

BUSINESS VALUATION ACROSS THE INDUSTRY LIFE CYCLE: FOCUS ON INTERNET-ENABLED BUSINESSES

Ph.D. Thesis – Summary

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1. Summary of the Ph.D. Thesis

While the importance and overall reach of the internet are undisputed, researchers of related fields, such as the valuation of internet-enabled businesses, are often left in the dust by the development speed. During the seven-year period in which the Ph.D. study was carried out (2016 - 2023), the business environment, business processes, and workflows have been dramatically reshaped. Following the launch of 5G in 2019, which enabled completely new possibilities such as IoT, AI, M2M communication in addition to very fast, low-latency wireless communication (Attaran, 2021), COVID-19 forced on one side, all employees working from a computer to work from home and on the other side forced virtually all companies to embrace digitalization. The entirety of the human economic system was effectively obliged to decentralize overnight and use a relatively new system of interaction as its backbone. COVID-19 will likely have everlasting effects on society and represents the starting point “of new digital products and services based on the principle of flexibility” (Almeida et al., 2020). Lastly, with the commercialization of Starlink, virtually every human could gain access to the internet for unprecedented connectivity.

With virtually every emerging technology relying on the internet and digitally driven ecosystems, ranging from metaverses to machine-to-machine communication and IoT, which according to Ericsson, should comprise 24 billion connected devices by 2050 (Ericsson, 2023), the relevance of understanding what drives the valuation of internet-driven companies is more important than ever. The study provides entrepreneurs, shareholders, and other stakeholders with a new framework to optimize business, financing structures, and exit points once they are not the best owners. In addition to few empirical studies in the field, even fewer address the topic of change over time while examining the entire internet sector to draw conclusions for future industries.

1.1. Scientific Reasons and Arguments Based on Trends and Developments in the Scientific Literature

Despite the research idea being ignited by practice-rooted questions, the research phase could not answer the questions and showed multiple gaps between what is possible from the available data and the internet as a natural experiment perspective and available research. Limitations of existing research can be grouped into three categories. Firstly, most studies are performed at one point in time and do not evaluate if such conclusion changes over time or other indicators of industry development, let alone over half of the lifespan of internet-driven business models. Secondly, all studies focus on a limited number of peers compared to all companies that are relevant to this sector. And third, most studies focus on a limited number of financial information in terms of types of variables and timeframes. All three factors are required to answer the research questions the study has commenced with.

Relevant scientific literature can be grouped into finance literature, internet development literature, and internet-based business models. While the finance literature discusses the idea of change in multiples and drivers, there is little empirical research. In addition to providing a history of the development of the internet, Internet development literature covers extensively the lessons learned from the Dot-Com bubble from all perspectives. Despite extensively covering valuation trends in the Dot-Com literature, such studies do not continue in the post-Dot-Com period, leaving a void in understanding. The study of business models is particularly important as it defines the relevance of the findings to future industries that will sprout around the Internet ecosystem. While a direct extrapolation is difficult without knowing how such future models will resemble, the conclusions from past Internet industries will likely carry on into the future Internet industries.

The study complements and extends the current Internet-focused finance literature on one side, provides conclusions on the past development of certain Internet industries that could be extrapolated, and, most importantly, proposes a framework for such studies in the future.

While the present study will not harvest all the potential the internet as a natural experiment offers, it is the first study that tries to cover the entirety of the sector over a long period of 15 years with an extensive range of variables and tries to draw conceptual conclusions regarding the evolution of multiples and drivers of valuation across certain industry life stages.

1.2. Professional Reasons Based on Developments in the Field of Finance

Like technology, the art and science of business valuation have also evolved considerably over the last years. Driven by the internet's transparency across all economic sectors and, implicitly, the financial sector, finance professionals were pushed to be more transparent and precise. The urge for precision has created new metrics, such as the Rule of 40 or User-based Valuation Metrics, forcing investors to consider new factors besides traditional discounted cash flow methods when evaluating investments. New factors range from a company's ability to act as a consolidation platform for buy-and-build activities (the acquisition of smaller market players) to the company's ability to act as an organic platform by having excellent access to human capital and the ability to deploy new employees profitably from day one. The organic platform factor is of the essence for companies in knowledge-driven industries such as internet-driven businesses.

One such factor is the evolution of the relationship between valuation multiples and drivers and industry life cycles. While the change from Sales based multiples to Profitability based multiples is often mentioned in the practice of corporate finance, there is little empirical research to document such changes. Multi-year academic research goes beyond the pragmatic approach of corporate finance professionals in practice and is the correct setting to evaluate such factors without having time pressure or implicit biases.

This study tries to close this understanding gap and hopefully spark the introduction of a new valuation dimension to the toolbox of corporate finance professionals.

1.3. Summary of the Research Objective with Tangible Example

With the risk of oversimplifying the study's objective, a short explanation of the types of variables used, the relationship between the types of variables, and a short example illustrating the reason for conducting such a study will provide the background and perspectives required to understand the study. Comparing the sale or acquisition of a company with the sale or acquisition of an apartment will put all variables into perspective. The value of an apartment is usually calculated as Euro per square meter, with factors such as location or year of construction driving the price per square meter up or down. Applying this concept to companies, one arrives at value multiples defined as Euro per Unit of Revenue or Profit, and Growth or Profitability as the factor defining such values. While companies are organic beings that evolve, grow, and eventually die, the metrics used to value them vary over their lifetime. Furthermore, complex organisms such as companies have significantly more factors that can be measured compared to an apartment that is a non-evolving object. Consequently, the key valuation metric or base of "price per square meter" for companies does not always have to be the same and can change over time.

Depending on many reasons, the price for companies can be based on "price per revenue" or "price per some type of profitability or cash cash-flow" and can be driven by a multitude of factors like "location" or "year of construction." This study tries to find the "price per square meter" and the key factors changing this price, such as location and year of construction for companies over certain stages of their life.

1.4. Research Objectives and Approach: Considerations Concerning Expected Impact of Research Results

Considering the arguments above, describing the motivation for choosing to research this topic, and the mentioned research gaps in the academic literature as well as empirical professional knowledge combined with the tangible example, the importance of investigating and answering the research question can be summarized.

From an academic standpoint, the proposed research would fill four separate research gaps. Firstly, the proposed study would continue the series of analyses often focused on individual industries and points in time by expanding both the coverage through the inclusions of 21 separate industries and the time by covering 15 years of data representing half of the lifespan of the internet. Secondly, the proposed study would try to empirically demonstrate the change in bases and drivers over the industry life cycle that some scholars suggested. Thirdly, the study will try to find non-time-related variables to predict changes in bases and drivers, representing an entirely new area of research. Lastly, the framework developed together with

the well-researched clusters will provide an ecosystem for future research around the natural experiment of internet-enabled business models.

From a professional point of view, the research will add new insights into three separate areas. Firstly, the study will provide a tangible analysis of the development of multiples and drivers over a long time and segmented across 21 industries helping management teams and shareholders of such industries implement value-maximizing strategies. Secondly, the research introduces a new factor (the connection between relevant multiples/ drivers and industry life cycle) that can further improve valuations' precision. And lastly, it provides a framework that can be extrapolated to new internet-enabled industries helping the management teams and shareholders not to be surprised by fundamental changes in valuation bases and drivers.

The research approach is presented as a logical diagram together with all the research phases in Figure 1-1. ***The broad research objective can be summarized by condensing the four hypotheses that will be evaluated:***

- 1) Segmentation/clustering based on industries and business models will increase the explanatory power of Bases and Drivers;
- 2) Valuation Bases represented by valuation multiples change over the industry development from being Sales to being Profitability based;
- 3) Valuation Drivers represented by various financial metrics evolve over time from being Growth focused to being Profitability focused;
- 4) Metrics other than time can provide valuable insights into the inflection points of Bases and Drivers.

The ***operational objectives*** of each stage in the research process can be seen in Figure 1-1, shown in light blue, and can be discussed stage by stage. The first stage focuses on formulating the research questions and hypotheses based on the practice-rooted questions and the internet as a natural study. The second stage reviews the relevant literature to answer parts of the questions and derive the required building blocks for the overall study framework.

The third stage focuses on identifying, understanding, and clustering all companies for the study. This stage will be one of the most time-consuming as the study will review and classify thousands of companies. Furthermore, the stage will be implemented as exploratory research because the review of the business models will impact the classification of each company, while the clusters in which companies are classified are in a permanent chance since they need to be precise by grouping only comparable models while being sufficiently large for the later statistical analysis.

The fourth stage focuses on acquiring and processing the required data, which given the size of the study, will be a challenge requiring data analytical skills, while the fifth stage will perform the required descriptive and inferential statistical analyses to evaluate the hypotheses.

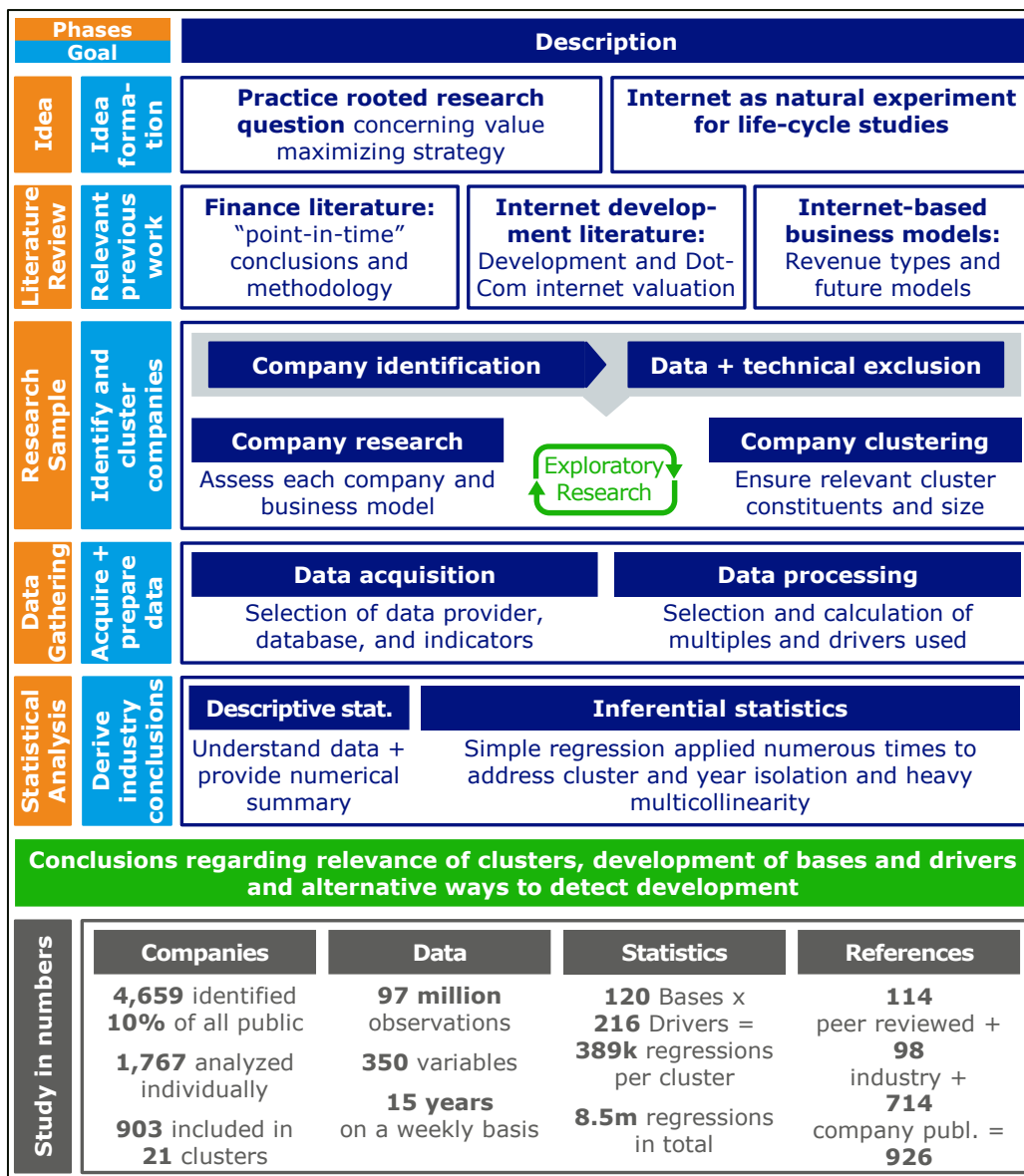


Figure 1-1: Logical research diagram with research stages (own illustration)

To highlight the size of the endeavor, some tangible numbers are worth emphasizing. The study identified 4,659 companies representing over 10% of all public companies worldwide, with 1,767 requiring individual analysis to find 903 companies that ended up in the final form of the study. These companies were clustered in 21 industries and analyzed separately across 120 Valuation Bases and 216 Valuation Drivers using weekly observations totaling over 97 million observations. Inferential statistics required implementing and analyzing over 8 million regressions to derive industry-level conclusions. It can be said that almost no shortcut was taken to derive and analyze such a large dataset.

To achieve the research objectives, a complex research methodology has been designed that is supported by methods and tools from different scientific fields such as management, database creation and management, data analytics, statistics, econometry, business financial analysis, and business valuation. The multidisciplinary design will be described in detail in each chapter. The chapters follow the operational objectives and study stages as described above and can be summarized as follows:

Chapter 1 sets the stage by explaining the motivation and relevance of the study in addition to describing the scientific, professional, and personal reasons for the endeavor. The chapter also provides a simplistic explanation of the concept of base and driver of valuation. The section also summarizes the stages of research, the research and knowledge gaps it tries to close, the research objects, and the operational objectives to implement the study. The chapter ends with a summary of the chapters.

Chapter 2 presents the research context and challenge and the internet as a natural experiment for such studies. The chapter starts with a short summary of the relevance of the internet in the context of industrial revolutions and technology adoption before diving into the history of the internet with the overarching goal of understanding the emergence of internet-enabled business models and their development. It continues with a detailed summary of the Dot-Com bubble and its valuation learnings and implications before discussing the bubble's aftermath and the emergence of sustainable business models. The next subchapter summarizes the types of business models and types of revenue before diving into future business models, their dependence on the internet, and the study's relevance for future models.

Chapter 3 continues the research context with a literature review of comparable studies, their findings, limitations, and learnings for the present study, in addition to summarizing professor's Damodaran work around life cycles. The chapter also briefly discusses the idea of valuation and its development over time, defining the research scenario, the hypotheses, and the proposed methodology.

Chapter 4 tackles the research sample by describing the methods used to identify, understand and classify the companies. While the summary of the work on a company level is presented in the Annexes, this chapter provides the background required to perform the work. The first sub-chapter describes the sources used to identify the companies and the process implemented to identify and assess every company. A simplified overview of the process is also presented and discussed. The second sub-chapter discusses the importance of clustering, key factors for clustering businesses, and summarizing relevant business models and clusters. While this sub-chapter is closely tied to each company's individual analysis and classification, the order represents the exploratory nature of the study in which included companies influence the cluster, and the clusters influence the inclusion of the companies. The chapter concludes by summarizing the clusters identified and their business models.

Chapter 5 continues the research by discussing the data acquisition and processing methodology. It starts by explaining potential data providers and data sources and the process followed to find the best source. The chapter continues by explaining the technical implementation of the acquisition as well as the relevant variables and time frames. The second sub-chapter discusses the data quality and provides coverage ratios, while the third sub-chapter presents the research variables split into Valuation Multiples (Bases) and Valuation Drivers in addition to the process of defining relevant ranges. The fourth sub-chapter explains the technological implementation for processing the data and arriving at the final dataset, while the fifth sub-chapter discusses the outcome in terms of size and quality.

Chapter 6 begins the statistical analysis with descriptive statistics to understand the data and the quantitative development of key ratios. Chapter 6 describes quantitatively the pool of companies included before diving into a comparison of valuation multiples over time and across industries and discussing the data tendencies of the variables included in the study.

While chapter 7 focuses more on developing bases and drives and industry-level conclusions on a conceptual level, chapter 6 provides the numerical summaries expected from an empirical study. The chapter concludes by summarizing the key learnings.

Chapter 7 continues the statistical analysis and dives into inferential statistics. The first sub-chapter explains the methodology, the reasoning behind choosing this certain methodology, the tested equation, and the technical implementation. The second sub-chapter is broken down into 21 further sub-chapters to discuss the results cluster-by-cluster or industry-by-industry basis. Such a detailed discussion is essential for the conclusion, as each cluster or industry represents a separate observation for testing the hypotheses. The last sub-chapter summarizes the learnings so that each hypothesis can be discussed individually. The first and second hypothesis is confirmed, while a variation of the third hypothesis is also confirmed. The study gathers sufficient evidence to neither confirm nor infirm the fourth hypothesis leaving room for future research.

Chapter 8 concludes the study by presenting the predominant conclusions, research limitations, original contributions to existing literature, and theoretical and applicative research. The study also discusses directions for future research in detail and divides these into areas that can be implemented using the current data and framework and areas that require new frameworks and/or data. The chapter ends by summarizing the praxiological implications for managers and shareholders.

The research results have also been the subject of different scientific articles published in journals and conference proceedings, as presented in ANNEX 7.

The thesis comprises 443 pages, of which 205 are the main work, 168 present the work on business models and clustering, and 64 show the references. The work also encompasses 80 tables, 49 figures and illustrations, and 7 annexes.

2. Conclusions. Contributions and Implications of the Research

2.1. General conclusions

As the title states, the goal of the thesis is to link the “industry life cycle” with the “business valuation” by using “internet-enabled” business models as the focus or case study. The intention is to observe the bases and drivers of relative valuation across the time period covered by the study, which corresponds with the time period in which internet-enabled businesses reached a certain level of maturity, and understand if the bases (multiples) and drivers (financial indicators) that explain the highest share of variation have changed. In the preparation of relative valuations, the literature and professional know-how suggest three generally valid concepts:

1. Comparability: companies included in a peer group (cluster) should have similar business models and financials;
2. Prices as multiples: the price of a company is to be calculated as Euro per unit of measurement (e.g., EV/ Revenue, EV/ EBITDA, Price per Earnings) using a similar analogy to the price per square meter; and

3. Multiples are “driven”: by various financial metrics such as Growth or margin, implying that a company with a higher growth rate or a higher margin should have a higher price per unit than one with lower growth or margin.

While this reasoning can be applied to virtually everything, businesses are complex entities with many financial variables that can be used to derive a valuation. Both the reference unit for the price and the indicators that increase or decrease the price per reference unit can be represented by virtually any financial metric. Furthermore, reference units and drivers can change over time depending on time, the life cycle of the company, or some industry financial metric.

This study implements the concept of “comparability” across all publicly listed companies with internet-enabled businesses to derive 21 clusters that can be used independently of each other over the period of 15 years to observe the shift in reference units for multiples (bases) and drivers.

The study demonstrates for internet-enabled businesses the relevance of clustering and, for several industries part of the internet-enabled sector, the shift from Revenue Multiples to Profitability Multiples and from Profitability Drivers to Drivers combining Growth and Profitability. The study also tries to suggest metrics in addition to time that could cause an inflection point in Multiples and Drivers, however, it cannot identify evidence for the one factor that causes these changes. In addition to this limitation, it should be noted that the study focused on evaluating the key research questions, ignoring other research directions that can be explored using the same framework and data.

Further limitations of the study include the focus on public companies and the focus on the growth and early maturity phases of the industry life cycles. Both limitations are technical in nature and would require the redesign of the study. In most cases, private companies provide no financial information or forecasts, making the analysis at this level of detail impossible. Including initial phases of the industry life cycles would require including private companies as most companies in this phase are not publicly listed. Furthermore, including such companies would require the removal of the story vs. financials story component limitation, which would come with a significantly lower ability to provide accurate and precise answers. Including the last phase (the decline phase) of an industry life cycle would require the selection of new industries since internet-enabled business models are far away from this life stage.

The inclusion of publicly listed companies reduces the applicability to private situations to some extent, as the return expectations for public companies are often significantly lower than for private ones. The data availability of public companies makes, however, such studies possible. A similar study only including private companies would be incredibly difficult to implement due to data availability and other limitations. Lastly, it should be noted that there are methods to adjust valuation multiples of public companies for private situations making the findings relevant.

Despite the limitations, demonstrating shifts in Multiples and Drivers could represent the stepping stone for future research and potentially a new element in the corporate valuation toolbox.

2.2. Original Contributions

The study contributes to the scientific literature and professional know-how in multiple ways and closes several research and knowledge gaps:

1. Extends the period covered by existing literature on the Dot-Com bubble or similar studies performed at single points in time to cover the period 2007-2021;
2. Delivers one for the first studies covering a long period of time (15 years) with each year compared to one another as opposed to single points in time or short time periods;
3. Covers most relevant internet-enabled industries as part of 21 clusters as opposed to focusing on a single industry or a small number of industries and delivers industry-level conclusions;
4. Provides an empirically determined link between the coming of age of internet-enabled industries and related shifts in the Valuation Multiples and Drivers potentially representing a new element in corporate valuation; and
5. Derives a framework that could be used to study additional elements of importance in corporate valuation.

2.3. Praxiological Implications of the Research Results

Having initiated the study with questions from managers and shareholders, it is only fair to end it with the praxiological implications and recommendations for value-maximizing strategies. The study adds to the list of matters that founders, managers, and shareholders need to watch out for the valuation bases and the valuation drivers.

The findings show that the derivation of precise valuation multiples and drivers depends on the precise clustering of business models implying that a good understanding of the business models and revenue models of similar companies and competitors can help triangulate their own valuation.

Concerning the multiples (valuation bases), the study demonstrates, using several industries as case studies, that once an industry reaches a certain level of maturity, its valuation multiples shift from being top-line-based to being profitability-based. While the intention was to pinpoint the switch and relate it to a variable or equation to accurately predict future shifts, the variables used for the prediction were not more useful than time. While this finding implies that valuation has a certain “art” component, what is certain is that once an industry achieves Profitability on average, after a certain amount of time (not immediately), the valuation base shifts towards Profitability. Beyond the obvious conclusion that Profitability is expected from a player if the industry is already profitable, it also shows that a growth strategy focusing on achieving Profitability at some point in the future is not necessarily value-generating and that the strategy should be geared towards Profitability if an exit is in sight.

Regarding drivers, the shift is also clear from Profitability or Growth alone towards combined drivers like the Rule of 40. This finding does not help solve the old Growth vs. margin dilemma, however, it highlights the importance of profitable Growth and positive unit economics for businesses where initial investment does not boost long-term Profitability (e.g., SaaS with high initial investment).

While the conclusions are generalized, the industry-level conclusions in the thesis should be consulted to determine a value-maximizing strategy.

3. List of References for the Summary

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