Research on Value Investment of Start-up Companies
-- A Case Study of Tomboy X & Eridan
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Abstract. This study investigates how investors can strengthen their value investment by applying the SWOT analysis in the Start-up company context. By conducting a constructive study with two cases, we develop a construction for qualitative and quantitative reference information with the help of the literature on Start-ups and value investment, the data on CB insights.com. This reference information for two Start-ups comprises funding data, investors, web traffic, news articles, patent data, and regulatory filings. This study also associates each information element to the internal factor assessment and external factor assessment of two Start-ups and accordingly develops metrics regarding the value investment. In addition, it demonstrates the different nature of two Start-ups for operating business to highlight the divergent value metrics. The key contributions of this study are the developed construction for qualitative and quantitative reference information and concluding that the founding team, market, product, business model, and competition are important factors for the development of Start-up company and investors’ decision-making. The results of this study, and particularly the developed criterion, build avenues for further research on Start-ups and value investment.

Keywords: Start-up Company; Value Investment; SWOT Analysis.

1. Introduction
The term of Start-up company appeared after the second world war and had a really significant development since the 90s. A firm is considered as a Start-up company that should possess some special characteristics, including innovation, new products, the rapid growth of its sales, and maximum age (vary from 5 to 12 years) [1-2]. In recent years, the definition of Start-ups is companies or ventures that are focused around a single product or service that the founders want to bring to market. These companies typically lack a fully developed business model and adequate capital to move into the next phase of business, which is the reason that they look for capital from a variety of sources such as venture capitalists, family and friends, crowdfunding, and loans. Since the birth of Start-up company, it has changed people’s production and lifestyle profoundly and played a particularly important role in technological advancement, local employment, and social impact in a short period of time. On the one hand, Start-up companies are closely integrated with the Internet and information technology in the early stages of market research. Especially, due to the advent of the big data era and market needs, Start-ups have acquired substantial new development opportunities and market shares. Meanwhile, a lot of entrepreneurial and innovative companies have emerged with the support of the country’s "double innovation" policy. According to the data provided by CB insights in December 2020, there are 372 Start-ups around the world valued at $1B+ and China’s Bytedance is the most valuable "unicorn" company in the Artificial Intelligence category, which values $140 billion, and followed by Didi Chuxing values $62 billion [3]. These are embodied the important position of Start-ups in the contemporary economic system. On the other hand, Start-up company has attracted more and more academic researchers. Villéger shows a positive relationship between Start-up company and time [4]. Chen argues that Start-up companies bring economic growth, wealth, and new social structures by introducing unique services and products [5]. Conversely, some scholars propose that Start-ups frequently encounter problems with market entry and growth, including a lack of reputation, legitimacy, and knowledge of the various business environments [6]. In a nutshell, there is minimal research of the Start-ups’ value, specifically how their competencies and evidence on
value investment are effectively displayed within investors. This paper will fill up the research gap in the literature and have a theoretical significance to some extent.

The core characteristic of this economic era is a rational investment based on value. The value investment theory is often associated with famous names like Graham, Fisher and Warren Buffet, and the aim is to find fundamentally strong shares whose intrinsic value exceeds the current market price. It is possible to say that value investment started with the publication of “Security Analysis” by Benjamin Graham and David Dodd in 1934. The authors describe the approach and investment techniques to achieve success in investing, regardless of the market cycle [7]. There are many factors that affect value investment in the stock market, including PEG, Debt/Total Assets, Operating Margin, ROE (Return on Equity), ROA (Return on Assets), gross margin, liquidity of the shares, company size, trust and so on [8-11]. Compared with the entire market, Basu uses the CAPM model to conclude that stocks with low price-to-earnings ratios can obtain excess returns, and vice versa [12]. Goodman and Peavy use the industry price-earnings ratio analysis to reach the same conclusion [13]. Undoubtedly, the value investment theory produces excess returns that are mainly caused by the time lag in the market’s perception of the value of listed companies and the market errors. These researches inspire scholars to link the basic analysis of value investment with some typical concepts for further research. According to the original F-score, Gimeno et al. conduct a value investing tool-neural F-Score-in order to significantly improves the portfolio returns [14]. Likewise, Curto specifically illustrates the value and investment of Equities in his work and emphasizes the interaction of inflation and bubbles within the CROCI framework [15]. Moreover, value investing is also the focus of domestic scholars’ research. Lu Fei believes that the return of value stocks is higher than growth stocks in the Chinese stock market [16]. Another empirical result shows that the Shanghai-Hong Kong Stock Connect has shown a clear trend of value regression in the entire Shanghai stock market by using the non-parametric panel data model [17]. And by testing the China stock market, Kong Lei finds that two indicators of P/B and P/E can diversify non-systematic risks and obtain market returns for investors [18]. Overall, researches on the value investing of stocks or securities are reaching maturity.

While the existing literature has largely focused on the value investing of stocks or securities, papers on the value investment of Start-up companies are scarce and rare. Investors’ value investment can not only obtain profit for themselves but provide financial support, governance structure, and human resource allocation for Start-up companies in different growth stages. Therefore, this paper is designed to fill this gap by exploring the Start-ups’ value characteristics with case analysis and providing the criteria of value investment for investors. In the analyses of cases, this paper applies SWOT analysis to assess internal and external factors from Tomboy X and Eridan, as well as current and future potential. It is hoped that this structured examination of the factors may help investors’ decision-making of investment and promote Start-ups' further development.

2. Data and Method

2.1 Data

This paper collects funding data, investors, web traffic, news articles, patent data, and regulatory filings of two Start-up companies available from CB insights.com. CB insights.com is a well-known venture capital data company that regularly publishes economic development trends such as a list of unicorn Start-up. The paper uses data from the beginning of 2013 to the end of 2020 to enhance the trustworthiness of the results. Furthermore, comments and interview data will be secondary data to supplement the study material. Then this section briefly overviews the two cases. The first Start-up company, Tomboy X, is an internet first private label brand for women's clothing and accessories with a focus on fit and quality in all-inclusive sizes. Tomboy X was founded in 2013 by Fran Dunaway and Naomi Gonzalez and is located in Seattle, Washington. The company initially focused effort on creating shirting for women who preferred more masculine clothes. Subsequently, the company's platform offers a wide range of apparel like underwear, bras, swimsuits, sleepwear, among
others, designed to fit bodies of all sizes and shapes and enable women to buy comfortable undergarments online as their personality and body. Naomi said the undergarments appealed to cisgender women, the transgender community, and non-binary people who struggled to find clothes they liked and that fit them. The company creates top quality and private label designs, curates retail products that reflect high standards and style, and cultivates community around the lifestyle brand. Tomboy is a word describing “a girl who enjoys rough, noisy activities traditionally associated with boys”. And in 2020, Tomboy X was listed as 231 in Inc Magazine's fastest-growing companies and increased 445% in three-year [19]. Notably, Tomboy X has raised a total of $24.3M in funding over 5 rounds. Their latest funding was raised on May 13, 2019, from a Series B round (Table1). The second Start-up, Eridan Communications, is developing RF transceiver technology for 5G software-defined power transceiver applications, has joined the Silicon Catalyst incubator. The company was in California and founded in 2013 by Douglas Kirkpatrick, Dubravko Babić and Earl McCune, three engineering PhDs. Eridan is building the world’s first digital sampling radio for 4G and 5G to improve connectivity for every person on earth. Moreover, Eridan's unique transceiver architecture produces all sub-6GHz cellular signals at full transmit power, a spectrum-flexible solution from VHF through 6 GHz, which offers data bandwidth-efficiency and power efficiency. This fully digital wireless signal generation approach consumes 5-10x less power to transmit the same amount of data. And it is applicable to 5G wireless infrastructure, defense and first responder, IoT applications. As previously stated, the two Start-up companies have a good development prospect in the future.

2.2 Method

The case study methodology is particularly suitable for this study for three reasons. First, this study aims to answer the question of how investors can achieve value investment, belonging to the category of "how" questions. It is also appropriate to use the case study method to present the dynamic value investment process. Second, the purpose of this study is to provide investors with selection criteria for value investment through systematically exploring the business model, operation mechanism, and founding team of Start-up companies. Furthermore, the demand for content richness is high, which makes it more appropriate to examine the question by adopting quantitative and qualitative methods. Third, academic researches on value investment in Start-up companies are still limited and at the exploratory stage. This study explores the formation of a newly established enterprise cognition in value investment. And the exploratory case study is especially suitable for all new or existing academic fields that lack adequate research.

Selecting Tomboy X and Eridan as the case study object is based on the following three criteria. First is the principle of importance and representativeness. Tomboy X is the first women-led apparel company that designs and makes eco-friendly, comfortable underwear for all sizes and genders. The operating growth rate is increased between 100% and 200% since it launched in 2013. Hence, the company’s successful digital production strategy and market orientation experience, which expand customer groups and retail sales, and set up a model in the industry. This also inspires high-potential
female leaders and Start-ups with at least one female in leadership. Eridan is a rapidly-growing Start-up building 5G radios to enable abundant wireless connectivity everywhere in the world. The company includes 21 registered patents primarily in the 'Basic Electronic Circuitry' category and 4 trademarks, with the most popular class being "Scientific and electric apparatus and instruments." Eridan has a leading position in 5G information technology and product development. Therefore, the study of two Start-ups follows the importance and representative principles of case selection. Second is the principle of theoretical sampling. The case study method selection of cases is based on filling in existing theoretical gaps or developing new theories, rather than statistical sampling reasons. Although previous studies considered the importance of Start-ups' growth, many of them are lack value investment understanding with Start-up companies. This study takes Tomboy X and Eridan as the research object, which tries to construct a value investing criteria for investors from the perspective of SWOT analysis. Thus, the study will improve relevant theories, promote Start-ups to perfect their operations, and realize the optimal allocation of capital resources in the Start-up market. The third is the consistency between the enterprise’s theoretical goal and its practice. The two cases have achieved significant success due to the key capabilities and innovation at the strategic, business and technology levels. Although the historical data is relatively incomplete from the Start-ups, the key indicators are prominent such as growth percentile, market cap, web traffic and patent. In short, the two cases are crucial to build a value investing criterion for investors. And this is consistent with the theoretical goal of constructing a value investment criterion. This study follows the case study procedure of identifying a research problem, theoretical review, case study draft design, data collection, and data analysis. By analyzing theory and data, the study maintains its focus and discovers theoretically innovative points.

3. Results and Discussion

SWOT analysis is a commonly used method for analyzing and positioning an organization’s resources and environment in four regions: Strengths, Weaknesses, Opportunities, and Threats. After identifying the factors in these four fields, the investors can recognize Start-ups’ core competencies for decision-making and investment through analyzing the results and determining the priorities.

3.1 Internal Factor Assessment

3.1.1 Strength

Tomboy X has an experienced and blended industry background team in marketing, merchandizing and designing, and Eridan’s management shows excellent ability to deliver 5G milestone and focus on RF area (Table 2). A good entrepreneurial team should be committed to creative, passionate, accomplished, work well together, and professional in technology, which is conducive to the well-development of Start-up companies.

Next, Tomboy X has registered 10 trademarks, with the popular class being “Clothing, footwear, headgear” and “advertising, business”. This company also actively applies 28 technology products and services, and 76 technologies for its website, including Viewport Meta, Mobile Compatible, SPF and SSL by Default. As a result, Tomboy X is ranked 80860 among websites globally based on its 464724 monthly web visitors. The site’s traffic in the United States accounted for the largest proportion (94%), and Canada had a greater increase in monthly visits growth (104.91%). Additionally, Tomboy X focuses on online retail and advertising on social media such as Facebook Ads, Instagram, Podcast ads and SEO. According to the Alexa’s referral sites, ordered by how many other websites link to them, the company has a good site’s reputation on the internet. The number of sites linking to tomboyx.com are 82, ranked third. The successful marketing channels are not a huge revenue source for the company but a great way to engage with customers and meet their needs at any time, which also further enhance the sales volume and reduce the cost of store rent and management. Similarly, the intellectual property of Eridan includes 26 registered patents and 2 pending patents primarily in the “Basic Electronic Circuitry” and “electric communication technique”
category (see Fig.1 for details) [20]. And the company has registered 4 trademarks, with the most popular class being “Scientific and electric apparatus and instruments”. These patents are the core competitiveness of Eridan whose founder recognizes the importance of basic technology research. Eridan’s breakthrough transceiver technology enables breathtaking wireless capabilities and allows for unprecedented communications systems performance.

**Table 2. Tomboy X & Eridan: Executive Team**

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<th>Start-up</th>
<th>Executive team</th>
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| Tomboy X | Fran Dunaway | Co-Founder & CEO | 1. Formerly partner & producer in a media strategies firm.  
2. 20 years of experience in managing people, systems and budgets.  
3. Director-level roles with political consulting firms.  
4. Executive Director of Equal Rights Washington. |
|          | Naomi Gonzalez | Co-Founder & COO | 1. 10 years of experience in sales and small business.  
2. Director at Prepaid Legal Services, Inc. |
|          | Julie Nomi | VP of Product | 1. Materials, Development & Innovation Head.  
2. 7 years Independent Consultant to Apparel Brands.  
3. 7 years Product Marketing Director, Limited Express.  
4. 10 years Product Management/ Development/ Sourcing VP. |
|          | Leslie Garrard | Chief Operating Officer | 1. 20 years of experience in retail, strategy, operations, digital, and brand management.  
2. Former Vice President of Experiences and Strategy at Recreational Equipment, Inc. (REI) |
| Eridan   | Doug Kirkpatrick | Co-Founder, CEO & Board Member | 1. 30 years of experience in RF and technology product development.  
2. Partner in Vantage Point VC.  
4. Former Chief Scientist at DARPA.  
5. MIT PhD & 30+ patents. |
|          | Dubravko Babić | VP RF Devices | 1. 30 years of experience in RF and optical device Development.  
2. Prior CEO/CTO experience.  
3. UCSB PhD & 30+ patents. |
|          | Earl McCune | CTO | 1. 30 years of experience in RF and technology product development.  
2. Prior CEO/CTO experience.  
3. UC Davis Ph.D. & 90+ patents. |
|          | Eve Cohen | CFO | 1. 30 years of experience in corporate financial management including several Silicon Valley Start-ups.  
2. HBS |
|          | Rick Booth | VP Systems | 1. 30 years of experience in RF systems development  
2. Prior CEO/CTO experience.  
3. USC PhD & 15+ Patents. |
From the product and business model perspective, Tomboy X works with a factory that made boxer briefs for men in Vancouver, BC. The company’s product line has expanded to swimwear, sleepwear and loungewear and carried all styles in sizes XS to 4XL, which reflects the diversity of products. Also, Tomboy X provides quality products at lower prices, free trials at home, and donations to various LGBTQ organizations. Consumers are increasingly shopping online, which make the company sell their own branded products directly to consumers through owned e-commerce channels, rather than relying on department stores or big online marketplaces. Bypassing any third-party retailers or wholesales, this company can keep costs down and offer high-quality products at more affordable prices than traditional retailers, which attract several customers and have more competitive than other underwear brands. In addition, Tomboy X has a long customer LTV (lifestyle brand) and a high repeat customer rate (33%), this is the reason why the company has a high gross margin and product margin. When it comes to Eridan, the company is permitted into the Silicon Catalyst, which is the world’s only Start-up incubator focused exclusively on solutions in silicon. This company sells the product to operators (T-Mobile, Vodafone, British Telecom, Verizon, ATT, China Mobile) via integrators (Ericsson, Nokia, Parallel Wireless), which enables stable sales channels and lower operational costs during the transaction. Subsequently, the company’s revenue model with integrated hardware module, firmware subscription, and GaN chipset with CMOS IP license, which provide solid recurring revenue and license fee once successfully acquired customers. Fabless manufacturing is helping to low fixed cost (depreciation, labor cost), higher profit margin (65% of revenue for goods sold), and aggressive revenue growth. Eridan’s strong product and business model resolve the pain of 5G system integrator and network provider like transmitting 5-10X less power per GB and saving 2-3X cost for equipment, making them unique in the market potentially popular among customers.

3.1.2 Weakness

Tomboy X is an online retailer with no offline stores. Due to the more errors in local demand forecasting, the more excess inventory and forced markdowns there will be, the operating model ineffectively addresses the challenges associated with inventory management and demand uncertainty. Meanwhile, online sales will not only increase the possibility of returns and exchanges but operating expenses. Next, rely on web-based advertising, Tomboy X has a weaker brand awareness comparing to large companies such as Victoria's Secret and Calvin Klein. And there is a disadvantage about the company's design technology that cannot fulfill its target customers' needs as few senior designers. Besides, the product homogeneity is serious, which intensifies competition among enterprises and affects the development of enterprises.

Eridan only raised a total of $10M in funding over 3 rounds. Their latest funding was raised on January 1, 2019 from a Series A3 round. The insufficient capital investment is not conducive to the promotion of enterprise value-added services and terminals. Furthermore, Eridan Miracle is technically still immaturity and low coverage rate, which are undoubtedly testing Eridan's operational capabilities and patience. In addition, Intellectual Property is often among an organization's most
valuable assets, yet it’s also vulnerable to threat and compromise. Particularly, Eridan’s core IP assets may hold by executives, not the company, which may cause some unnecessary losses and risks.

3.2 External Factor Assessment

3.2.1 Opportunity

As shown in Fig.2, there were four keyword opportunities that have effectiveness scores between 1 and 100. According to the results, the important opportunities that obtained 11000 keywords were “Keyword Gaps” and “Easy-to-Rank keywords” [21]. In the Keyword Gaps, Tomboy shirts and suits had a high score of 19 and 18, respectively, which can acquire the expansion of innovative business for tomboy shirts and suits. A keyword gap analysis helps the company drive more traffic and uncovers valuable development opportunities that it's missing out on. In the Easy-to-Rank keywords, an estimation of how frequently men's underwear (54) and butch fashion (50) were searched across all search engines, ranked at the top. By finding gaps in the keyword strategy, the company can discover opportunities to create new content and attract more audiences. On the one hand, the global internet traffic and audience trending from the beginning of 2013 to 2020 maintained steady-state growth (Fig.3) [22]. Tomboy x community marketing has obtained a steady customer source and cash flow, which is also conducive to improving the gross profit of the company.

Fig 2. Keyword Opportunities Breakdown

Fig 3. Audience Trending Over Time Tomboy X

On the other hand, a new study revealed that women now own an average of 34 pairs of underwear [23]. And Tomboy X global volume mainly focuses on the US, approximately 331000, whereas lower sales in CA, UK, AU and DE (Fig.4). These show a global opportunity to expand overseas markets and strengthen market competitiveness and market share. Additionally, Tomboy X had a post-money valuation of $75M as of May 2019, according to PrivCo. The series A1 has a higher proportion of authorized share and liquidation preference than the seed series, which are 3693216 and 13.44%, respectively. It can not only protect the interests of investors but attract new funds to expand the existing team, including the recruitment of experienced professional e-commerce personnel.
Eridan Communications, which is developing RF transceiver technology for 5G software-defined power transceiver applications, has joined the Silicon Catalyst incubator in May 2018. Silicon Catalyst is the world’s only incubator focused exclusively on semiconductor solution Start-ups. Gradually, Silicon Catalyst ecosystem provides to Start-ups such as Eridan in exchange for a relatively small amount of common equity, which is an opportunity for the company to dramatically reduce cost and enter the market effectively. According to Silicon Catalyst founder, Eridan Communications is a perfect fit for Silicon Catalyst. The Start-up has a strong team, feasibility demonstration of a differentiated technology that will impact several significant markets, and a need to integrate their current solution into an integrated circuit. Notably, the market for power amplifiers is expected to grow from USD 21.4 billion in 2018 to USD 30.6 billion by 2023, at a CAGR of 7.4% during the forecast period (Fig.5) [24]. Eridan has broad market space and huge development potential in the Blue Ocean Market. There are two reasons explained: the power amplifier market for industrial vertical continues to grow with 5G investment and a high entry barrier for other Start-ups due to 5G integrator’s difficulty to switch suppliers.

3.2.2 Threat

Tomboy X has the risks and opportunities that coexisted in the process of market cultivation. One of the key threats is market competition among peers. It is the most common phenomenon that a leading enterprise takes the lead in innovation to acquire excess profits, which will confront with a rapid imitation in the same industry and finally return to its original pattern. Meanwhile, the technological content of the apparel industry is lower than tech companies, which is difficult to obtain entry barriers. Thus, Tomboy X can continue to gain competitiveness through innovation and collective effort of all employees. Next, Tomboy X is facing a fierce competition of apparel and sharing the existing resource and market share. The domestic brand competitors in the apparel industry have strong competitiveness, including Victoria's Secret, Jockey, MeUndies, and Calvin Klein. Similarly, International brand competitors have also entered the market for the market competition, such as La Perla, Wacoal, and Stella McCartney.
As for Eridan, threats mainly come from Traditional RF Power Amplifiers (Skyworks, TDK, NXP etc.) and Baseband Transceivers (Analog Devices, Intel, Qualcomm). The baseband processor (BBP) allows user data to be processed in the digital domain between an end application and the transceiver device. The baseband processor design is also easily designed using system modeling tools such as Simulink. RF power amplifier is a type of electronic amplifier that converts a low-power radio-frequency signal into a higher power signal. RF power amplifiers using LDMOS (laterally diffused MOSFET) are the most widely used power semiconductor devices in wireless telecommunication networks, particularly mobile networks. LDMOS-based RF power amplifiers are widely used in digital mobile networks such as 2G, 3G and 4G. Advances in 5G technologies are driving new technical challenges in the semiconductor industry. 5G services work at higher frequencies to ensure higher transmission rates with very low latency. The use of new frequencies can create power efficiency problems, resulting in the need for new solutions. Eridan has also spotted this new business market and strived to explore a successful business model. Traditional RF Power Amplifiers and Baseband Transceivers have strong user scale and strength. Once Eridan misses the opportunity, the company will lose its share in the new 5G communications market. If Eridan cannot find a good operating model and business model, the company will be in danger of being overtaken and eliminated when foreign competitors enter the local operating market.

4. Conclusion

This research uses a case study methodology to develop theory. As this method is relatively novel in the Start-up company context, we believe that the research also enhances this discipline's methodology knowledge. This study raises many possibilities for future research. According to SWOT analysis, founding team, market, product, business model, and competition are important factors for the development of a Start-up company and investors' decision-making. For a gender-neutral underwear brand, Tomboy X has an excellent team, successful marketing channels, steady customer source and cash flow, global opportunity, and expansion of innovative business etc. However, the company is also confronted with problems such as offline stores, returns and exchanges, operating expenses, design technology, product homogeneity, and market competition. For the emerging tech company, Eridan has 26 registered patents, 2 pending patents, and 4 trademarks, which is the company's core competitiveness. Meanwhile, these characteristics-the professional team, strong product, and business model, blue ocean market-are played an important role in building a world-class digital sampling radio for 5G. Yet, Eirdan is confused by insufficient investment, immature technology, the ownership of IP, and competitors. Given these points, Start-up companies can focus on the development of their own situation, improve their predictability and avoid unnecessary risks and losses to some extent. Investors can also identify the growth potential of Start-up companies, which is more beneficial to maximize their value investment.

As the findings of this study highlight the importance of studying Start-ups, we call other researchers to continue this research path. This research stream would benefit from further quantitative and qualitative studies focusing on the value investment of Start-ups, bringing clear, practical gains for investors and helping the Start-ups improve their success rates.

References


