynamics across regions.

Worldwide investment in startups has reached significant levels. According to KPMG's 2025 report, global venture capital investment in 2024 totaled US\$368.3 billion, up from US\$349.4 billion in 2023. The United States led with US\$209 billion, followed by the Asia-Pacific region with US\$78.8 billion and Europe with US\$15.6 billion in Q4 2024. Artificial Intelligence (AI) emerged as a top sector, with five major companies including OpenAI and Databricks raising up to US\$32.2 billion in a single quarter.

In Indonesia, startup growth shows a positive trend, supported by the rise of unicorns and investments from both local and international sources. Audretsch and Belitski (2021) suggest that institutions and government policies play a critical role in shaping regional entrepreneurial ecosystems and influencing startup development trajectories. The e-Conomy SEA 2024 report by Google, Temasek, and Bain & Company estimated that Indonesia's digital economy would reach a Gross Merchandise Value (GMV) of US\$90 billion in 2024, the largest in Southeast Asia. This growth is primarily driven by e-commerce, digital payments, and AI adoption. In particular, the interaction between traditional financial institutions and FinTech startups has significantly influenced innovation diffusion and investment partnerships (Hornuf et al., 2021).

Startup funding typically occurs in several stages: pre-seed, seed, Series A, B, C, and beyond. Each stage reflects different levels of company development and valuation. As emphasized by Grilli, Mrkajic, and Latifi (2021), financial capital is a strategic resource that empowers startups to pursue innovation, expand operations, and strengthen their competitive positioning in uncertain and rapidly changing markets. In addition, new financing channels such as equity crowdfunding are becoming relevant in democratizing access to capital for startups (Cumming et al., 2021). Thus, understanding investment trends and distribution is essential for investors seeking to reduce risks and optimize returns, as well as for startups planning their growth and capital strategies.

However, accessing real-time investment and growth data globally remains a challenge due to data privacy, limited public access, and proprietary restrictions. For academic and analytical skill development purposes, this study uses synthetic data, artificially generated using algorithms to simulate real-world characteristics. Kaggle, a platform offering various educational datasets, is the source of the synthetic dataset on startups and global investments used in this research.

The main problem addressed in this research is the limited accessibility to real-time data on global startup investment and valuation, which hinders in-depth understanding of

funding trends and investor behavior. The novelty of this study lies in the application of Power BI to comprehensively visualize synthetic startup data, a method that has been rarely explored in previous studies. Furthermore, this research fills a gap in the existing literature concerning the lack of simulation-based visual approaches to analyze the dynamics of global startup investments.

The dataset includes information on startup companies, geographical locations, industry sectors, funding types, and investment amounts. While the data does not reflect actual market conditions, its structure and patterns mimic real-world scenarios, making it useful for simulation-based analysis.

This study uses Power BI to process, analyze, and visualize the data. Power BI is a business intelligence platform by Microsoft known for its capability to present dynamic, interactive visualizations. It not only simplifies the identification of data patterns and trends but also enhances understanding through intuitive and engaging visual representations.

The study focuses on analyzing startups worldwide using synthetic data, with key areas of analysis including the top-funded startups, those with the highest valuations, countries with the most investor activity, and investment distribution patterns by industry sector and funding stage. The goal is to provide insights for both investors and startup founders to better navigate the global startup ecosystem.

This research aims to serve as an educational simulation, illustrating how data can be leveraged in business reporting, investment risk assessment, and growth potential evaluation for startups across regions. It also contributes to knowledge development in data analysis using Power BI, and offers a practical reference for applying data visualization techniques in both real and simulated case studies.

The research question proposed is: “What are the patterns of the relationship between investment, valuation, and investor activity in global startups based on synthetic data analysis?” The objective of this study is to analyze funding and valuation patterns and to visualize them interactively in order to provide strategic insights for relevant stakeholders.

REVIEW OF LITERATURE

Startup

According to Kidder (2012), a startup is a new venture built from an original idea by its founder, oriented toward rapid growth, with significant risks and potential profits, measurable through analytical methods, and holding the potential to become a market leader in its industry. Another perspective is offered by Blank and Dorf (2012), who define a startup as a temporary organization formed to discover a suitable business model amidst uncertainty. In other words, a startup is the early form of a business still in the process of identifying its identity and direction. Ries (2011) similarly defines a startup as a group of individuals who develop and offer new products or services in unstable market conditions. The primary goal is to find a suitable business model while navigating high levels of market uncertainty. This distinguishes startups from established companies.

In venture capital, startups are classified into several categories, such as Unicorns and Decacorns. According to Brown & Wiles (2015), the term "unicorn" refers to a startup with a market valuation of at least USD 1 billion, which has not yet gone public, has received at least one round of institutional funding, and is not a spin-off from a public company. Meanwhile, a Decacorn is a startup with a valuation of USD 10 billion or more (Jahidi, 2022).

It can be concluded that a startup is an organization or company that has been newly established and is still in its early stages of development. The main characteristics of a startup include a focus on market exploration, research and development of new products or services, and efforts to discover the most suitable business model in a highly uncertain market environment. The ultimate goal of a startup is to identify an appropriate market segment and build a sustainable business model.

According to Marikxon (2018), common characteristics of startups include:

- A small number of employees, typically fewer than 20 people.
- A company age of less than three years.
- A primary focus on technology-based sectors.
- An annual net revenue of less than USD 100,000.
- Currently in the development or growth phase.
- Business operations conducted through a website.
- Products usually offered in the form of digital applications.

Investment

Investment plays a crucial role in financial decision-making, both for individuals and companies. According to Adnyana (2020), investment is a deliberate action taken by an individual to allocate funds, time, or other valuable resources into a venture or opportunity, with the objective of generating a greater return in the future compared to the initial capital invested.

In general, investments are categorized into two types: real assets and financial assets, each of which has its own advantages and disadvantages (Oliver in Firmansyah & Matoviany, 2021). The primary motivation behind investment is typically driven by the desire to earn profits from the allocated capital, along with the potential to achieve the expected outcomes (Adnyana, 2020).

Startup Funding Stages

Startups generally seek funding from various sources. As the business prospects and potential increase, the amount of funding they receive typically grows as well. There are three main types of funding commonly used by startups:

1. **Bootstrapping**
Bootstrapping is a form of funding in which the startup founders use their personal funds to finance the business operations until they attract investors who are willing to provide additional capital (Jha, 2023).
2. **Seed Funding**
Seed funding refers to the initial capital received by a startup, aimed at proving that their business idea is viable before pursuing further funding rounds.
3. **Series A, B, C Funding, and Beyond**
Following the seed funding stage, startups may proceed to subsequent funding rounds such as Series A, B, C, and beyond. In these stages, they typically receive capital from venture capital firms in exchange for equity ownership in the company.

Valuation

According to Djaja (2019:4), valuation is the process of determining, measuring, and justifying various related variables in order to calculate the value of a company. In other

words, valuation is a method or approach used to determine the fair (intrinsic) value of a company, whether it is already publicly listed, not yet listed, or planning to go public. This definition aligns with Budiman (2020), who states that valuation is a method to determine the value of an investment, which is then compared with its current market value. This market price is influenced by dynamic market factors.

Another definition is provided by Asnawi (2011:25), who complements the previous definitions by describing valuation as an effort to determine a company's fair value. This valuation process is not only important in the context of financial management but also plays a broader role in business. By knowing a company's intrinsic value, one can assess whether the business is in a healthy condition.

In conclusion, valuation is a systematic process used to determine and justify the intrinsic or fair value of a company or investment. It involves measuring various relevant variables and aims to assess the fundamental value of an entity, regardless of market price fluctuations driven by external dynamics. Furthermore, valuation is not only crucial in financial management to evaluate business health, but also essential for investment decision-making and strategic planning, whether for public or soon-to-be-public companies.

Relationship Between Investment And Valuation

Investment and valuation have a mutually reinforcing relationship that is crucial in the development of startups. Investment acts as vital funding support to develop products, expand market reach, and strengthen organizational structure. In turn, valuation represents the economic worth of a startup and serves as a key benchmark in funding negotiations. Startups with higher valuations are generally more attractive to investors due to their perceived strong growth potential and lower associated risks.

Several studies support this view. Dewi (2023) emphasized that the Scorecard Valuation method is particularly relevant for assessing early-stage startups without financial histories, as it incorporates qualitative factors such as team strength, market size, and competitive advantages. Similarly, Windari et al. (2022), in their study on Panak.id, highlighted the importance of non-financial aspects in attracting investments. Moreover, Apriyanthi et al. (2022) suggested that combining the Scorecard approach with financial statement analysis can provide a more comprehensive valuation assessment. Accurate valuation not only facilitates investment acquisition but also reflects the startup's readiness and competitiveness in a dynamic market environment. This finding is consistent with Lerner and Nanda (2020), who emphasized that valuation serves as a crucial proxy for innovation potential, which is central in investment decisions involving high uncertainty.

Data Visualization

Data visualization is a combination of art and science. It is a method used to visually present data in order to help people understand the meaning and significance of data by providing a clear visual context (Few, 2008). Data visualization is a crucial stage in the data science process. After data is collected, processed, and modeled, the results must be visualized to enable proper interpretation. Visualization plays a vital role in displaying outputs to monitor performance and ensure that the built models function as expected (Sosulski, 2018).

Data visualization is not merely about turning data into visual charts or graphs, it also requires careful planning. Each type of data demands a visualization technique that aligns with its context and purpose. To produce effective visualizations, collaboration from various

disciplines is required, such as statistics, data mining, graphic design, and information visualization (Kirk, 2019).

In conclusion, data visualization holds a crucial role in the data science workflow. Following data collection, processing, and modeling, visualization becomes essential for interpreting the resulting insights. This process not only displays model outputs for performance monitoring and validation, but also represents a blend of artistic skill and scientific methodology. Through visual representation, data is presented in a meaningful context, facilitating a deeper understanding of the information's meaning and significance.

Power BI

Power BI is a Business Intelligence application developed by Microsoft that functions to present data visualizations, perform queries, connect to data sources, and compile reports (Ronald, 2008). The application is user-friendly due to its interface being similar to other Microsoft Office products. In addition, Power BI is capable of managing data in-depth and presenting it in an interactive visual format. In the business world, Power BI offers the ability to explore and manage data efficiently, resulting in deeper insights to support more accurate decision-making. By emphasizing data utilization, Power BI has become a vital tool in the implementation of business intelligence concepts (Bororing, 2022).

Power BI can be accessed through three types of platforms: a desktop version that can be installed on a computer or laptop, a web version accessible via a browser, and a mobile version designed for smartphones. The application is available in both free and paid versions, depending on user needs. Power BI greatly assists business analysts in creating reports and analyzing company business processes. Furthermore, Power BI is capable of integrating various data sources such as databases, files, and web services automatically. Its gateway feature enables the combination of data from various sources, both cloud-based and non-cloud-based, including connections to SQL Server databases, Analysis Services models, and other data sources (Stiawan et al., 2022).

By using Power BI, analysis results are presented in the form of interactive dashboards that allow users to explore data and gain in-depth insights into funding and valuation trends in startups based on the synthesized dataset used.

Dashboard

A dashboard is a visual display designed to present key information in graphical form, with the aim of providing a data summary that is easy to understand and quickly accessible (Nunes et al., 2020). Dashboards serve as a reference point for determining the next strategic steps in decision-making. A well-designed visual layout can enhance user engagement and facilitate comprehension of the information presented through graphic elements (Rahmawati, 2022).

Interactive dashboards offer various advantages, such as simplifying data analysis and presentation, as well as aiding in the formulation of better objectives and the creation of more accurate forecasts. Other benefits include the ability to display and organize critical categories, measure and visualize Key Performance Indicators (KPIs), support analytical processes, and deliver real-time data updates (Rahman et al., 2025).

RESEARCH METHOD

This study adopts a descriptive quantitative approach, which aims to describe the characteristics of a phenomenon by collecting numerical data and analyzing it statistically,

systematically, factually, and accurately. This method is utilized to provide a general overview of specific variables without seeking causal relationships. A quantitative approach was chosen because the data being processed and analyzed consist of numerical values related to startup funding and valuation. The research utilizes secondary data in the form of synthetic datasets related to global startup investment. The dataset was obtained from the Kaggle platform, which offers educational datasets for simulation analysis. Although the dataset does not reflect actual market conditions, it is designed to mimic realistic patterns commonly found in real-world startup and investment environments.

The data was retrieved on May 7, 2025, from <https://www.kaggle.com/datasets/adilshamim8/startup-growth-and-investment-data>. The dataset file is titled `startup_growth_investment_data`, in CSV format, with a file size of 372 KB. It contains 5,000 rows and nine columns with the following variables (data types): (1) startup name (categorical); (2) industry (categorical); (3) funding rounds (numerical); (4) investment amount (numerical); (5) valuation (USD) (numerical); (6) number of investment (numerical); (7) country (categorical); (8) year founded (numerical); dan (9) growth rate (numerical).

The dataset holds a usability score of 10.00, which is Kaggle's automated metric (ranging from 0 to 10) evaluating the ease of use and implementation potential based on documentation and metadata quality. The data collection was conducted by downloading the synthetic dataset from Kaggle. According to Han et al. (2011), a dataset is a structured and systematically organized collection of data, commonly used for analysis, model training, or decision-making. As stated by Choi et al. (2017), synthetic data refers to artificially generated data that simulates the characteristics of real datasets. It is commonly used when original data is unavailable, sensitive, or required for testing purposes without exposing real information. The dataset was initially opened using Microsoft Excel (MS Excel) to identify its specifications, including column names, data types, and values. Since the dataset was in CSV (Comma Separated Value) format, a transformation process was required to convert the data from plain text format into structured columns (text to column). This step was essential to enhance data readability and facilitate further analysis.

During this stage, a technical issue was encountered due to the large number of digits in the Valuation (USD) variable. MS Excel automatically converted these values into thousands (Number format) or scientific notation (General format), leading to significant discrepancies from the original values. For instance, an original value of 6621448041.824468 (approximately 6.6 billion, 10 digits before the decimal point) was incorrectly converted to 6,621,448,041,824,460 (6.621 trillion, 16 digits) in Number format and to scientific notation 6.62145E+15 in General format. In this conversion, the decimal portion .824468 was incorrectly merged into the whole number, altering the actual monetary value. The correct representation should have remained 6,621,448,041.824468. In the English (USA) number style, commas indicate thousand separators, which are critical for accurate computation, while periods serve as decimal points (unlike the Indonesian style where the usage is reversed).

This formatting issue also occurred when importing the original dataset into Power BI. Therefore, technical handling was necessary to ensure the data's integrity before being utilized in Power BI for visualization purposes. This is particularly important in investment-related research, as inaccurate data presentation may lead to incorrect investment decisions

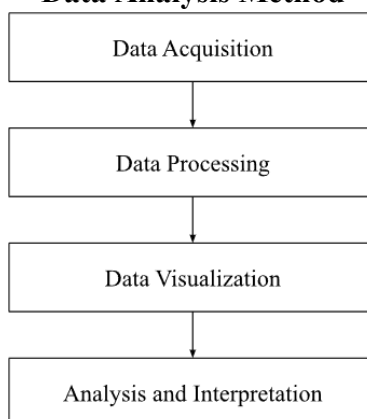
in certain industrial sectors. To overcome this issue, the dataset was first imported into a MySQL database engine. The MySQL database then served as the data source for Power BI for data modeling and visualization. Unlike the CSV file format interpreted in MS Excel, the dataset imported into MySQL retained its original numerical values and formatting. Consequently, the data consumed by Power BI from the MySQL data source accurately reflects the original dataset without unintended transformations. Figure 1 illustrates the data acquisition workflow for investment and valuation of global startups.

Figure 1.
Data Acquisition Workflow



The analytical method employed is descriptive quantitative analysis, which aims to describe data characteristics and identify patterns relevant to startup funding and valuation. The steps of the data analysis can be seen in Figure 2.

Figure 2.
Data Analysis Method



1. Data Acquisition: Understanding the structure of the dataset, including column names (e.g., startup name, location, industry sector, funding type, investment amount, valuation) and associated data types.
2. Data Processing: Conducting data cleaning and transformation as necessary, even though synthetic data generally requires minimal adjustment.
3. Data Visualization: Presenting the processed data visually using charts, graphs, and dashboards.
4. Analysis and Interpretation: Calculating and interpreting descriptive statistics to extract insights.

The primary tool used in this research is Microsoft Power BI, which enables data processing, modeling, and visualization. Power BI was selected due to its capabilities in the following areas:

1. Importing data from various sources (e.g., Excel, CSV, databases)
2. Performing data transformation and modeling
3. Creating interactive and dynamic visualizations (dashboards, charts, tables)
4. Facilitating the identification of patterns and trends effectively

This methodological framework was systematically designed to process synthetic data using a descriptive quantitative technique with the support of Power BI. The final outputs are presented in informative visual formats to support analysis and decision-making.

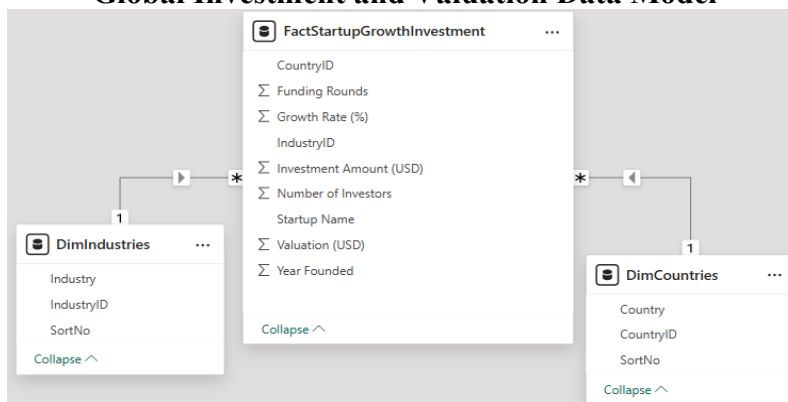
RESULTS AND DISCUSSION

Global Investment and Valuation Data Model

The original dataset consists of a single table, which functions as a transactional or fact table. However, complex aggregation requirements and advanced visualizations such as custom sorting beyond simple ascending or descending orders necessitate a more structured approach to data modeling. To address this, the data was normalized into three separate tables. Two tables were defined as dimension tables, named DimCountries and DimIndustries, while the remaining table serves as the fact table, titled FactStartupGrowthInvestment. This naming convention follows standard practices in Business Intelligence (BI) and data warehouse design, where dimension and fact tables are used to optimize data storage and retrieval for analytical purposes.

The dimension tables contain primary keys (CountryID and IndustryID), which are linked to the corresponding foreign keys in the fact table. These relationships are defined with a one-to-many cardinality, allowing for efficient querying and slicing of the data. This data modeling approach supports better performance and maintainability during the implementation stage and enables the creation of more dynamic and insightful visualizations. The resulting data model for global startup investment and valuation is illustrated in Figure 3.

Figure 3.
Global Investment and Valuation Data Model



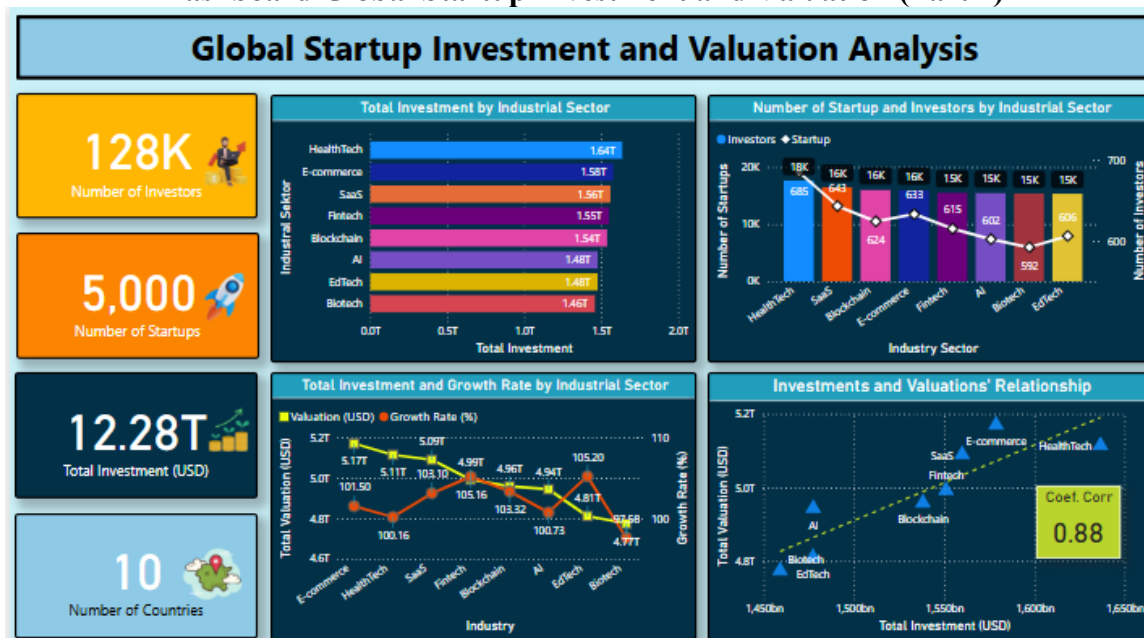
The fact table serves as the central repository that stores quantitative metrics and values to be analyzed, such as Average Funding per Year, Average Funding Rounds, Growth

Rate (%), Investment Value, Number of Investors, and Startup Age. These metrics represent key indicators used to evaluate the performance and development of startup companies.

Dashboard Global Startup Investment and Valuation

Figure 4.

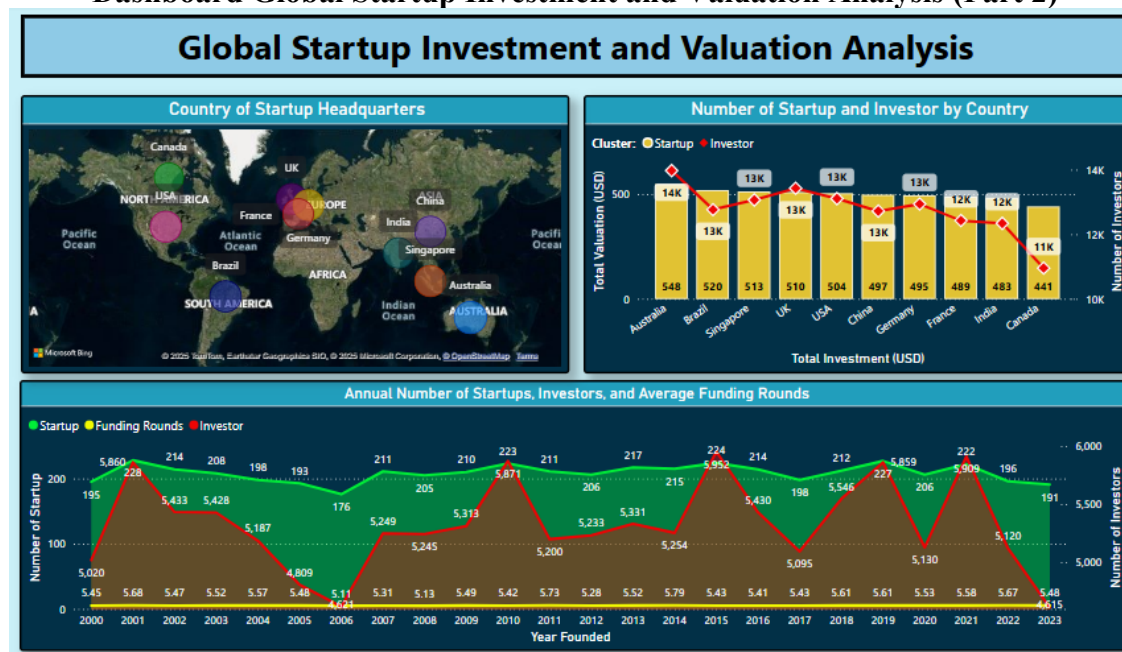
Dashboard Global Startup Investment and Valuation (Part 1)



From the perspective of valuation and startup growth, E-Commerce is the sector with the highest valuation reaching \$5.17 trillion with an average startup growth rate of 101.5%. The sector with the highest growth is EdTech, reaching 105.20% with a total valuation of \$4.81 trillion. The sector with the lowest valuation and growth is BioTech, with totals of \$4.77 trillion and 97.58%, respectively. Other sectors' valuation and growth values are as follows: HealthTech \$5.11 trillion and 100.16%, SaaS \$5.09 trillion and 103.10%, FinTech \$4.49 trillion and 103.30%, and AI \$4.81 trillion and 100.73%.

On the same dashboard, it can also be seen that the higher the investment value in an industry sector, the higher the valuation value in that sector. Although there is an anomaly in the E-Commerce sector, which has a total investment of \$1.58 trillion, lower than the total investment in HealthTech at \$1.64 trillion, the total valuation of E-Commerce (\$5.17 trillion) surpasses that of HealthTech (\$5.11 trillion). In general, it can be concluded that there is a strong relationship between the variables of investment and valuation. This is supported by the correlation coefficient, which reaches a score of 0.88. Based on this information, it can be interpreted that investors tend to decide to invest in industry sectors with high valuation values. In other words, industry sectors with high valuation values attract investors to invest.

Figure 5.
Dashboard Global Startup Investment and Valuation Analysis (Part 2)



Based on the dashboard in Figure 5, it can be observed that the headquarters of startups are spread across ten countries, namely: Australia, Brazil, Canada, China, France, Germany, India, Singapore, the UK, and the USA. Australia is the country with the highest number of startups and investors, with 548 startups and 14K (13,973) investors. The rise of startup activity in countries like Australia and Singapore can also be attributed to strong policy support and investor-friendly environments (Block et al., 2018). Meanwhile, the country with the smallest number of startups and investors is Canada, with 441 startups and 11K (10,955) investors. The distribution of startups and investors in the other eight countries is as follows: Brazil 520 and 13K (12,764), Singapore 513 and 13K (13,064), UK 510 and 13K (13,426), USA 504 and 13K (13,104), China 497 and 13K (12,720), Germany 495 and 13K (12,937), France 489 and 12K (12,427), and India 483 and 12K (12,340).

Furthermore, analysis of the startup establishment trends by year shows a fluctuating pattern. The period from 2000 to 2023 exhibited several peaks of growth but was also marked by significant declines. In 2020, there were 195 startups receiving funding support from 5,020 investors. A year later, the number of startups rose to 228, an increase of approximately 16.92%. However, for five consecutive years from 2002 to 2006, the number of startups continuously decreased. The lowest number of startups occurred in 2006, with 176 startups, which is the lowest count in 24 years, despite being supported by 4,621 investors.

This decline is identified as an impact of the global financial crisis. During that period, investor sentiment tended to decline, causing funding flows to startups to be constrained. Nevertheless, four years after the crisis, from 2007 to 2010, a recovery occurred, marked by an increase in the number of startups established. This reflects the resilience of the startup ecosystem in facing global economic pressures. Another notable decline happened around 2020, coinciding with the global COVID-19 pandemic. The health crisis brought systemic impacts on the global economy, including a decrease in investment volume and

operational restrictions on startups. The highest number of startups over the 24-year span was recorded in 2015, with 224 startups funded by 5,952 investors.

In addition, the average funding rounds per startup per year remain relatively consistent at approximately 5.49 (Series E Funding). This indicates that the number of funding rounds a startup has received from its inception until now has passed mature stages (Funding Round 4 / Series D Funding). This finding can be interpreted as a form of long-term investor confidence in startups. The greater the number of funding rounds obtained indicates broader economies of scale, sustainable expansion strategies, and increased investor trust in the startups.

These findings align with previous studies highlighting the positive relationship between startup valuation and funding levels. For example, Colombo et al. (2018) emphasized that high valuation increases investor interest due to the potential for higher returns and successful exits. However, Pantea and Tkacik (2024) in their systematic review of venture capital and high-tech startups in Europe report that venture capital contributes not only through financial resources but also through non-financial support such as know how, networks, and institutional capacities, influencing firm growth in multiple dimensions. The strength of this study lies in its use of interactive visual analytics through Power BI, which offers deeper insights into global investment patterns. Its limitation, however, is the use of synthetic data, which although realistic does not fully capture real-world dynamics.

CONCLUSION

Based on the data visualization results, patterns of funding, valuation, and investor activities from various global startups. HealthTech is the sector with the highest total investment, reaching \$1.64 trillion. This sector comprises 685 startups, approximately 13.5% of the total startups, supported by 17,682 investors. Furthermore, there is a strong correlation between investment and valuation variables, evidenced by a correlation coefficient score of 0.88. This indicates that sectors with high valuations attract investors to invest. In other words, investor behavior tends to favor industries with high valuations. Additionally, Australia emerges as the primary destination for global investment, hosting the highest number of startups—548 startups funded by 13,973 investors.

This study highlights the importance of utilizing data visualization to support understanding and strategic decision-making within the global startup ecosystem. Overall, the findings emphasize the significance of using visualization platforms such as Power BI to interpret data efficiently and informatively. Through a quantitative descriptive approach, the resulting interactive dashboards facilitate more focused data analysis, support strategic decision-making, and serve as educational tools to comprehend investment and valuation trends in the global startup world.

This study is expected to serve as a practical reference for applying data analytics technology in both simulated and real-world contexts. Future research may continue to explore relationships among existing variables and conduct forecasting on startup growth, investment values, and valuations. Furthermore, subsequent studies could investigate the impact of startup development on economic growth in the communities where these startups operate.

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