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The Impact of Valuation Methods on the Likelihood of Mergers and Acquisitions of High-tech Startup Companies in Nigeria

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Abstract

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MS, Ladoke Akintola University of Technology, Ogbomoso, Nigeria, 2012

BS, Federal Polytechnic, Ado-Ekiti, Nigeria, 2004

Dissertation Submitted in Partial Fulfillment

of the Requirements for the Degree of

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Abstract

Valuing high-tech startups using traditional valuation models has continued to pose valuation challenges to entrepreneurs, investors as well as financial analysts. The complications in valuing startups are heightened by the variations in valuation methodologies and the absence of operational data. Identifying the appropriate methodology for valuing startups is crucial to establishing value and a prerequisite for accessing funding through mergers or acquisitions. The purpose of this study was to examine the effect of valuation methods on the likelihood of mergers and acquisitions of high-tech startup organizations in the Nigerian capital market. The theoretical underpinning of this study is rooted in valuation theory and mergers and acquisitions theories. The extent to which valuation methods impact the likelihood of securing funds through mergers and acquisitions was the overarching research question. Random sampling was used to obtain records of valuation methods and mergers and acquisitions that occurred between 2006 and 2016 from companies in the high-tech sector. A binary logistic regression model was used to test the impact of valuation methods on the likelihood of mergers and acquisitions of high-tech startups. The impact of valuation methods on the likelihood of mergers and acquisitions was found to be not statistically significant. The participants indicated a preference for specific valuation methods during negotiations for mergers and acquisitions. The findings have implications for positive social change via a reduction in the unemployment rate by encouraging startups with their innovation and entrepreneurship. This should help to facilitate the emergence of sound valuation methods for valuing high-tech startups in the Nigerian capital market.

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Dedication

This work is dedicated my parents, Mr. Michael Okafor and late Mrs. Theresa Okafor for their enormous contribution towards my education, who through their enchantment for education and passion for excellence encouraged me to be ruthless in the pursuit of my goals. I extend a special dedication to my darling wife, Olusola for her pep talks, love, and unconditional support. Thank you for believing and having confidence in my ability. To my children, Kamsy and Daniel, thank you for your patience, understanding, and love. Knowing I have your support throughout the doctoral journey meant the whole world to me.

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List of Acronyms

ABM: Asset Based Method

APT: Arbitrage Pricing Theory

ATCON: Association of Telecommunication Companies of Nigeria

CAC: Corporate Affairs Commission

CAPM: Capital Asset Pricing Model

CBN: Central Bank of Nigeria

DCF: Discounted Cash Flow

EBITDA: Earnings before Interest Tax Depreciation and Amortization

ICT: Information Communication Technology

LCCI: Lagos Chambers of Commerce and Industry

MVM: Mixed Valuation Method

NBS: National Bureau of Statistics

NSE: Nigerian Stock Exchange

OR: Other Valuation Method

P/E: Price to Earnings

ROVM: Real Option Valuation Model

RVM: Relative Valuation Method

SEC: Securities and Exchange Commission

VC: Venture Capital

VCM: Venture Capital Method

WACC: Weighted Average Cost of Capital

Chapter 1

Introduction to the Study

The impact of innovative technologies on the growth of startups across the globe has been unprecedented. In this study, I examined the impact of valuation methods on the likelihood of mergers and acquisitions of high-tech startups in Nigeria. Startups are generally defined as companies that support the growth of a nation's economy, but usually with less than 10 years of operation and with a business model that thrives on the application of innovative technologies (Kollmann, Stöckmann, Hensellek, & Kensbock, 2016).

The growth of startups in Nigeria has been occasioned by the advances in technology, such as global system mobile (GSM) technology, online payment systems, telemarketing, e-commerce, and so on. With the growing importance of high-tech firms and the positive impact that they have on the economy (Raymond, Moses, Ezenyirimba & Otugo, 2014), the valuation of high-tech firms has started to dominate the attention of financial analysts as well as scholars. According to the National Bureau of Statistics (NBS) of Nigeria, the information and communications technology (ICT) sector contributed 10.40% to the gross domestic product (GDP) of Nigeria in 2016. The role of startups in reducing unemployment among the youths and their contribution to the modernization of economies has been widely reported (Fitzgerald, Haynes, Schrank, & Danes, 2010; Kritikos, 2014; Makinde, 2013; Poudyal, Siry, & Bowker, 2012).

The valuation of startups is becoming more and more important in today's economy (Flanc, 2014). Estimating the value of high-tech startups is still a relatively new subject of research. Marom and Lussier (2014) observed that over 50% of young businesses fail within 5

years of commencement due primarily to funding issues. Most entrepreneurs do not keep financial records making it difficult for entrepreneurs and investors to estimate the value of their firms or assess the value of their potential investments (Damodaran, 2012; Okeke & Eme, 2014).

In this chapter, I describe the purpose of the study, the research question and hypotheses and the problem statement. The theoretical framework relevant to the variables in the study is also discussed. Other sections addressed in this chapter include the assumptions made, the scope and delimitation of the study, as well as the significance of the research. The findings of this study are expected to contribute to positive social change by enhancing the knowledge base of entrepreneurs as well as investors.

Background

The growth in economic activities across the globe has led to an upsurge in entrepreneurial activities, with advances in innovative technologies leading the pack (Goutam & Sarkar, 2015). Zhang and Zhang (2014) pointed out the major roles that startups play in the modernization and growth of any economy particularly the positive impact they have on innovation and alleviating the problems of unemployment. Marom and Lussier (2014) observed that over 50% of young businesses fail within 5 years of commencement, due primarily to funding issues. The challenge has been how to monetize the innovative tendencies of high-tech startups. An expectation gap exists between owners and investors because firm owners seek higher valuations while investors seek lower valuations, thus making the estimation of a startup's value cumbersome (Halt, Donch, Stiles, & Fesnak, 2017).

Another challenge with determining the value of startups is the confusion as to the valuation method (model or approach) that best approximates the value of the firm (Cohen,

Diether, & Malloy, 2013). This confusion may be further amplified depending on the level of information asymmetry - the asymmetrical distribution of information between firm owners and investors (Stiglitz, 2000) that exists between owners of startups and investors (Fosu, Danso, Ahmad, & Coffie, 2016). Because of the seemingly unclear valuation processes, Monika, Nitu, and Latika (2013) described as guesswork, the process of valuing startups. Funders and founders are also frustrated by the huge variance in estimates computed from the extant methods for the same new venture (Miloud, Aspelund & Cabrol, 2012).

Additionally, the emergence of high-tech industries such as semiconductors, biotechnology, the internet, e-commerce, health-care, including the emergence of several disruptive innovative technologies across the different sectors of the economy has continued to pose valuation challenges to venture capitals as well as investors (Nanda & Rhodes-Kropf, 2013). The existence of complex capital structures adds to the difficulty (Rob & Robinson, 2012). While various valuation methods exist, determining the specific value remains difficult due to the amount of uncertainty surrounding early stage companies (Aydin, 2015).

While prior researchers have focused on valuation methods applicable to mergers and acquisitions targets (Gompers, Kaplan & Mukharlyamov, 2016; Olbrich, Quill & Rapp, 2015; Reddy, Agrawal, & Nangia, 2013; Söderblom, Samuelsson & Mårtensson, 2013), there is a lack of information about the relationship between valuation methods and the likelihood of consummating mergers and acquisitions.

Problem Statement

Determining the value of startups has been a contentious issue because of lack of historical data and many uncertain factors about the future of the organization (Festel,

Wuermseher & Cattaneo, 2013). Thousands of startups are acquired or sold every year leaving the founders or funders sometimes frustrated because of the variations in theoretical valuations and the practical propositions of the firm (Loukianova, Nikulin, & Vedernikov, 2017). The challenge with valuing startups is further heightened by the several valuation methods available and the many unknowns that characterize an innovative venture (Damodaran, 2012). The general problem is that, in spite of the various available valuation methods, valuing startups has become complicated, resulting in significant discounts in the purchase or sales value of between 20% and 40% compared with publicly traded companies (Aydin, 2015; Fazekas, 2016; Schootbrugge & Wong, 2013).

A preponderance of literature exists in the field of finance that highlights the different aspects of firm valuation, and methods of firm valuation including the mergers and acquisitions processes (Loukianova, Nikulin, & Vedernikov, 2017). In the past decade, the attention of scholars has focused on the valuation methods used in the mergers and acquisitions process (Dorisz, 2015; Rózsa, 2014; Safwan, 2016). Other scholars have investigated the challenges of using the cost method of valuation when making an investment decision (Onyejiaka, Oladejo, & Emoh, (2015). The specific problem is that owners of startups, as well as investors, need to determine acceptable valuation methods that leads to securing funds through mergers and acquisitions in order to limit valuation challenges and to minimize the significant discounts paid on startups in the high-tech industry in Nigeria (Cohen, Diether, & Malloy, 2013; Mangipudi, Subramanian & Vasu, 2013).

PriceWaterHouseCoopers (2012) noted that inability to agree on valuation had been the single most important cause of uncompleted mergers and acquisitions deals in Nigeria. The

mortality rate in the high-tech industry is estimated at 50% in the first 4-5 years of operation (Hyytinen, Pajarinen, & Rouvinen, 2015). Consequently, identifying the effect of valuation methods on the likelihood of securing funding through mergers and acquisitions for startups may go a long way towards addressing the mortality rate of startups in the country and may also contribute to positive social change. Researchers have called for increased quantitative and qualitative analyses of acceptable valuation methods for startups in the high-tech industry to improve mergers and acquisitions activities in that sector (Chen, & Yang, 2014).

Purpose of the Study

The purpose of this quantitative survey study was to examine the effect of valuation methods on the likelihood of mergers and acquisitions of high-tech startup organizations in the Nigerian capital market. The focus was to assess whether valuation methods do influence the chance of securing funds through mergers and acquisitions. The dependent variable was the likelihood of mergers and acquisitions of high-tech startups, while the independent variables were the valuation methods. Determining the association between valuation methods and the likelihood of securing mergers and acquisitions has become imperative because establishing that relationship may minimize the challenges faced by startups' owners and investors during the negotiation process for mergers and acquisitions.

Research Questions and Hypotheses

The purpose of this quantitative survey study was to examine the effect of valuation methods on the likelihood of mergers and acquisitions of high-tech startup organizations in the Nigerian capital market. This study was guided by the following research question and hypotheses:

RQ: To what extent, if any, does valuation method impact the likelihood of securing funds through mergers and acquisitions for high-tech startup organizations?

Ho: There is no statistically significant probability of impact of valuation methods on the ability of high-tech startups to secure mergers and acquisitions

Ha: There is a statistically significant probability of impact of valuation methods on the ability of high-tech startups to secure mergers and acquisitions

In the hypothesis, the dependent variable was the likelihood of mergers and acquisitions of high-tech startups. The independent variable was the valuation methods used for measuring the value of high-tech startups. Typically, in Nigeria, the traditional valuation methods are frequently used in evaluating the economic value of the owner's interest in an enterprise (Okafor & Onwumere, 2012). The traditional valuation methods, as put forward by Stevenson, Roberts, and Grousebeck (1989), can be categorized into asset-based method; income/earnings-based method, cash-flow discounting method, and the market-based valuation method. Since valuation is fundamental to accessing finance, it is important to understand what constitutes the value of a firm and how that value is computed. Valuation is a necessary step in the decision to reconstruct, sell, merge, or acquire other businesses (Damodaran, 2012).

Söderblom, Samuelsson, and Mårtensson (2013) identified six main business valuation techniques in emerging markets: discounted cash-flow method (DCF), asset-based method (ABM), earnings multiple methods, real options valuation model (ROVM), venture capital model (VCM), and the relative valuation method (RVM). In their work on valuing companies in emerging market using Nigeria as a case study, Aidamenbor and Mgbemena (2008) tested the popularity of valuation methods in emerging market as espoused in (Pereiro, 2002). The result

showed that the asset-based method, discounted cash-flows (DCF) method, income-based method, the earnings multiple method, the real option (option pricing) method, the market-based method and the economic value added (EVA) method were the most popular with corporations, financial advisors, banks, insurance companies, and individual investors. For this study, and in line with (Aidamenbor & Mgbemena, 2008; Söderblom, Samuelsson & Mårtensson, 2013), the following methods were discussed: asset-based method, discounted cash flows method, earnings multiple methods, real options pricing model, venture capital model, and the relative valuation. Also, a mixed valuation method was added for a possible combination of two or more methods and a group for other valuation methods not highlighted in this study.

Theoretical Framework for the Study

The model theory for this study is the mergers and acquisitions theory (Akerlof, 1970; Posner, 1981; Schendel, Patton, & Riggs, 1976) and supported by asset valuation methods that are components of valuation theory (Modigliani & Miller, 1958). Broadly, mergers and acquisitions theory can be described as activities involving corporate restructuring or changes in the ownership structure of firms (Rao & Kumar, 2013). The mergers and acquisitions theory is based on the assumption that benefits derived from mergers and acquisitions stem from the complementarities between acquiring and target firm's assets and capital reallocation (Malik, 2014). The mergers and acquisitions theories relevant to this study were classified into three categories: wealth maximization theory (Posner, 1981); the turnaround theory (Barker & Duhaime, 1997; Schendel, Patton, & Riggs, 1976) and the information asymmetry theory (Akerlof, 1970; Spence, 1973; Stiglitz, 1975).

The mergers and acquisitions theories cited above formed the theoretical basis for the study and are discussed in more detail later in the study. This study was based on existing business valuation methods supported by mergers and acquisitions theories which provided a context for answering the research question. In this study, I argued that valuation methods were associated with the probability of startups securing funds via mergers and acquisitions. This was based on the assumption that misvaluation affects mergers and acquisitions (Pereiro, 2016).

Reddy (2014) observed that corporate growth strategies, such as mergers and acquisitions, leveraged buyouts, takeovers and other strategic alliances, have a significant implication for a firm's growth prospects. However, misvaluation has been acknowledged as a major challenge when negotiating mergers and acquisitions (Pereiro, 2016). Rhodes-Kropf, Robinson, and Viswanathan (2005) studied the effect of misvaluation on the chances of consummating mergers and acquisitions. Rhodes-Kropf et al. (2005) established that misvaluation affects who buys whom, the mode of payment, and provides explanations for neoclassical mergers and acquisitions activities.

Prior studies such as Damodaran (2012) examined different valuation models for startups while other studies discussed in broad terms the mergers and acquisitions of startup firms (Gao, 2015; Rok, 2012). However, a gap exists in the body of literature regarding the relatedness of valuation methods to the consummation of mergers and acquisitions. Similar to the research conducted by Fernández (2007a), a comparison of the various valuation methods and how they relate to securing funding through mergers and acquisitions were discussed. Also, the study includes other valuation models that involve multiple valuation processes similar to the research conducted by (Fiorentino & Garzella, 2014).

Valuation determines the worth of an asset and provides an agreeable price in which an offer and acceptance can be made (Mohammad, 2016). The traditional valuation methods, such as the DCF, CAPM, ABM, VCM, ROVM, and RVM were used as a theoretical base for discussing valuation methods for startup. The wealth maximization theory (Garzella & Fiorentino, 2014), turnaround theory (Barker & Duhaime, 1997; Schendel, Patton & Riggs, 1976) and information asymmetry theory (Akerlof, 1970) were used to provide the theoretical framework for analyzing mergers and acquisitions as they relate to startups in line with the procedures set by (Karpoff, Lee, & Masulis, 2013).

The binary logistic regression model was used to assess the effect of valuation methods on the likelihood of securing funds via mergers and acquisitions for high-tech startups. Field (2014) stated that the binary logistic regression model could be used to conduct regression analysis when the dependent variable was dichotomous. As a predictive analysis model, the logistic regression model can be used to predict the relationship between one dependent binary variable and one or more metric independent variables (Field, 2014).

In this study, the logistic regression model was used to establish the relationship between the independent variables and the likelihood of the dependent variable (Feng, 2016; Ngugi, 2014). The outcome of this analysis helped to describe the association between various valuation methods and the mergers and acquisitions of high-tech startup organizations.

Nature of the Study

This quantitative survey study was designed to examine the effect of valuation methods on the likelihood of mergers and acquisitions of high-tech startup organizations in the Nigerian

capital market. The goal was to assess whether valuation methods influence the chance of securing funds through mergers and acquisitions.

The choice of quantitative survey research for this study was appropriate. A survey research design is best used to draw statistical inferences from a large sample that is representative of the intended population when using other research designs might prove difficult (Aggarwal & Saxena, 2012). Additionally, the quantitative survey research design allows for the combination of both observed and latent variables obtained during the data collection process (Iverson, 2016). The dependent variable was the likelihood of mergers and acquisitions while the independent variable were the different valuation methods used in valuing high-tech startups organizations. Identifying the possible relationship between the two variables was important to this study. To test the hypotheses, survey data were obtained from 106 participating companies randomly selected from about 450 high-tech startups that participated in mergers and acquisitions activities between the years of 2006 and 2016. Senior executives of these companies were invited to participate in the survey. The survey data were collected electronically.

Data were collected through a random sampling of the high-tech firms involved in mergers and acquisitions between 2006 and 2016. The flexible statistical power analysis program, G*Power 3.1, was used to determine the minimum sample size. Details of this analysis are given in Chapter 3. This study was an attempt to determine the association between valuation methods and the chance of securing funds through mergers and acquisitions for startups in the high-tech industry. Establishing the relationship between valuation methods and the likelihood of mergers and acquisitions of high-tech startups could help to reduce valuation challenges of high-tech startup organizations in Nigeria and also expand the literature in this field.

Definitions

Capital asset pricing model: The CAPM is the foundation of all asset pricing theories, and probably one of the most fundamental theories in asset pricing. CAPM is useful in determining the relationship between risk and return, and helps in identifying undervalued or overvalued assets (Bajpai & Sharma, 2015). CAPM is best used in estimating a firm's cost of equity. Equity cost of capital is equal to the return on a risk-free investment plus a premium which reflects the risk of the company's equity (Akpo, Hassan & Esuike, 2015). The equation for CAPM is given as:

$$K_e = R_f + \beta * (R_m - R_f) \quad (1)$$

Venture capitals: Venture capitals are a section of the private equity industry which specializes in building high-risk startups with potentials for high growth (Festel, Wuermseher & Cattaneo, 2013). Venture capitals provide funding to startups in exchange for equity in that company.

Venture capital method: Venture capital method is a specialized valuation process in which venture capitalists integrates the features of DCF and the Multiples methods in determining the value of a young firm (Aydın, 2015).

Discounted cash flow method: The discounted cash flow method is used for estimating the value of a business based on the concept of time value of money (Bilych, 2013). The present value of the company is determined by discounting the projected cash flows of the business using the company's appropriate cost of capital (Investopedia, 2017a).

Adjusted net asset method: The adjusted net asset of a company is determined by taking into consideration all the fixed assets and intangible assets owned by the company and adjusting for its obligations including off-balance sheet liabilities (Janas, 2013).

High-tech company: A high-tech company is characterized for being innovative in the use of cutting edge technology to deliver goods and services (Koller, Goedhart, & Wessels, 2010).

Relative valuation method: The relative valuation method is the process used to determine a company's value by comparing the entity's assets with identical assets for which the price is available (IVS 105, 2015).

Real option valuation: Real options valuation is used to determine the value of an investment usually by taking into consideration the real option available to the project such abandoning, expanding or deferring to undertake certain investment decisions (Investopedia, 2017b).

Book value: Book value refers to the theoretical value of a company's net assets (Chandrapala, 2013). Theoretically, the book value of a company is equivalent to the amount of cash shareholders would receive if all of the company's debt obligations were paid off and all remaining assets were sold. Chandrapala (2013) noted that no quality enterprise should sell for a price equivalent to or less than its theoretical liquidation value.

Valuation theory: The valuation theory as propounded by Modigiliani and Miller (1958) and Black and Scholes (1973) is based on the assumption that arbitrage opportunities do not exist under equilibrium condition. The valuation methods used in this study are components of the valuation theory (Damodaran, 2005).

Pre-money vs. Post-money valuation: Pre-money refers to the value of a company before receiving financial support. Post-money valuation = pre-money valuation + new funding (Damodaran, 2012). These terms are important in determining the ownership stake that will be given up during the funding round.

Operating cash flow: According to Bingilar and Oyadonghan (2014), operating cash flow measures the net cash flows from the operations of the business, not from sales of company assets (investing activities) or issuance of debt (financing activities). Operating cash flow can also be computed as the net operating income (NOI) + depreciation.

Leveraged buyout: Leveraged buyouts enable companies to make large acquisitions without committing huge capital. The target company's assets or revenue is used as "leverage" to pay back the amount used to acquire the company. Leveraged Buyout can also be referred to as Highly-Leveraged Transaction (HLT) or bootstrap transaction (Tripathi, 2012).

Merger: In mergers, two or more firms combine to form a separate legal entity (Piesse, Lee, Lin, & Kuo, 2013).

Acquisition: Acquisition is defined as activities by which a firm acquires more than 50% equity control of the acquired firms, whereas, in mergers, two or more firms combine to form a separate legal entity (Piesse, Lee, Lin, & Kuo, 2013).

Mergers and acquisitions: Mergers and acquisitions is a strategic expansion activity taken to transfer ownership of a company between two set of shareholders (Ross, Westerfield, & Jaffe, 2010). Mergers and acquisitions is seen as a fundamental strategy used for corporate restructuring and control as well as achieving growth strategy (Garzella & Fiorentino, 2014).

Information asymmetry: The concept of information asymmetry in corporate finance assumes that at least one party to a transaction has more useful information that might tilt the balance of power in the transaction (Salehi, Rostami, & Hesari, 2014). In other words, information is distributed asymmetrically between firm owners and investors (Stiglitz, 2000).

Valuing startups: Startup valuation refers to the process of determining the value of startups before it begins to generate revenues for the purposes of fund raising or investment (Damodaran, 2012).

Entrepreneur: An entrepreneur is described as one who undertakes new business activities and assumes the risks of the business despite the financial constraints associated with starting a new business (Amolo & Migiro, 2014).

Valuation: Valuation is the current worth of an asset or a company which is usually determined by a professional valuer (Investopedia, 2017c).

Initial public offering: An IPO involves selling a company's shares to the general public on the stock market for the first time, which also serves as a means of obtaining financing for its projects (Hejazi, Salehi, & Haghbin, 2010). Through IPOs, companies raise equity (Chang-Yi, Jean & Shiow-Ying, 2013) which provides investors with a liquid security with an established market price (Boeh & Southam, 2011).

Assumptions

The following assumptions were based on scientific realism and considered necessary for this study:

1. Survey respondents will provide honest and unbiased responses.
2. The effect of valuation methods on the likelihood mergers and acquisitions of high-tech startups can be logically determined.
3. The logit model will fit correctly with the variables in the study.

Scope and Delimitations

The purpose of this quantitative survey study was to examine the effect of valuation methods on the likelihood of mergers and acquisitions of high-tech startup organizations in the Nigerian capital market. The scope of this study was limited to startups in the high-tech sector of the Nigerian capital market. Considering the funding issues and the challenges of valuing startups, I sought to investigate the possible association of valuation methods for valuing startup and the mergers and acquisitions of high-tech startup organizations. The companies surveyed had been involved in mergers and acquisitions within the sampling period of 2006 and 2016. The sample included internet service providers (ISPs), telecommunication companies, IT infrastructural companies, finance and e-commerce, agriculture, health information technology, mobile application and engineering and this is consistent with the definition of high-tech companies provided by (Koller, Goedhart, & Wessels, 2010).

Therefore, the survey was limited to startups rendering high-tech services. Since the focus was on valuation methods and mergers and acquisitions, discussions on mergers and acquisitions, types, and processes featured prominently. To determine this relationship, survey data were obtained from 106 companies from among the 450 startups involved in mergers and acquisitions activities in the industry between the years of 2006 and 2016. These companies had to be registered with the corporate affairs commission.

Data obtained were recorded using questionnaires. The questionnaires were pretested and assigned unique identifiers to enhance the validity of the test instrument (Selltiz, Wrightsman, & Cook, 1976). Before conducting the survey, a field test was conducted to include the inputs of practitioners in the survey. The sample size of 106 was appropriate in the circumstance given the

tremendous research work usually associated with handling high-tech startups' related data and the need to establish the underlying pattern in the data. Research data were widely used in the study because of its suitability for a social scientific inquiry (Singleton & Straits, 2009).

Considering the scope and purpose of this study, little or no effort was made to discuss the historical perspective of mergers and acquisitions, the impact of acquisition premiums on the outcome of mergers and acquisitions nor anti-takeover mechanisms. In addition, the impact of the years of operation on the valuation of startups was not part of this study. Therefore, there is likelihood that the non-inclusion of these variables in the logistic regression may have affected the statistical inference drawn from the study (Karlson, Holm, & Breen, 2012). Survey research designs are usually characterized with issues of low response rate and biased responses (Iverson, 2016). Thus, the extent to which the findings of this study could be generalized may be impacted.

Limitations

This study was subject to four limitations. The first may be traced to the methodology. The major limitation of cross-sectional studies is the inability to establish causation (Altman & Krzywinski, 2015; Barrowman, 2014; Deilami, Hayes & Kamruzzaman, 2016; Eaves, Hatemi & Verhulst, 2012). Therefore, only an association of valuation methods and the likelihood of mergers and acquisitions can be inferred. The inability to determine causation limits the likelihood that the outcome of this study may establish whether valuation methods prevent mergers and acquisitions.

A second limitation may be traced to the narrow sample base and the inability to achieve 100% of the expected sample size (see Chapter 4 for details). The inability to achieve the desired

sample size could impact the generalization of the survey's result to a larger population. Insufficient data imply that only available data was used for the study. This challenge may limit the outcome of this study to be generalized to other sectors of the economy. Nonetheless, the impact of this on the outcome of the study was limited because of the use of random sampling. Also, 96.0% of the expected sample size was achieved despite being a niche sample and exceeding the sample to variable rule of 10 (Austin & Steyerberg, 2015).

Inability to account for confounding variables in the regression equation was a third limitation of the study. The non-inclusion of spurious factors such as nature, size, and age of the company in the model may have affected the results of the study (Neuman, 2011).

A fourth limitation was the validity of the constructs. Details of how the constructs were operationalized are given in Chapter 3. Construct validity has to do with the adequacy of the operational definition and measurement of the theoretical constructs (Martin, Cohen, & Champion, 2013). To reduce the impact of construct validity on the study, the questionnaires were pretested with panel of experts reviewing the theoretical constructs with a view to reducing the instrumentation issues before implementation (Archibald, 2016; Bolarinwa, 2015; Zohrabi, 2013).

Significance of the Study

Contribution to Theory

This study is expected to contribute to the ease of valuing startups and extend the existing literature on the startup phenomenon. Researchers may build on the knowledge gained in this study to expand the startup phenomenon especially as it relates to evaluation, funding, and opportunities for mergers and acquisitions of high-tech startups. In this study, I extended the

discussion beyond the conventional traditional valuation methods to evaluating how a combination of different valuation methods may be used to more accurately determine if funding can be secured through mergers and acquisitions for high-tech startups.

Stakeholders such as financial analysts, researchers, entrepreneurs, investors, and regulators, who depend on accurate valuations, may benefit from improved valuation accuracy that this study provides (Reddy, Agrawal, & Nangia, 2013). Additionally, the study's findings may lead to the intersubjectivity of valuation experts, accelerate evaluation processes, and reduce the factors militating against mergers and acquisitions in the high-tech industry in Nigeria. Since valuation is important to investors (Salehi, Rostami, & Hesari, 2014), the intrinsic value of growing firms may be easily determined (Coit, 2016). An understanding of the linkages between valuation methods and mergers and acquisitions might enable high-tech startups adopt the best valuation methods that brighten the prospect of mergers and acquisitions.

Contribution to Practice

The study is expected to contribute to practice as private equity firms, venture capitals, and other organizations saddled with valuing young firms may benefit from additional information about startup valuation presented. Further, the valuation challenges experienced by valuers of high-tech startups have been addressed by eliminating the guesswork usually associated with valuing startups (Monika, Nitu & Latika, 2013). This should help to bridge the expectation gaps between the founders and funders during the negotiation process. By aligning the ambitions of the entrepreneur and the investors, the rate of mergers and acquisitions of high-tech startups might be improved. With improved valuation procedures, stakeholders may be able to determine their interests in associated companies (Coit, 2016).

On the policy front, the study may be beneficial to the National Communications Commission (NCC) and the Federal Ministry of Science and Technology in crafting policies that may support young entrepreneurs with innovative ideas to start their businesses. This may help to reduce the unemployment rate in Africa's biggest economy. The Ministry of Labor and Productivity, as well as the Lagos Chambers of Commerce and Industry (LCCI), may also benefit from the output of this study given its detailed coverage of high-tech startups especially in the economic diversification program of the government. The study was designed to address the gaps in literature that might have hindered access to the funding and growth of startups.

Implications for Social Change

The study is expected to contribute to positive social change by enhancing the knowledge base of entrepreneurs as well as investors. The study's findings may help to unlock access to funding and enhance the innovation and entrepreneurial tendencies of young Nigerians. The essence of creating organizations is to improve the wealth of their shareholders (Gómez-Bezares, Przychodzen & Przychodzen, 2016). Shareholders may benefit from improved valuation techniques and an increased aggregate net worth, which the findings of this study reveal. The study's outcome may help to reduce unemployment rate within the country as more people take up to entrepreneurship because of the increased knowledge about asset valuation, and access to funding and exit strategies. Thus, once organizations become successful, they are able to perform their functions to society such as job creation, provision of social amenities, contributions to innovation, and continued infrastructural and social development of the communities in which they do business (Hollensbe, Wookey, Hickey, George & Nichols, 2014).

Summary

Valuing high-tech startup organizations is fast becoming more an art than a science. Financial managers seeking to create firm value need to make smarter investment decisions armed with valuation techniques appropriate for different buckets of investments. Traditionally, firms are assessed using the DCF method, market approach, income approach or cost approach. Following this line of thinking, I examined how best to use valuation methods to value startups. Researchers have demonstrated that using conventional valuation methods to evaluate startups yield subjective results and are susceptible to market failures (Paternò-Ca stello, Vezzani, Hervás & Montresor, 2014). Essentially, not all values are equal; a clear understanding of what value is being measured is important along with the purpose for which it is measured. As a result, determining the appropriate value to measure is crucial when taking investment decisions.

Startups by their nature are constrained by financing, intellectual capacity, political and policy instability, and risk management problems (Katua, 2014). Incorporating mergers and acquisitions into the growth strategy mix should play a major role in addressing these challenges and might accelerate the transitioning phase of high-tech startups. This is the difference between organic and inorganic growth (Satnalika, 2016; Sharma, 2015). In addition, being open to the use of different valuation methods or a combination of methods reduces the valuation crisis during a merger and acquisition process (Mangipudi, Subramanian, & Vasu, 2013). By reviewing various works of literature as provided in Chapter 2, I provide an analysis of the economic realities of growing firms as well as the valuation challenges faced by founders as well as funders. This study was undertaken to identify the interactions between valuation methods and the mergers and acquisitions of high-tech startup organizations.

To achieve this objective, contemporary literature on valuation of startups, valuation methods, and mergers and acquisitions processes are reviewed in greater detail in Chapter 2. The impact of firm valuation methods on the success of mergers and acquisitions documented in prior studies are also reviewed. Chapter 3 is dedicated to discussion of the research methodology, the theoretical framework, and the research hypotheses. A detailed description of the dependent and independent variables, together with data collection procedures and interpretation are presented in Chapter 4. Finally, Chapter 5 includes the summary of the study, conclusions, and recommendations.

Chapter 2: Literature Review

The purpose of this quantitative survey study was to examine the effect of valuation methods on the likelihood of mergers and acquisitions of high-tech startup organizations in the Nigerian capital market. This study was designed to address the funding challenges usually associated with high-tech startups. The overarching intention of this study was to leverage existing literature as well as field analysis to advance an external growth strategy for startups in the high-tech sector. As such, I examined the impact of valuation methods on the likelihood of securing funds through mergers and acquisitions for high-tech startups in the Nigerian capital market.

In this section, I build on the existing literature to highlight the historical perspective of the startup phenomenon in Nigeria and the life-cycle model used for charting the growth trajectory of growing firms. The theoretical foundation on which this study is hinged was also discussed. This includes the valuation methods for high-tech startups and the governing theories for mergers and acquisitions related to the study. Also discussed were the motives for mergers and acquisitions and the typical mergers and acquisitions process.

Historical Perspective of the Startup Phenomenon

Before examining the existing literature, I provide a historical perspective of the evolution of startups (Simon, 1993) and mergers and acquisitions. Although history is replete with the evolution of small businesses, archivists have little to report on the development of high-tech startups due to the frequency of disruptive technologies in that space. Jaafar and Abdul Halim (2016) attributed the dearth of empirical studies to the historical perspective of high-tech companies and the difficulties in operationalizing the life-cycle concept of high-tech startups.

Small businesses dominate the Nigerian economic landscape and have been a part of the society with vibrant entrepreneurial skills predating colonial times. Entrepreneurship is synonymous with small businesses, and it began when people produced more products than they required and had to swap the surplus (Raymond, Moses, Ezenyirimba & Otugo, 2014). The example of this can be seen when blacksmiths produced more farm implements, such as hoes and cutlasses, than needed and had to exchange them with farmers for goats, yams or other foods (Ebiringa, 2011). Before money became legal tender, this phenomenon was widely referred to as "trade by barter."

Modern entrepreneurial activities began in Nigeria with the coming of the colonial masters, who brought in their wares in exchange for commodities or other local materials. The adoption of the Structural Adjustment Programme (SAP) in 1986 by the administration led by General Babangida resulted in dramatic policy shift from capital-intensive and large-scale corporations to SMEs (Ebiringa, 2011). The quest for growth, market control, and wealth maximization led to the idea of business combinations in the form of mergers and acquisitions (Garzella & Fiorentino, 2014). Malik, Anuar, Khan and Khan (2014) discussed the six waves of mergers and acquisitions that occurred between 1897 and 1981. In Nigeria, the first wave of mergers occurred after the Nigerian civil war (1967-1970) and gained momentum after the failure of banks in the 1990s, which triggered more mergers and acquisitions opportunities in Nigeria (Ebimobowei & Sophia, 2011). The highest number of mergers and acquisitions has been recorded in the financial services sector, especially in the banking subsector (Ebimobowei & Sophia, 2011).

Formation and Development of Startups

Researchers have utilized Erikson's (1963) organizational life cycle model to explain the transition of firms from initial entrepreneurial phase to a later phase that is more complex and sophisticated, requiring a bureaucratic type of management systems (Shahmansouri & Nazari, 2013). Life-cycle theory assumes the growth process of startups follow predictable and sequential patterns (Smith, Mitchell, & Summer, 1985). The life-cycle is commonly used by scholars to illustrate the progression of firms through growth stages. The development of startups is classified into different growth stages based on the problems they encounter in the growth process. Table 1 depicts the development of startups in line with the life-cycle model

Table 1

Life Cycle Model

Model	Theorists	Life cycle content
3-stage	Bhave (1994)	a. Opportunity stage b. Technology setup and organization stage c. Exchange stage
4-stage	Kazanjian (1988)	a. Conception and development b. Commercialization c. Growth d. Stability
5-stage	Galbraith (1982) Anthony and Ramesh (1992)	a. Proof of principle/Prototype stage b. Model shop c. Start-up d. Natural growth e. Strategic maneuvering
10-stage	Block and MacMillan (1985)	a. Development of concept, completion of product testing b. Completion of product prototype c. Initial financing d. Completion of initial plant testing e. Market testing f. First batch production g. Early sales h. First competitive activities i. First redesign or adjustment of direction j. First major adjustment of prices

Note. Adopted from "Development of a startup business: A complexity theory perspective" by S. D, Tsai, and T. T, Lan, 2006, *National Sun Yat-Sen University*, Kaohsiung, Taiwan pp. 4-5.

Furthermore, in Chapter 2, I provided a detailed review of existing literature on high-tech startups, valuation methods, and mergers and acquisitions and how they affect the activities of startups. This chapter is organized into five different sections. The first section comprised of various valuation methods used for valuing startups, related theories, strengths and weaknesses of each method and related concepts. A detailed description of the theories on acquisition dynamics in mergers and acquisitions is provided in the second section. The third section includes the literature review on the motives for mergers and acquisitions and the implication of mergers and acquisitions on the ownership structure of startups. Provided in the fourth section, is the analysis of the different opinions of researchers on the impact of mergers and acquisitions on growing firms, thus bringing the dependent and independent variables together.

Literature Search Strategy

This study was largely dependent on publicly accessible sources as well as field reports. The databases consulted included Google Scholar, Social Science Research Network (SSRN), JSTOR, Sage Premier and Science Direct. News releases from regulatory institutions such the Central Bank of Nigeria (CBN), Nigerian Stock Exchange (NSE), Securities and Exchange Commission (SEC) formed part of the resources utilized in this study. Others include releases from the National Bureau of Statistics (NBS) and the Lagos Chambers of Commerce and Industry (LCCI).

The search period covered a period of 2008 and 2017; however, older articles were collected in order to highlight base theories and where they fundamentally provide depth about the subject matter. The search was limited to only peer-reviewed articles published between 2008 and 2017. Emphasis was placed on original sources for primary referencing and for additional

references. The following keywords were used in the study: *mergers and acquisitions, bootstrap acquisition, hostile takeover, cost per acquisition, poison pill, valuation methods, high-tech startups, small and medium scale of enterprises, innovative potentials of start-ups, capital asset pricing model, venture capitals, private equity firms, firm performance, internal and external growth factors, initial public offering, asset pricing, information asymmetry, auction theory, acquisition theory, decision theory, complexity theory, management theory, life cycle theory, Lean start-up, book value and market value, market for lemons, discounted cash flow, risk free rate, free cash flow hypothesis, managerial self-interest hypothesis, private benefits hypothesis, capital investment and investment strategy, financial performance, analysis of variance, multivariate analysis, logistic regression, binomial logistic regression and forecasting*.

Theoretical Foundation

The model theory for this study is the mergers and acquisitions theory propounded by (Akerlof, 1970; Posner, 1981; Schendel, Patton, & Riggs, 1976) and supported by asset valuation methods which are components of the valuation theory of (Fisher, 1930; Modigliani & Miller, 1958; Williams, 1938). The mergers and acquisitions theory, as well as the asset valuation methods, were selected because the mergers and acquisitions theory enables me to describe how startups can achieve organizational goals through external financing while the asset valuation principles are necessary to establish the worth of the business.

The mergers and acquisitions theory is based on the assumption that benefits derived from mergers and acquisitions stem from the complementarities between acquiring and target firm's assets and capital reallocation (Malik, 2014). The mergers and acquisitions theories relevant to this study can be classified into three categories: wealth maximization theory (Posner,

1981); the turnaround theory (Barker & Duhaime, 1997; Schendel, Patton, & Riggs, 1976) and the information asymmetry theory (Akerlof, 1970; Spence, 1973; Stiglitz, 1975). In line with the procedures set by (Karpoff, Lee, & Masulis, 2013), I utilized the mergers and acquisitions theories to explain the dependent variable especially as they relate to startups.

Existing business valuation methods were used in conjunction with the mergers and acquisitions theories to provide a context for answering the research question. In this study, I argued that valuation methods predict the likelihood of securing funds via mergers and acquisitions for startups. This is based on the assumption that misvaluation affects mergers and acquisitions (Pereiro, 2016).

Determining the value of an asset is crucial in arriving at an agreeable price in which an offer and acceptance can be made (Mohammad, 2016). Establishing the value of an entity such as high-tech startups is a complicated process in which different valuation methods may need to be employed to determine its fair value or market value (Xiangying, Yueyan, & Xianhua, 2015). An entity's value consists of all is assets and liabilities and its capacity to generate future economic benefits (Ghiță-Mitrescu & Duhnea, 2016). The International Financial Reporting Standard (IFRS 13) described the fair value of an asset as the "price that would be received to sell an asset or paid to transfer a liability in an orderly transaction between market participants at the measurement date" (IFRS, 2013, p. 62).

At different times, theorists have contributed to the evolution of the various valuation methods used today. Valuation principles, such as the discounted cash flow methods (Fisher, 1930; & Williams, 1938), capital asset pricing model (Lintner, 1965; Mossin, 1966; Sharpe, 1964), asset-based method (Lee, 1996; Reilly & Schweihs, 1999), venture capital method

(Sahlman, 1990), real options pricing model (Myers, 1987), and the relative valuation model (Damodaran, 2001) were used as the theoretical base for discussing valuation methods for high-tech startup as well as to establish the market price for startups. Also included, are other valuation models that involve multiple valuation processes similar to the research conducted by (Fiorentino & Garzella, 2014).

The mergers and acquisitions theories especially as they relate to the growth of firms have been studied extensively. Rhodes–Kropf, Robinson, and Viswanathan (2005) studied the effect of misvaluation on the chances of consummating mergers and acquisitions transactions. Rhodes–Kropf et al. (2005) established that misvaluation affects who buys whom, the mode of payment, and provides explanations for neoclassical mergers and acquisitions activities. Reddy (2014) identified that corporate growth strategies such as mergers and acquisitions, leveraged buyouts, takeovers and other strategic alliances have a significant impact on the growth prospects of companies. In another related study, Fernández (2007a) discussed the various valuation methods and how they relate to securing funding through mergers and acquisitions, and DePamphilis (2014) discussed the different stages involved in mergers and acquisitions.

Prior studies such as (Damodaran, 2012; DePamphilis, 2014) examined different valuation methods for startups while other studies have discussed in broad terms the valuation methods used in the mergers and acquisitions of startup firms (Gao, 2015; Rok, 2012) which is similar to the ones used in this study. Miloud, Aspelund, and Cabrol (2012) conducted an empirical study on the valuation methods used by venture capitalists. They also investigated what venture capitalists consider when estimating the value of startups. Miloud, Aspelund, and Cabrol (2012) identified industry attractiveness, quality of the owner, the composition of the

management team, as well as external relationships as significant to establishing the value of a startup seeking venture capital financing.

Literature Review Part 1: Startup Valuation Theories

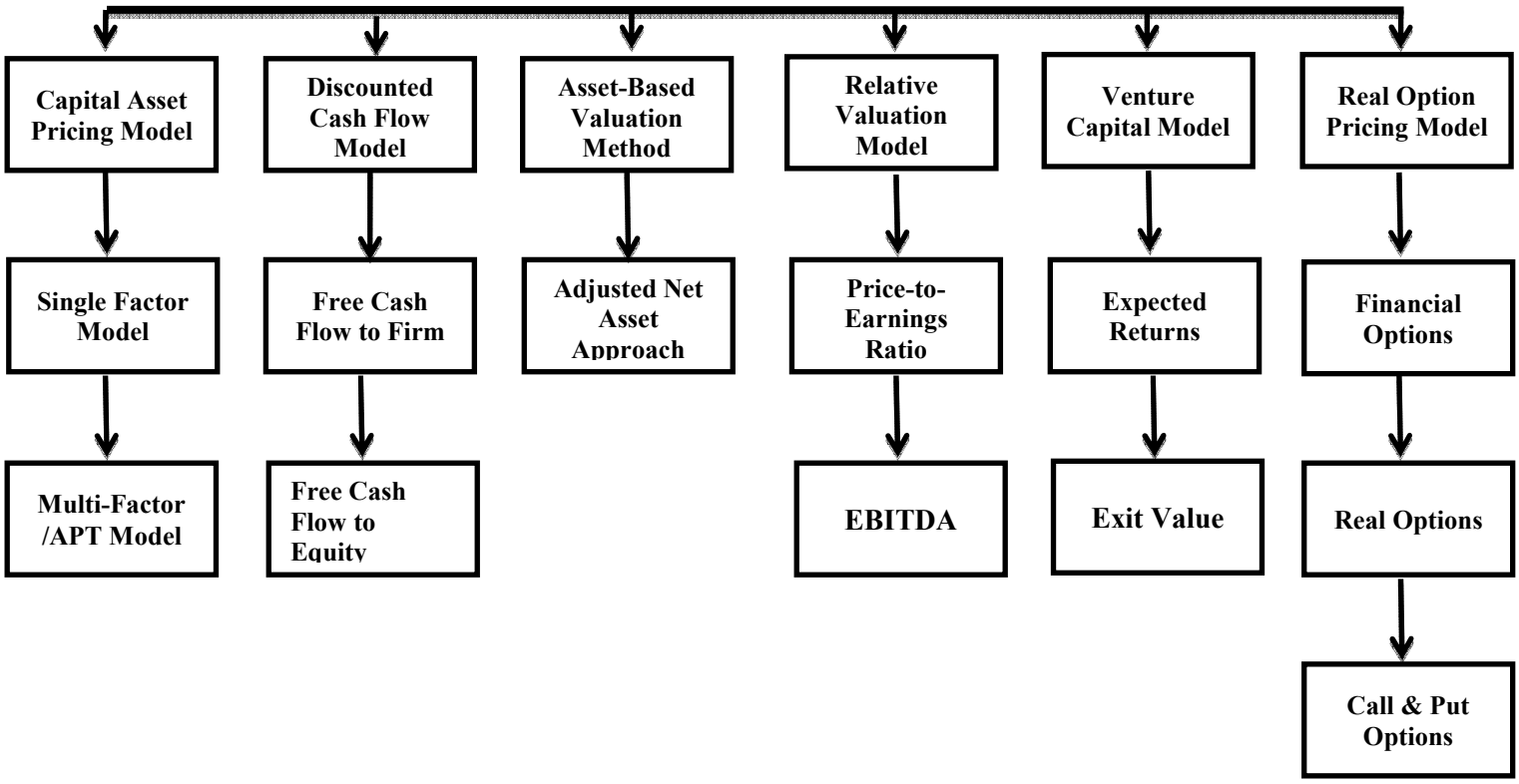

Figure 1. *Business valuation models.*

Capital Asset Pricing Model

The capital asset pricing model (CAPM) which was introduced by (Lintner, 1965; Mossin, 1966; Sharpe, 1964) is one of the most widely used asset pricing tool today in modern finance and has applications in asset valuation, portfolio performance measurement and portfolio risk management (Pavlikov & Uryasev, 2014). Following Markowitz's (1952) work on diversification and modern portfolio theory, theorists (Lintner, 1965; Mossin, 1966; Sharpe,

1964) propounded the capital asset pricing model in which they found that return on an individual asset, or a group of assets, should be equal to its cost of capital. The model is particularly useful in determining the required rate of return of an asset, and it provides a theoretical basis for estimating the price of an asset using the firm's expected cash flow (Elbannan, 2015). Thus, the CAPM is not a standalone valuation method; however, CAPM is used to determine the required cost of capital when making an investment decision which can then be applied to evaluate the value of a company using the discounted cash flow method (Elbannan, 2015). The CAPM posits that investors are compensated for the time value of their investment and any possible risk incurred during the investment (Dawson, 2015).

Sharpe (1964) built on the mean-variance optimization of portfolio articulated by Markowitz (1959) and explains that return premium of any financial asset over the risk-free return is directly proportional to the systematic or non-diversifiable risk of the given asset (Karki & Ghimire, 2016). During the last four decades, the CAPM has been one of the most widely used asset valuation techniques; it has been the benchmark of asset pricing models and has been used by most researchers to estimate the return on assets and the cost of capital (Shih, Chen, Lee & Chen, 2014).

Shih, Chen, Lee and Chen (2014) described the assumptions guiding the use of CAPM as follows:

1. Investors are risk-averse who seek to maximize the expected utility of their wealth;
2. Investors are price takers and have homogeneous expectations about asset returns that both have normal distribution;

3. The existence of a risk-free asset from which investors may borrow or lend unlimited amounts at a risk-free rate;
4. The quantities of assets are fixed, and all assets are tradable and perfectly divisible.
5. Asset markets are frictionless, and the information is costless and simultaneously available to all investors
6. Market imperfections such as taxes, regulations, transaction cost or restrictions on short selling do not exist.

According to Sharpe (1964) and Lintner (1965), the CAPM can be mathematically expressed as:

$$E(R_i) = R_f + \beta\left[E(R_m) - R_f\right] \quad (2)$$

The market Beta can be determined as follows:

$$\beta_i M = \frac{COV\,(R_I R_m)}{\sigma^2(R_m)} \quad (3)$$

Where $E\,(R_i)$ is the expected market return, R_f is the risk-free rate of return and $E\,(R_m)$ is the expected market return. The market return rate minus the risk-free rate $[E\,(R_m) - R_f]$ is referred to as the market premium with an underlying market risk which is equal to the risks added to the market portfolio (Damodaran, 2012). β is the market beta, which measures the sensitivity of an asset's return to the variations in the market return (Obrimah, Alabi & Ugo-Harry, 2015).

The CAPM also highlights the concept of the Equity Risk Premium which states that for every additional risk, an investor should be compensated and that the risk premium is directly proportional to the size of the risk undertaken (Dawson, 2015). Therefore, the expected return on an asset is equal to the risk-free rate in the economy (usually, yields on government securities

such as bills or bonds) plus the market premium multiplied by market beta (Obrimah, Alabi & Ugo-Harry, 2015).

The model shows a simple linear relationship between the required rate of return of an asset and the risk associated with that asset or for any portfolio of assets (Chiarella, Dieci, He, & Li, 2013). In addition, CAPM is used to explain the market equilibrium of asset prices under conditions of risk, and it could be used to evaluate a project's specific cost of capital (Sharpe, 1964). Thus, the major advantage of the CAPM is that it provides an intuitive means for predicting how to determine risk and to establish the relationship between expected risks and return (Fama & French, 2004).

Sharpe (1964) observed that investors tend to allocate resources to risk-free assets and in assets with acceptable risk profile to maximize their returns. In other words, investors would choose a combination of the risk-free asset and a portfolio of risky assets. This can be done through an efficient investment plan by selecting investments with the same expected rate of return and lower risk, or similar risk with higher rate of return, or lower risk with higher rate of return. Elbannan (2015) posited that this form of asset combination yields the highest ratio of excess return-to-risk which is referred to as the efficient portfolio.

The capital asset pricing model can be divided into the Single factor and Multi-factor models:

Single Factor Model

The CAPM is a single-factor linear model (security market line) that shows the relation between the expected returns of an asset and a market portfolio (Pavlikov & Uryasev, 2014). The asset beta is depicted by the slope which is a measure of the non-diversifiable (systematic) risk of

the asset. Under the single factor model, investors are compensated for their investment on the basis of time value and the associated risk. The risk-free rate compensates for time value while the associated risk is captured by comparing the return on the asset and the market return (Pavlikov & Uryasev, 2014).

The single factor model can be expressed as follows:

$$E(R) = (NRFR) + \beta_a E(R_m - NRFR) \quad (4)$$

Where

E (Ra) = the expected return on security a,

NRFR = the nominal risk-free rate,

Ba = the beta or the systematic risk of security a, and

E (Rm) = the expected return on the market.

The parameters of Equation (3) are usually determined using average industry equities return data over a period of time while the expected market return is the total market return on the market portfolio in a given period which is proxied on a composite index such as the NYSE.

Based on Equation (3), we can deduce that there is a linear relationship between the systematic risk of an investment and the expected rate of return on the investment and that the intercept of the linear relation between the systematic risk of an investment and the expected rate of return is the risk-free rate. Spyrou and Kassimatis (2009) stated that the higher the systematic risk of security, the higher the expected rate of return from the security. Also, the expected return is only affected by systematic risk provided the risk-free rate and the market return remain constant. Thus, the beta of the risk-free rate is zero, and the beta of the market portfolio is one (Spyrou & Kassimatis, 2009). In principle, the risk-free rate is the minimum return an investor

expects from an investment (Dawson, 2015). However, in practice, the risk-free rate is nonexistent because even the safest investments carry some measure of risk based on the dictates of macroeconomic variables. In Nigeria, investors use the Central Bank of Nigeria (CBN) monetary policy rate (MPR) as the risk-free rate while U.S investors employ three months Treasury bill rate as the risk-free rate.

CAPM expects investors to adopt the mean-variance efficient portfolios. An equilibrium single factor pricing model can be derived by equating an investor's aggregate asset demands to aggregate asset supply. The major weakness of the single factor model CAPM is the static one-period framework and incapable of forecasting return. The multifactor model was developed because of the shortcomings of the single factor model.

Multifactor Model and APT

The multifactor model otherwise known as the arbitrage pricing theory (APT) model is used to determine the price of an asset or a portfolio of assets (Acheampong & Swanzy, 2016). Ross (1976) originally developed the Asset Pricing Theory in which it opined that the return on any stock is linearly related to a set of systematic factors and the risk-free rate. Arbitrage Pricing Theory (APT) states that the returns on security is not based on a single factor but related to its exposure to multiple factors (Acheampong & Swanzy, 2016). The main objective of the multifactor model is to consider other relevant factors that affect the movement of security prices since the single factor model only considers a single factor to explain the movements of security prices in the market. The multi-factor model was first suggested by Ross (1976) and subsequently refined by (Fama & French, 1992). The multifactor model is based on three factors namely betas which measure market risk (Lintner, 1965; Mossin, 1966; Sharpe, 1964), firm size,

which is a function of the market capitalization (Banz, 1981) and value, measured by the book-to-market ratio (Bhandari, 1988).

In general, the arbitrage pricing theory can be expressed as:

$$R_I = a_i + \sum b_j * F_j + e_i \quad (5)$$

Where

R_i = Return on security i

a_i= independent return

B_j= Sensitivity of return of security i to j^{th} factor

F_j = F_j is the value of the j^{th} factor

e_i= random error

For the conditions above to be satisfied, the following assumptions are required.

1. The market is assumed to be perfect.
2. Investors are risk averse and have common expectations.
3. The number of assets in the market is infinite so that assets specific risk for a portfolio asset is zero.
4. There is no arbitrage opportunity.
5. Multiple factors influence the returns on assets.

These assumptions are less demanding and make the CAPM less fashionable. In general, the CAPM has come under intense criticism because of the following assumptions:

1. Investors can borrow and lend at risk-free rate.
2. Investors are only concerned about the risk and return of one-period portfolio returns,
3. Expected returns is explained by market risks (beta)

4. Market beta serves as a proxy for determining the market portfolio of all risky assets (Elbannan, 2015)

Other documented anomalies of the CAPM include equity duration (Dechow, Sloan, & Soliman, 2004), operating leverage (Novy-Marx, 2011), asset price behavior (Da, Gurun, Warachka, 2014) and organizational capital-to-assets (Eisfeldt & Papanikolaou, 2013).

Fama and French (2004) identified theoretical failing, arising from oversimplified assumptions as the major problem of CAPM. Acheampong and Swanzy (2016) citing Fama and French (2015) posited that the problem with the model stem from weaknesses in its empirical implementations. Therefore, the Fama-French multifactor model provided an alternative model to CAPM and helped to explain most of the anomalies of CAPM. The arbitrage pricing theory (APT)is less demanding and more readily applicable to asset pricing than other asset pricing models such as the CAPM or the intertemporal capital asset pricing model (ICAPM) advanced by (Maio & Santa-Clara, 2012; Merton, 1973) because it relies on relative asset pricing taking into consideration other systematic risk factors.

In a comparative study of CAPM and APT, Acheampong and Swanzy (2016) focused on determining the model that best explains the impact of excess portfolio returns on non-financial firms listed on the Ghana Stock Exchange. Acheampong and Swanzy (2016) compared the uni-factor asset pricing model with the multifactor asset pricing model in order to determine the model that best explains the phenomenon. The research findings show that the uni-factor model and the CAPM could not be used to predict the cause of excess portfolio returns reported on the Ghana Stock Exchange. However, the multifactor model provided a better explanation of the excess portfolio return for non-financial firms listed on the Ghana stock exchange.

In another study, Obrimah, Alabi, and Ugo-Harry (2015) examined the powers of the single factor CAPM, the two-moment CAPM and the CAPM with idiosyncratic risk to explain the expected returns on selected stocks listed on the Nigerian Stock Exchange (NSE). The research findings reveal that the traditional one-factor model of the CAPM could not be used test the efficiency of the Nigerian Stock Market. Also, Obrimah, Alabi, and Ugo-Harry (2015) concluded that effect of changes in the risk of the market portfolio on portfolio returns could be mitigated by having a preference for market skewness or co-skewness.

Chiarella, Dieci, He, and Li (2013) examined the heterogeneity and evolutionary behavior of investors by incorporating the adaptive behavior of investors with heterogeneous beliefs in order to establish what they termed an evolutionary capital asset pricing model (ECAPM) within the mean-variance framework. The findings revealed that instability in the market price of assets is traceable to the rational behavior of agents when they switch to better-performing trading strategies. Also, Chiarella, Dieci, He, and Li (2013) argued that the spillover in the market price of one asset to another can be caused by volatility in price and volume traded. Chiarella, Dieci, He, and Li (2013) concluded that there is a significant correlation between the volume of asset traded and volatility in price.

Despite the widespread criticisms of CAPM, the model continues to remain popular in estimating the equity cost of capital for evaluating the net present of a project (Kaya, 2016). Researchers have continued to justify the position of CAPM as the most used model of capital asset pricing noting that in most instances the results of the two models have been similar (Levy, 2012). One of such cases where the CAPM provided superior performance is the mutual funds alpha return test by (Betker & Sheehan, 2013). Betker and Sheehan (2013) compared mutual

fund alphas computed using single factor models with the ones calculated using the multifactor models. Betker and Sheehan (2013) pointed out that on the average, the single-factor model produced larger alphas than the multifactor model by 50-75 basis points, and for smaller cap funds, an alpha of more than 200 basis points greater that the multifactor methods. Betker and Sheehan (2013) concluded that alpha returns computed using single factors model showed more positive persistence than the ones computed using the multifactor method.

In practice, the CAPM is infrequently used by investors to determine the value of a startup. Festel, Wuermseher and Cattaneo (2013) noted that only a quarter of venture capitalist (VCs) utilize the CAPM to evaluate the risk premium on startups.

Income Approach-Discounted Cash Flow Method

The discounted cash flow model is one of the most widely used valuation methods for estimating the value of an investment. The initial formulation of the discounted cash flow model was first introduced by (Fisher, 1930; & Williams, 1938). The DCF is based on the assumption that cash is king and values a business by discounting the future cash flow to its present values (Ved, 2013). Two fundamental principles are subsumed in the DCF model namely the concept of time value of money and the net present value (NPV) theory (Bilych, 2013).

The assumption in the model is that the estimated value of a business and its purchasing power determined today, which is the intrinsic value of the firm, will be different from its future value and purchasing power (Bilych, 2013). DCF model is of two variants - the free cash flow to firm (FCFF) model and the free cash flow to equity (FCFE) model (Damodaran, 2012).

The most important task when using the DCF model is to determine the appropriate discount rate for discounting the relevant cash flows (Kramna, 2014). The discount rate contains

risk factors and other volatilities inherent in the market (Fernández, 2013b). Usually, the discount rate is agreed by the parties involved in the transaction based on the prevailing discount rate in the market. The discount rate reflects a systematic risk that cannot be diversified either by hedging or holding a diversified portfolio (Mehrara, Falahati & Zahiri, 2014; Waemustafa & Sukri, 2016). Damodaran (2012) stated that discount rates could either be a cost of equity if equity valuation is required or can be a cost of capital when calculating the value of a firm which can either be expressed in real or nominal terms based on the nature of the cash flow.

The discounted cash flow method can be mathematically expressed as follows:

$$V = \frac{CF1}{(1+r)} + \frac{CF2}{(1+r)^2} + \frac{CF3}{(1+r)^3} + \ldots\ldots\ldots\frac{CFn}{(1+r)^n} + VRn \quad (6)$$

Where

CF = cash flow generated by the business

V_n= residual value of the business

r = agreed discount rate

The residual value in year n can be expressed as:

$$VR_n = \frac{CF_n\,(1+g)}{(K-g)} \quad (7)$$

Where

g = the constant growth rate of cash flows after the period.

The Free Cash Flow (FCF) Model

The free cash flow is the cash generated from operations otherwise known as the operating cash flow. Begović, Momčilović, and Jovin (2013) stated that the free cash flow to the firm represents the cash flow available to fund providers after taking into consideration investments in net working capital and fixed assets. In other words, there are no financial expenses (Fernández, 2013a). The free cash flow is the difference between free cash flow to

equity and free cash flow to the firm in addition to the firm's debt and other expenses (Fernández, 2013b). The free cash flow equation can be expressed as:

Free cash flow to the firm = EBIT (1- tax rate) + Depreciation – Investment in fixed assets – Change in the net working capital (8)

The free cash flow to the firm is discounted using the weighted average cost of capital (WACC) because it takes into consideration the various funding sources (Al-Zararee & Al-Azzawi, 2014). The WACC model was propounded in 1958 by Modigliani and Miller and states that the value of a firm can be extracted by calculating the present value of the after-tax operating cash flows.

In general, Damodaran (2012) gave the basic formula for determining an entity's WACC as follows:

$$WACC = \frac{E}{V} * r_e + \frac{D}{V} * r_d * (1 - T_c) \quad (9)$$

Where

r_e = cost of equity, which reflects equity's risk

r_d = cost of debt before tax

E = market value of the company's equity

D = market value of the company's debt

V = the sum of market value of the company's equity and market value of the company's debt (E+D)

T_c = corporate tax rate

Estimating the free cash flow of a company is important because it shows the financial health of a business, and its ability to fund new business opportunities without seeking external finance

(Ghadage & Abale, 2016). The model is also important to investors because the FCF can be used to estimate the amount available for distributable as dividends at the end of the period.

Free Cash Flow to Equity

Free cash flow to equity (FCFE) is used to determine the amount of cash available to be paid to equity holders of a company after deducting the company's debts (both old and new) including all expenses (Farooq & Thyagarajan, 2014). Essentially, FCFE measures how a company makes use of its equity capital (Ghadage & Abale, 2016). Fernández (2013a) describes FCFE as the money that comes out from the company's cash to the pockets of the shareholders. This can be represented as:

FCFE = Net Income - Net Capital Expenditure - Change in Net Working Capital + New Debt - Debt Repayment (10)

Alternatively, the FCFE can be expressed as:

FCFE = FCF - [interest payments x (1- T)] - principal repayments + new debt (11)

The free cash flow to equity is measured by deducting the free cash flow from the interest and principal payments (after tax) plus new debt provided. Despite the criticisms of the DCF valuation method, many have identified the DCF method as the most dominant and conceptually correct method used in practice. The DCF is popular in corporate finance because it incorporates elements of risk in estimating a firm's cost of capital; the DCF is largely independent of market shocks and takes into consideration the entity's future investment plans (Kramna, 2014; Zarzecki, 2010). In their observation about the use of DCF, Farooq and Thyagarajan (2014) described the model as the most reliable valuation method for determining the fair value of an asset after taking into consideration the growth prospect of the organization.

DCF has been criticized for lack of information needed to establish the intrinsic value of an asset. Specifically, Farooq & Thyagarajan (2014) pointed out that the weaknesses of the DCF made it unsuitable for evaluating research and development (R&D) companies and by extension high-tech startup companies. Festel, Wuermseher, and Cattaneo (2013) noted that the weaknesses of the DCF model include its inability to predict cash flows, growth rates and the cost capital for startups. Also, the DCF is incapable of adapting to the changes in the real world such as business liquidation or a change in scope of the business (Schootbrugge & Wong, 2013).

Asset Based Valuation Model

Asset based valuation model was first developed by Lee (1996) and expanded by Reilly & Schweihs (1999). Asset based model focuses on the assets owned by a business including the cost of replacing such assets. The asset based valuation method is one of the traditional models used in establishing the value of a business based on its identifiable assets after taking into account all its liabilities (Janas, 2013). The asset based method is simple to use and usually requires little or no technical inputs (Farooq &Thyagarajan, 2014). The common asset based valuation method includes adjusted net asset method, the book value approach, replacement cost and the liquidation value.

The International Accounting Standard: Presentation of Financial Statements (IAS 1), described an asset is a resource controlled by an entity arising from past events from which economic benefits are expected to flow to the entity. The essential features of an asset include controlled by the entity, the asset is a product of past events, future economic benefit is expected to flow to the entity and the asset can be measured reliably.

An asset can be classified as current and noncurrent assets, and assets can further be divided into tangible or intangible assets (Janas, 2013). Examples of current assets include cash and cash equivalents, assets held for trading for less than twelve months and assets which are expected to be realized, sold or consumed in the normal course of the business operating cycle. Noncurrent assets are assets that do not meet the definition of current assets. Property, plants and equipment, investments, intangible assets are examples of noncurrent assets.

The international financial reporting standard: Fair value measurement (IFRS 13) provides the procedure for determining the fair value of an asset. The standard describes the fair value of an asset as the price that would be received to sell an asset or paid to transfer a liability in an orderly transaction between market participants at the measurement date (IFRS 13). The standard assumes the presence of an active market aids price discovery. The challenge with valuing non-financial assets is that only a few of them are traded in active markets (Fang, Majella, & Daifei, 2015), hence unobservable inputs, usually fair value of similar assets are then used to compute the value of the asset (Farooq & Thyagarajan, 2014). Valuing assets based on unobservable market prices is permissible to allow the business owner as well as the investor make a more rational decision by revealing hidden values of the business (Bastian, Haase, & Grunewald, 2012). Other forms of value are the "value in use" or "special value."

Adjusted Net Asset Method

The adjusted net asset method is used to determine the value of a company by computing the difference between the assets and liabilities based on their book values. The adjusted net asset method is usually the starting point in evaluating the worth of a business but not the definite value. In practice, the model is widely used to value small companies with difficult cash

flow projections or loss-making ventures. The value obtained through this process is compared with valuations obtained using other models in order to make an informed investment decision.

Damodaran (2012) noted that the adjusted net asset method works based on the assumption that an investor will pay no more for a business than the cost of assembling all the individual assets and the liabilities of the firm. This is akin to Marshall (1920) principle of substitution in economics that states that a buyer will pay no more for a property than a comparable alternative. The potential adjusting items in this approach includes the fixed assets, current, and noncurrent assets to incorporate their fair values. Other adjusting items include accounts receivables to identify all doubtful and irrecoverable debts and ensuring all the company's liabilities including potential liabilities are recorded.

Silvia and Cristina (2016) noted that there is more to the value of a business than its assets. The value of company is a function of its assets and liabilities and its capacity to generate future economic benefits (Ghiță-Mitrescu & Duhnea, 2016).

Usually, the value of a business computed on the basis of its net assets is usually lower than its market value because of its investment in human capital development or marketing (Farooq & Thyagarajan, 2014). Thus, the adjusted net asset method is not to be used in isolation, the value-in-use as a going concern entity should be considered. The adjusted net asset method is mostly used for valuing holding companies or capital-intensive companies, loss-making businesses and when a business is going to be liquidated.

As shown in Table 2, a fair market value adjustment of the company's individual asset is made. The depreciated amounts over time are taking into consideration in determining the fair value of the assets. An allowance of 5% is made for irrecoverable debts and items in inventory

written down to its recoverable amount in agreement with International Accounting Standards (IAS 2 Inventories). The standard stated that items in inventory are to be measured at the lower of cost and net realizable value (NRV). Also, the company's current and long-term liabilities are taking into account with any loan repayment adjusted in arriving at the net liabilities. The difference between the net assets and net liabilities yield the equity component of the company, and this is true for every company, because irrespective of the number of operations performed, the company's total assets must always be equal to its total liabilities (Janas, 2013).

Table 2

The Adjusted Net Asset Approach

ASSETS	Book Value ($'000)	Adjustments ($'000)	Fair Value ($'000)
Noncurrent assets			
Land and building	5,000	250	5,250
Plant and equipment	3,500	-350	3,150
Office equipments	1,300	-130	1,170
Vehicles	250	-25	225
	10,050	-255	9,795
Less: Accumulated Depreciation	-500	500	-
	9,550	245	9,795
Current Assets			
Inventories	3,500	-100	3,400
Receivables	2,500	-125	2,375
Cash	500	-	500
Bank deposits	350	-	350
	6,850	-225	6,625
Other Assets	250	-	250
Total Assets	**16,650**	**20**	**16,670**
LIABILITIES AND EQUITY			
Current liabilities			
Payables	3,000	-	3,000
Expenses	2,250	-	2,250
Interest on loans	500	-	500
	5,750	-	5,750
Noncurrent liabilities			
Long-term debt	2,500	-250	2,250
Total liabilities	**8,250**	**-250**	**8,000**
Equity component	**8,400**	**-230**	**8,170**

The major limitation of this model is its inability to build in a company's valuation to the future potential of the business. The model only shows a picture of the market value of the

company at the measurement date (Ghiță-Mitrescu & Duhnea, 2016). Investors are more likely to be concerned about the ability of the business as a whole to generate economic benefits and not the aggregate value of the company's individual assets. However, despite its criticisms, the adjusted net assets model is widely used as a starter when evaluating the value of a business. The model provides a fair market value of the individual assets owned by the company that allows both the founder and the investor make an informed decision (Ghiță-Mitrescu & Duhnea, 2016). Additionally, the model is only suitable for valuing a business when the aim of buying the company is to wind it up immediately after acquisition. Experts have, however, warned that this model should be used in conjunction with other models when determining the value of a business.

Relative Valuation Method

The international valuation standard council: Valuation Approaches and Methods (IVS 105, 2015) described the market approach to valuation as the process of determining a company's value by comparing the entity's assets with identical assets for which the price is available. A comparable firm is one with similar characteristics with the entity being valued such as similar cash flows, risks and growth opportunities (Damodaran, 2012). This is in tandem with the provisions of the International Financial Reporting Standards (IFRS 13-Fair value measurement) which states that assets can be valued using level 2 inputs which are the quoted prices for similar assets or liabilities in active or inactive markets.

The relative valuation approach is based on the principles of market valuation method. Bernström (2014) noted that the objective of the relative approach to valuation is to establish a company's value based on prices of comparable assets obtained from the stock exchange or

through publicly available company transactions. This approach combines the entity's sales volume, sales value, book values, price-related indicators and earnings-related ratios to establish the value of a company. Damodaran (2012) identified three essential steps to utilizing the relative valuation method.

1. Identify similar assets priced by the market.

2. Standardizing the market prices to ensure comparability.

3. Adjusting for differences across assets by comparing the assets with the standard values especially when the assets are not perfectly comparable.

The relative valuation method uses ratios or multiples to determine the value of a company usually by comparing them with specific industry averages (Farooq &Thyagarajan, 2014). The most commonly used ratio is the price-to-earnings ratio (P/E ratio). The P/E ratio is the ratio of the share price to earnings, and it's determined by market value per share by the company's earnings per share. The ratio provides investors with an indication of the future performance of the company and how sustainable the company's net profit would be in the coming year (Sareewiwatthana, 2014). The formula for calculating P/E ratio is as expressed below:

P/E= Market value per share/ Earnings per share (12)

Acquiring a company with lower P/E ratio is seen as a bargain purchase, and a higher P/E ratio means that investors anticipate higher growth rate in the future. Loss-making firms do not have a P/E ratio. Sareewiwatthana (2014) stated that the efficiency of the P/E ratio can be enhanced by introducing a long-term growth rate and a risk factor as indicated below:

$$PEG = \frac{PE}{g} \quad (13)$$

Where g is the expected annual growth rate

$$PERG = PE * \frac{R}{g} = PEG * R \quad (14)$$

Where R is the risk factor

The earnings before interest, tax, depreciation and amortization (EBITDA) is another important multiple used in the relative valuation analysis. EBITDA is used as an alternative to P/E ratio. Farooq and Thyagarajan (2014) observed that EBITDA has been widely used in valuations and inter-company comparisons because EBITDA is capital structure-neutral and can be applied to loss-making firms and cash based businesses. The multiple can be used to assess a company's performance without considering financing cost or tax. The enterprise value (EV/sales) is another common ratio used in the relative valuation analysis. This value is determined by dividing the Enterprise Value by the annual sales figure of the company (Farooq & Thyagarajan, 2014). This ratio is mostly used in evaluating small income making companies but with a large amount of turnover.

The benefit of the relative valuation method is that its application is less cumbersome to apply and requires little or no amount of mathematical or technical skills (Bancel, & Mittoo, 2014), and the information required is readily available. Also, the information required is not as much as the ones required when using the discounted cash flow model (Farooq & Thyagarajan, 2014). The major challenge with this model is that relative valuation is built on the assumption that industry averages are accurate. This means that more often than not this approach might lead to over or undervaluation of assets (Damodaran, 2012).

In general, because of the uncertainties associated with high-tech startups, the lack of historical records, the absence of publicly available data and volatilities in their funding costs,

multiples are unsuitable for valuing early stage companies (Festel, Wuermseher & Cattaneo, 2013). Schootbrugge and Wong (2013) pointed out that the use of multiples to value early stage companies usually gives a higher valuation thereby presenting a false value of the company at the advantage of the founder and at the expense of the investor.

Real Option Valuation Model (ROVM)

The real options model also known as real options analysis is relatively a new valuation method that was first suggested by (Myers, 1987) and is built on financial option valuation framework. Myers (1987) utilized the financial option theory to explain and determine the value of an investment. The real option valuation model is rooted in the financial option theory, and hence they share similar terminology which makes it applicable to real options pricing model (Rigopoulos, 2014). The real option version of the conventional financial option was tagged "real" because their payoffs are based on real assets, such as R&D projects, oil exploration, mines, and technology licenses (Chan, Cheng, Gunasekaran, & Wong, 2012).

Rigopoulos (2015) described a financial option as the option that provides the holder the right, but not the obligation, to buy or sell a specified amount of an asset at a fixed price, the strike price or exercise price, before or at the expiration date. Conversely, a real option is the right but not the obligation to undertake certain actions on the business such as expanding, contracting, deferring, or abandoning at an agreed amount which is the exercise price for a specified period of time (Rigopoulos, 2015).

Financial options are usually of two types – call option and put option. A call option provides the buyer the option to buy an underlying asset at a predetermined price while a put option gives the seller the right, but not the obligation, to sell a specified amount of an

underlying asset at a predetermined price (Damodaran, 2012). An opportunity to undertake business expansion can be viewed as a call option while a decision to sell an asset can be described as a put option. The model views investment opportunities as a call option on real assets (Rigopoulos, 2015).

Using the Black and Scholes (1973) model, the call option can be presented as:

$$Call = S_o N(d_1) - XN(d_2)e^{-rf(T)} \quad (15)$$

While the put option is mathematically represented as:

$$Put = S_o N(d_1) - XN(d_2)e^{-rf(T)} \quad (16)$$

$$d_1 = \frac{In\left(\frac{S}{X}\right) + (r_f + 0.5\sigma^2)T}{\sigma\sqrt{T}} \quad (17)$$

$$d_2 = d_1 - \sigma\sqrt{T} \quad (18)$$

Where

S_o= value of the underlying security

X = strike price or the investment cost

r_f = risk free rate

T = expiration date

N(d) = cumulative normal distribution

e = base of natural logarithms

σ = volatility of the underlying asset

The real options model is a flexible valuation method that takes into account the possibility of an early stage firm evolving in different ways (Schootbrugge & Wong, 2013). This flexibility makes it possible to evaluate the value of a startup at various growth stages. The flexibility of the real options model takes into consideration the innovative potentials of startups

and the possibility for expansion in the valuation process. The model leverages on the value attached to management flexibility. Taneja, Pryor, Sewell, and Recuero (2014) described the ability of managers to make informed decisions during market turmoil, adverse economic and unfavorable technological conditions as invaluable and an indispensable asset.

Copeland, Koller, and Murrin (2000) stated that the value of an asset computed using the real options model is affected by the present value of the cash flow from the business, the exercise price or the cost of the investment and the expiration date of the right. Copeland, Koller, and Murrin (2000) noted that the time spent in obtaining more information about the deal increases the real option value. Other factors include the uncertainty or volatility that comes with management flexibility, the risk-free rate, and cash flow lost to competitors in the form of dividends (Copeland, Koller, & Murrin, 2000).

Unlike the traditional financial options, the underlying assets in real options are usually not traded as securities. In their study on modular reactors, Locatelli, Boarin, Pellegrino and Ricotti (2015) posited that the real options model is valuable when management is willing to exercise the option even during periods of uncertainty about the value of the business and when management has the flexibility to alter the fortunes of the business. The uses of the real options model extend beyond its application in modern finance to real life decision-making especially during periods of uncertainty. Motivated by the drawbacks of using the DCF, CAPM, and multiples to value startups, Milanesi, Pesce, and Alabi (2013) utilized the real option valuation model to value technologically based firms after adjusting for normal distributions. The results show that firm's value and its strategic options are affected by stochastic higher moments' behavior.

The major advantage of the real options method is its ability to consider the level of risk and uncertainties associated with new investments which are lacking in the CAPM, DCF and the asset-based methods (Rigopoulos, 2015). Cobb and Charnes (2007) noted that the real options model is seen as a more refined model for valuing early stage firms because it allows managers to decompose the business into components of risks and options which enhances the opportunity of addressing sources of uncertainty in the business. The major challenge with this model is the level of uncertainty that affects the underlying real asset investment. Also, establishing the real option value is quite complicated and might be difficult for an average business owner to understand (Schootbrugge & Wong, 2013).

Venture Capital Method

The venture capital model is one of the models widely used by investors to value young firms. The venture capital model (VCM) was first used by Sahlman (1990), a Harvard professor. The venture capital model is the method used by venture capitalists to make investment decisions by assessing startups with high growth potential. The VCM integrates the features of DCF and the Multiples methods in determining the value of a young firm (Aydın, 2015). Venture capital financing is usually carried out by professionals in their area of specialization, and they base the valuation of a business on the projected return on investment, how and when they want to exit (Aydın, 2015; Chavda, 2014; Festel, Wuermseher & Cattaneo, 2013). Using specialized valuation tools, venture capitalists utilize multi-stage financing approach to take advantage of different investment opportunities (Becsky-Nagy & Fazekas, 2015).

The VCM takes into consideration four critical factors when selecting options for investment namely the human capital, in this case, the founder or managers of the business, the

product, the market where the products are to be sold and the funding required. Becsky-Nagy and Fazekas (2015) stated that a venture capital approach is a form of risk financing in which the venture capitalists take up equity or quasi-equity in the new venture. The end product of this is that funds are given to support the venture, and in some cases, the venture capitalists contribute to the management of the business. Vijayalakshmi, Tirumalaiah, and Sony (2015) added that venture capital financiers provide technical know-how to the firm as well as offer consulting services based on the agreement reached with owners of the venture.

The financing stages are usually classified into seed financing, startups, expansion and acquisition financing (Aydın, 2015). One of the important decisions taken before investing is the exit strategy. According to Becsky-Nagy and Fazekas (2015), venture capitalists can cash out their investment either through initial public offerings, acquisition of the firm or sales of the venture capitalists' share to other investors. In general, the venture capital method can be presented mathematically as:

Expected exit value/expected return – amount invested = pre-money valuation (19)

Alternatively,

$$\text{Final Value of the venture} = \frac{\text{Investment}}{\text{Terminal value} / (1+\text{IRR})^{n}} \quad (20)$$

Where *n* is the number of years. For instance, assuming a venture capitalist seeks to invest $10,000,000 in a new venture in which it anticipates a 50% return after a five years period when it plans to exit the investment. The final value of the investment can be calculated as (1+0.50)5 x 10,000,000 = $75,937,500. The final value of the business in the fifth year can be determined using price-to-earnings ratio. Assuming the enterprise makes $ 3,000,000 in the fifth year and assuming an average industry P/E ratio for similar firms of 15, the value of the business

can be given as (15 x 8,000,000 = $120,000,000). Thus, the venture capitalist's share of the company is calculated as (75,937,500/120,000,000 = 63.30%).

There have been different interventions by researchers on the venture capital valuation phenomenon. Cumming and Dai (2011) examined how venture capital's fund size, reputation, and limited attention conditions affect their bargaining power and the valuation of investees. Cumming and Dai (2011) revealed a positive correlation between the size of the VC's and the price paid for investees. Peter and Anyieni (2015) examined how venture capital financing could influence the growth of Micro and Small Medium Enterprises (MSMEs) and how a government could adopt this model to accelerate the achievement of the millennium development goals. The study revealed that improved corporate governance and perception of MSMEs was necessary to ensure continued credit support to MSMEs. In another study, Feng (2015) examined whether VC-backed firms carry out earnings management before exiting their investment through initial public offering (IPO). The study showed a negative correlation between VC and earnings management before IPO when the firm is a single backed VC, and an insignificant relationship was observed when two or more VCs back the firm.

Literature Review Part 2: Mergers and Acquisitions Theories

Literature review part 2 relates to the mergers and acquisitions phenomenon. In this section, I discuss the features of mergers and acquisitions and the primary motives for acquisitions. Building on this, I examine related mergers and acquisitions theories and how they impact the growth opportunities of startups. After appreciating the uniqueness of the different valuation methods used in determining the worth of a business, it became possible to identify relevant mergers and acquisitions theories that helped to explain the interplay between valuations

and consummating a merger and acquisition transaction in addition to understanding the motive behind mergers and acquisitions. Therefore, this section covers three key areas, the theories explaining acquisition behaviors namely the wealth maximization theory, turnaround theory, and the information asymmetry theory. Secondly, the motives for mergers and acquisitions and thirdly, how mergers and acquisitions deals are consummated. In summary, the theoretical guidance provided a background to contextualize and accentuate the role of mergers and acquisitions in the developmental phase of startups. Also, these theories provided a means of testing the veracity of the research assumptions; offered an opportunity to better appreciate the challenges of consummating mergers and acquisitions in the high-tech industry and strengthens existing theories in this field.

The concept of mergers and acquisitions has been widely documented in literature and broached by many authors from different perspectives including corporate finance, information, and strategic management. The two terms are often used interchangeably, but there is a clear difference in their economic implication and realities. Mergers and acquisitions is a strategic expansion activity to shift control of a firm from one set of shareholders to another (Ross, Westerfield, & Jaffe, 2010). Mergers and acquisitions is a fundamental strategy of corporate restructuring and control as well as growth strategy (Garzella & Fiorentino, 2014).

Further, Malik, Anuar, Khan, and Khan (2014) defined mergers and acquisitions as activities involving takeovers, corporate restructuring, or corporate control that changes the ownership structure of firms. To be more specific, acquisition represents activities by which the acquiring firms can control more than 50% control of the equity of the acquired firms (Piesse, Lee, Lin, & Kuo, 2013), and as part of an organization's growth plan (Koi-Akrofi, 2014). On the

other hand, a merger is the combination of two companies to form a new legal entity (Piesse, Lee, Lin, & Kuo, 2013). Ciobanu (2015) added that merger is the combination of two companies to form a single entity, while one company survives the other ceases to exist.

Wealth Maximization Theory

Wealth maximization has been identified as the main business strategy behind most investment decisions made by investors (Manne, 1965). Creating economic value for shareholders is at the heart of corporate finance and strategic decisions made by management in line with neoclassical and modern finance theories (Watson & Head, 2013). Oladipupo and Okafor (2011) posited that increasing shareholder's value is the fundamental objective of mergers and acquisitions. In principle, taking investment decision should be based on the expected returns from the project and whether shareholder's wealth can be maximized in the process.

In their comparative study on budgeting techniques, Lunkes, Ripoll-Feliu, Giner-Fillol and Rosa (2015) identified four project appraisal techniques to include the payback period, accounting rate of return, the net present value and the internal rate of return. These techniques have been used to establish the corporate performance of a firm measured based on the return on assets.

In modern finance, undertaking business valuation has become an essential tool for identifying the sources of economic value and potential sources of mergers and acquisitions (Kramna, 2014). Watson and Head (2013) stated that for an investment to be considered worthwhile, it must have a positive net present value (NPV). This means that its projected future

cash flows exceed its initial capital outlay, which invariably leads to accretion in shareholder's value.

Using the single factor and multiple factor market models to examine the rate of return accruing to the acquiring company in the post-acquisition era, Smita, and Muralidhar (2014) found a significant increase in wealth to the acquiring firm which invariably impacts on the wealth of the owners of the company. Alshammary and Almutairi (2015) analyzed the shareholder's wealth creation effect of mergers and acquisitions using Lloyd's acquisition of HBOS as a case study. The study revealed a significantly positive relationship between mergers and acquisitions and wealth creation both in pre and post-acquisition period. Using data obtained between 2006-2007 from 39 acquiring firms in India, Azhagaiah, and Sathishkumar (2014) registered that acquiring firms had significant improvement in operational performance over the study period.

In their study on Merger Activity in Industry Equilibrium, Dimopoulos and Sacchetto (2017) posited that mergers and acquisitions directly affect the productivity of the engaging firms as a result of the synergy that now exists. Dimopoulos and Sacchetto (2017) found that mergers and acquisitions activities increase average firm productivity by 4.8%, of which 4.1% relates to the accumulation of synergies, while 0.7% reflects the firms' entry and exit decisions conditions.

Target firms' shareholders also benefit from takeovers. Reviewing banking sector acquisitions in the U.S between 1980 and 2002, Li (2016) established that acquisitions do increase wealth especially for the shareholders of the bank acquired. Researchers such as

Mallikarjunappa and Nayak (2013) and Inoti, Onyuma, and Muiru (2014) have also confirmed that the wealth of the shareholders of target firms does appreciate following a takeover deal.

Stunda (2014) thinks that mergers and acquisitions have in fact helped to lift the stock market, and ultimately, acquiring firms' bottom lines and stock prices. In cases where there is a post-acquisition slump in stock prices, Chatterjee (2011) attributes this to the direct costs of acquisition which is the purchase price and the indirect cost such as the legal fees accounting fees and other associated costs of acquisition.

Researchers have also shown that impact of mergers and acquisitions on the acquiring firm is not always positive. On the failure of mergers and acquisitions in recent past, Lau, Liao, Wong, and Chiu (2012) argued that 60% of mergers and acquisitions deals fail to meet the financial objectives and in the case of a cross-border mergers and acquisitions deal, only 17% create value for the shareholders. In another related study, Islam, Sengupta, Ghosh, and Basu (2012) found that the impact of mergers and acquisitions on employees was the same irrespective of the geographical location of the merger and acquisition deal. Calix, Mallepudi, Chen, and Knapp (2010) argued that most mergers and acquisitions fail because so much attention is placed on financial objectives over social, socio-cultural and other nonfinancial factors. Ghosh and Dutta (2014) described mergers and acquisitions as corporate marriages and alliances, stressing that mergers and acquisitions encounter the same challenges as traditional marriages. As such, most of them fail to achieve the anticipated strategic and financial objectives outlined in the pre-merger or pre-acquisition planning phase (Ghosh & Dutta, 2014).

Turnaround Theory

Theorists led by Schendel, Patton, and Riggs (1976) and Barker and Duhaime (1997) are united that an organizational decline is framed as strategic management problem that can only be solved through turnaround strategy. In strategic management, mergers and acquisitions is considered as one of the major turnaround strategies for slow growing firms. Turnaround strategy occurs when an acquiring firm takes over a poorly run firm that is experiencing financial difficulties or loss making with the intention of reversing the fortunes of the target firm (Pozniak, Hirth, Banaszak-Holl, & Wheeler, 2010). To achieve a turnaround, the two firms harness their competitive strength through acquisition and combination of resources.

A corporate turnaround is said to be achieved when an organization undertakes external measures such as mergers and acquisitions because of the limitations in its available resources to improve growth, corporate value, increase profit margins, and to attain greater productivity (Panicker & Manimala, 2015). Panicker and Manimala (2015) described turnaround as management actions at arresting organizational decline or at reversing a loss situation to achieve a breakeven point. The turnaround strategy is about making fundamental adjustments to the growth strategy of a business such as acquisitions, mergers, and divestment (Angwin, McGee & Sammut-Bonnici, 2015).

Also in line with turnaround theory is the preference of firms for target firms with low debt, low-interest payments and predictable cash flows (Pozniak, Hirth, Banaszak-Holl, & Wheeler, 2010). According to Ruess and Voelpel (2012), a successful mergers and acquisitions depend on appropriate timing, the choice of a suitable target and a low acquisition price. Selecting the wrong target and doing so at the wrong time, might not achieve the desired result

(p.78). This has necessitated the need for pre-acquisition screening to ensure the right companies are targeted for acquisition (Collan & Kinnunen, 2011). Turnaround strategy comes in different terms such as repositioning, restructuring and reorganizing.

Takeovers have been identified as a key turnaround strategy. Zanoni, Vernizzi, and D'Anna (2014) in their empirical study observed that organizations utilize takeovers as part of their growth strategy especially where acquisition would be more beneficial to existing operations than to continue growing organically. Young firms are usually cash trapped and unable to achieve any meaningful growth by relying on its operating cash flows. To bridge the funding gap, growing high-tech firms form strategic alliances or enter mergers and acquisitions (Klobucnik&Sievers, 2013). Malik, Anuar, Khan and Khan (2014) stated that the main reason why firms enter into mergers and acquisitions is to benefit from working together as compared to working alone.

In their empirical study, Morrow, Hitt, and Holcomb (2007) found that acquiring external resources and capabilities through mergers and acquisitions are tools to accelerate an organization's turnaround when the firm's internal resources are inadequate to bring about the needed change. Following this line of argument, Ndofor, Vanevenhoven, and Barker (2013) posited that acquisitions and strategic alliances provide the firm with the much-needed resources to achieve strategic repositioning that could have been impossible working with the firm's own resources.

Other researchers (Michael & Robbins, 1998; Ndofor, Vanevenhoven, & Barker, 2013; Robbins & Pearce, 1992) have argued that retrenchment could help accelerate a firm's turnaround. While studying textile firms experiencing a decline, Robbins and Pearce (1992)

concluded that retrenchment was an indispensable factor in achieving an organizational turnaround. Other researchers have questioned this conclusion. In an empirical study to examine the role of retrenchment in turnaround process, Castrogiovanni and Bruton (2000) reported a neutral effect of retrenchment on turnaround performance of a distressed firm post acquisition. In a related study, Datta, Guthrie, Basuil, and Pandey (2010) contended with the literature supporting downsizing as a strategy to achieve turnaround for firms experiencing an organizational decline. Datta, Guthrie, Basuil, and Pandey (2010) stated that cost savings from downsizing do not come without creating other organizational problems.

Successful Turnaround Acquisitions

Literature is replete with successful acquisitions that have turnaround the fortunes of either the acquiring firm or the target firm. A classic example is the 2005 China-based Lenovo's acquisition of IBM PC Division for $1.75bn. The PC division of IBM was sold off because it was loss making and needed to be revamped. In a statement made available to the Securities and Exchange Commission, IBM noted that the PC division lost nearly a billion dollars within a space of three and half years. On the part of Lenovo, Thomas (2016) reported that the company took the decision in order to scale up its PC and Smartphone manufacturing division to keep pace with its competitors. Post-acquisition and within a space of ten years, Lenovo had grown into the world's number 1 PC maker, ranking third in Smartphone manufacturing and number 3 in the production of tablet computers (Thomas, 2016).

Turnaround acquisitions can help to accelerate the time to market of a target's product. In their empirical study, Koller, Goedhart, and Wessels (2010) highlighted some successful turnaround acquisitions of high-tech firms. For instance, the study discussed IBM's strategy of

pursuing its software business. In a series of acquisition between 2002 and2009, IBM acquired 70 companies for a value of $14 billion to pursue its software development business. Koller, Goedhart, and Wessels (2010) found that IBM revenue grew by almost 50% in the first two years after each acquisition and at an average growth of 10% in subsequent years. Also discussed was the Procter & Gamble's acquisition of Gillette in 2005. In some quarters, the P&G-Gillette combination is regarded a transformative deal in which the combined company leveraged on Procter & Gamble's existing coverage in the emerging market to achieve tremendous growth in sales and boosting the new company's revenue above the $60 billion mark.

Koller, Goedhart, and Wessels (2010) also evaluated the Cisco Systems acquisition of 71 companies from 1993 to 2001 at an average price of $350m to bridge its technology gap and to enable it to assemble additional networking products. Post-acquisition and between a space of eight years, Cisco's revenue had expanded from $650 million in 1993 to $22 billion in 2001 and $36 billion in 2009 with the 40% of the revenue coming from those acquisitions.

There is no magic formula to decipher which acquisitions will be successful or not in repositioning a company. Putting all the arguments above together, the conclusion is that, if done properly, at the appropriate time and with the right parties, acquiring or merging with firms with low debt profile and supported with the right dose of downsizing could provide high-tech startups a pathway to achieving sustained growth.

Information Asymmetry Theory

Information asymmetry has been identified as the major cause of the bid-ask spread between buyers and sellers during a merger and acquisition transaction (Miloud, Aspelund & Cabrol, 2012). The concept of information asymmetry in corporate finance assumes that at least

one party to a transaction has more useful information that might tilt the balance of power in the transaction. In other words, information is distributed asymmetrically between firm owners and investors.

The theory of information asymmetry stands in contrast with the efficient markets hypothesis. The efficient market hypothesis holds that the stock market is efficient and should reflect news relating to mergers and acquisitions in the stock prices concerned (Titan, 2015). The efficient market theory was first muted in 1965 by Fama who posited that on the average, competition would cause the full effects of new information on intrinsic values to be reflected immediately in actual prices. An efficient market has been described as the market where investors return cannot be higher than the market return (Degutis, & Novickytė, 2014). This view was also shared by Brealey, Myers and Allen (2011) who noted that the stock price of a company is equivalent to its future cash flows after discounting it by an alternative cost of capital.

Arguably, no other theory in modern finance has generated so much interest about the prospect and challenges of efficient market hypotheses as it relates to information asymmetry (Antoniadis, Gkasis, & Sormas, 2015). In their empirical analysis of information asymmetry and liquidity, Bartov and Bodnar (1996) revealed that information asymmetry has a significant effect on the liquidity and market price of the firm. In a related study, Martins and Paulo (2014) utilized stock-trading data of 194 listed entities collected between 2001 and 2011 in the Brazilian stock exchange to examine the relationship between information asymmetry and stock trading. In their concluding remarks, Martins and Paulo (2014) found that information asymmetry was strongly correlated with the risk, return, the cost of equity, the liquidity of the stock and the

firm's size. In Uganda, market liquidity and stock market performance were found to be correlated with information asymmetry (Mwesigwa, Tumwine & Atwine, 2013).

Akerlof (1970) was the first to propose measures to overcome information asymmetry in his classic paper on Market for Lemons. Using the used car market as an example, Akerlof (1970) noted that buyers would seek all relevant information to avoid buying lemons in the market. Spence (1973) identified information signaling to parties and other stakeholders as a means of reducing information asymmetry. Further to this, researchers (e.g. Leland & Pyle, 1977; Ross, 1977) stated that business combination in the form of mergers and acquisitions reduces information asymmetry and the financing costs for companies in mergers and acquisitions talks. That is, profit is maximized in mergers and acquisitions when information asymmetry is reduced. On their part, Fu, Kraft, and Zhang (2012) investigated the impact of financial reporting frequency on information asymmetry and as it affects the firm's cost of equity. The study showed consistent higher reporting frequency reduces information asymmetry and the cost of equity. In general, the efficient market hypothesis holds that market value of a company would reflect fundamental information about the company and the intrinsic value of the firm.

Motives for Mergers and Acquisitions

Synergy

Synergy has been identified as one of the primary motives for mergers and acquisitions activities of growing and established firms. In this context, researchers (Ficery, Tom, & Pursche, 2007: Pamplona & Junio, 2013) described synergy as the present value of the net additional cash flow generated by a combination of two companies that could not have been generated by either

of the two companies on its own. According to Junior, Pamplona, and Francisco da Silva (2013), empirical evidence has shown that a company's combined value is always different from the sum of the values of the companies before securing mergers and acquisitions (p.1584). Malik, Anuar, Khan and Khan (2014) stated that the main objective of mergers and acquisitions is to create a synergy where 1 + 1 = 3. This difference arises from the synergy that now exists between the two companies (Junior, Pamplona, &Francisco da Silva, 2013). The immediate benefit of achieving synergy is cost reduction, elimination of duplicate facilities and processes, increased bargaining power (Fatima & Shehzad, 2014), increase in efficiency of resource allocation (Liu & Wang, 2013) and ultimately revenue enhancement (Krishnakumar & Sethi, 2012).

Diversification

Diversification management theory asserts that related acquisitions provide greater synergistic effect than unrelated acquisitions (Cording, Christmann & Bourgeois, 2002). Mergers and acquisitions serve as a vehicle or mode of entry into a target company, and they facilitate the strategy of diversification and corporate restructuring (Verma, & Sharma, 2014). Both established, and startup firms benefit from mergers and acquisitions through risk diversification and access to new resources (Liu & Wang, 2013). Through mergers and acquisitions, resource reallocation can be achieved by transferring funds from areas of surplus to areas where the funds can be effectively utilized. Additionally, in times of dwindling revenues from one stream of income as seen in the collapse of commodity prices in the last three years, mergers and acquisitions provides firms with the mechanism to gain access to other sectors of the economy or industries. Mergers and acquisitions plays a unique role in industry consolidation (Liu & Wang, 2013) as seen in countries like Nigeria and Angola where sub-national governments are veering

into agriculture to diversify their foreign exchange earnings thereby boosting activities in that sector.

Corporate Restructuring

The role of mergers and acquisitions in achieving corporate strategy has been widely documented. Nguyen (2015) observed the important role that mergers and acquisitions play in the business landscape, and how mergers and acquisitions are used as mechanisms to strengthen the market economy to becoming more efficient and effective. Mergers and acquisitions are a critical expansion activity that shifts control of a firm from one group of shareholders to another (Ross, Westerfield, & Jaffe, 2010). Mergers and acquisitions is a fundamental strategy of corporate restructuring and control as well as growth strategy (Garzella & Fiorentino, 2014).

Other reasons why organizations engage in mergers and acquisitions include gaining market share, economies of scale and cross-selling. Since the acquirer will be absorbing a major competitor, they are able to increase their market share, dominate the market and set prices. Firms are able to achieve economies of scale through increased managerial specialization and increase order size and discount from bulk purchases. In cross-selling, mergers and acquisitions presents an opportunity to the acquirer to sell complementary products similar to that of the acquired firm such as a bank selling complementary products of a stock broking firm (Arora & Kumar, 2012).

Typical Mergers and Acquisitions Process

Ruess and Voelpel (2012) itemized mergers and acquisitions process as follows:

1. Target identification
2. Acquisition or merging decision

3. Integration
4. Post-acquisition or post-merger assessment

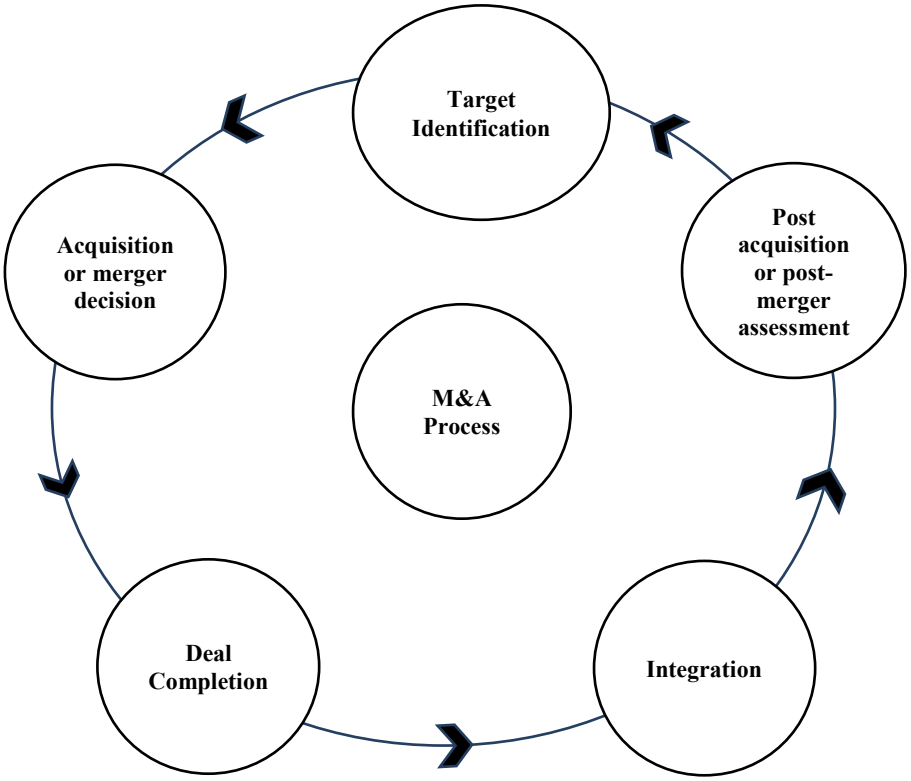

Figure 2. *A typical mergers and acquisitions process*

Mergers and acquisitions is often administered by an investment bank saddled with completing all necessary documentation for the transaction. As shown in figure 2, the process begins with identifying and contacting suitable targets for acquisition, this is done at the target identification stage. An acquirer is on the buy-side while startups are usually on the sell-side of mergers and acquisitions transaction. After identifying appropriate targets, and necessary due diligence completed, a mergers and acquisitions decision is then made and communicated to the other party through an expression of interest letter which is the second phase. The third stage is

the deal completion phase. Upon the satisfactory agreement of terms by both parties, the agreed consideration in exchange for the company is made which could either be in the form of cash or share exchange. The fourth phase is the integration stage. The acquirer integrates the company into the parent company or can continue operating as a standalone. The last phase is the post-acquisition assessment which could be made at any time following successful integration of both companies.

According to Ruess and Voelpel (2012), a successful mergers and acquisitions depend on appropriate timing, the choice of a suitable target and a low acquisition price. Selecting the wrong target and doing so at the wrong time, might not achieve the desired result (p.78). This has necessitated the need for pre-acquisition screening to ensure that the right companies are targeted for acquisition (Collan & Kinnunen, 2011).

Summary

In this chapter, I focused on startups related valuation theories as well as mergers and acquisitions theories. Over the last decade, the focus of most researchers has been on valuation methods for already established firms even to the point of literature saturation. However, the impact of valuation methods on the likelihood of mergers and acquisitions of startups has been non-existent to the best of my knowledge. Previous studies have focused on the traditional valuation methods which have largely failed to identify the unique characteristics of startups in establishing their fair values. For instance, Pereiro (2015) examined the misvaluation curse in mergers and acquisitions noting that misvaluation lead to high-sided valuations, overbid, and eventually overpay for targets and destroy the expected synergy and shareholder's value.

Other studies examined the impact of mergers and acquisitions on the growth of startups and the performance of the acquiring and target firms in the post-mergers and acquisitions era (Koller, Goedhart, & Wessels, 2010; Morrow, Sirmon, Hitt, & Holcomb, 2007; Zanoni, Vernizzi & D'Anna, 2014). The recurring theme in the studies examined so far has been the role of valuation as a determinant of the bid price during a mergers and acquisitions transaction, little or no focus have been placed on the possible relationship between valuation methods and the consummation of mergers and acquisitions.

An understanding of the relationship between valuation methods for high-tech startups and the consummation of mergers and acquisitions is critical to addressing the valuation challenges encountered by founders and funders during the negotiation stage (Aydin, 2015). Addressing this fundamental problem may improve the decision-making process especially when trying to determine the appropriate value to place on a startup and thereby reducing any illusions about a firm's value (Farooq & Thyagarajan, 2014). Also, since valuation is important to investors (Salehi, Rostami, & Hesari, 2014), establishing the appropriate valuation and pricing mechanisms may unlock access to funding for startups in the high-tech sector. To overcome these challenges, an examination of these theories as well as the valuation methods selected, was necessary to establish a possible relationship between the variables being analyzed in the study.

In part 1 of this chapter, I focused on valuation models which informed the means of evaluating the value of startups. Specifically, I covered (a) capital asset pricing model, (b) the discounted cash flow model, (c) adjusted net asset methods, (d) the relative valuation model (e) real option valuation model and (f) the venture capital method.

In part 2 of this chapter, I reviewed the theoretical underpinnings of the mergers and acquisitions phenomenon especially as they pertain to the focus of this study. The mergers and acquisitions theories covered included the wealth maximization theory, the turnaround theory and the information asymmetry theory.

In part 3, I analyzed the motives behind mergers and acquisitions and the process for consummating mergers and acquisitions. In particular, achieving synergy was identified as the primary objective for mergers and acquisitions. Other motives discussed included organizational and risk diversification agenda and corporate restructuring. With this analysis, I seek to provoke scholarly debates on the effect of valuation methods on the likelihood of securing funds through mergers and acquisitions for startups.

In Chapter 3, I discuss in much details, the research methodology used in the study. This section of the study is dedicated to discussions about the rationale for a quantitative survey research design, the participants and the sampling population from where the participants were drawn and the sampling procedures. Also, included in this section is the survey instrument used for data collection and analysis together with a discussion on the threats to the validity of the study.

Chapter 3: Research Method

In this chapter, I provide a detailed description of the quantitative survey research design used in this study. I reiterate the purpose of the study including my role during the data collection and data analysis stage. Also discussed in this section are the instrumentation and operationalization of the study's constructs. Lastly, this section includes a discussion on the study's validity, external validity and internal validity, and how threats to the validity of the statistical conclusion were reduced.

The survey research design was selected to examine the possible association between valuation methods and the mergers and acquisitions of startups. The purpose of this quantitative survey study was to examine the effect of valuation methods on the likelihood of mergers and acquisitions of high-tech startup organizations in the Nigerian capital market. A binary logistic regression model was used to test the impact of valuation methods on the chance of securing funds through mergers and acquisitions for high-tech startups.

Research Design and Rationale

A quantitative survey research design was applied in the study to examine the effect of valuation methods on the likelihood of mergers and acquisitions of high-tech startup organizations. The dependent variable was the likelihood of mergers and acquisitions of high-tech startups, while the independent variables were the valuation methods. The valuation methods used in the study included capital asset pricing model, discounted cash flow method, venture capital method, relative valuation method, asset-based method, real options valuation model, mixed valuation method and other valuation methods not stated in the study.

The quantitative research method was considered appropriate for this study because it provided an opportunity for collection and analysis of numerical data following the procedures set out in (Vance, et al. 2013). This type of inquiry can be competently addressed using a quantitative survey research design (Aggarwal & Saxena, 2012; Lawal, 2013). The research design implemented in the study was similar to that suggested in Miciuła (2016), who used six valuation methods to investigate the complexity of enterprise valuation. Miciuła found that a proper selection of the valuation method used in the evaluation process is crucial to establishing the valuation of a business and solving the crisis of the methodology of valuing an enterprise. The dependent variable, which is mergers and acquisitions, was applied in Jaroslav, Alois and Zuzana (2013) to test the key factors necessary for the success of the negotiation process for mergers and acquisitions. Jaroslav, Alois, and Zuzana (2013) found that successful negotiation of the mergers and acquisitions process was dependent on establishing the value of the target firm. Also, Yagil (1996) studied quarterly statistical reports of merger activity in the United States between 1954-1979 to examine the relationship between merger activity and macroeconomic factors. Yagil concluded that macroeconomic factors have a significant impact on merger activity in an economy.

The survey instrument suitable for this type of data is the questionnaire; it was implemented through of SurveyMonkey, an online survey platform (Davison, 2014). SurveyMonkey allows researchers to create surveys quickly using custom templates hosted on websites or sent via e-mails for participants to complete (Alshenqeeti, 2014). I selected this research design to allow for clarity, objectivity, and to ensure a high degree of certainty in the

analysis of the variables (Boone & Boone, 2012). With this approach, the superfluous details associated with qualitative research designs were avoided (Bansal & Corley, 2011; Evans, 2013).

The qualitative research methodology was considered inappropriate for this study because it will be difficult to determine the values of each variable numerically. Also, the study was about establishing association not necessarily causal relationships (Frankfort-Nachmias, Nachmias, & DeWaard, 2015); the qualitative inquiry lacks the structure to achieve the objective of this study. Also, findings from qualitative inquiries cannot be generalized to a larger population (Choy, 2014). Perhaps, I would have considered qualitative research method if the objective of the study was, for example, to carry out an exploratory research, such as a case study to examine the perceptions of founders of startups or if the aim is to explore the views of research participants on mergers and acquisitions.

Similarly, I jettisoned the mixed method approach because it would have required a comprehensive data collection and analysis process which would have been time-consuming (Crosbie & Ottmann, 2013). Also, separate studies (quantitative and qualitative) will have to be conducted which was at variance with the objective of my study. Thus, the quantitative survey research design was more beneficial to my study because the aim was to establish the key association between valuation methods and the likelihood of mergers and acquisitions of high-tech startups.

Research Questions and Hypotheses

The purpose of this quantitative survey study was to examine the effect of valuation methods on the likelihood of mergers and acquisitions of high-tech startup organizations in the

Nigerian capital market. This study was guided by the following research question and hypotheses:

RQ: To what extent, if any, do valuation methods impact the likelihood of securing funds through mergers and acquisitions for high-tech startup organizations?

Hypothesis:

Ho: There is no statistically significant probability of impact of valuation methods on the ability of high-tech startups to secure mergers and acquisitions

Ha: There is a statistically significant probability of impact of valuation methods on the ability of high-tech startups to secure mergers and acquisitions

These hypotheses were tested through the binary logistic regression model. In the hypothesis, the dependent variable is the likelihood of mergers and acquisitions while the independent variable is the valuation methods for estimating the value of high-tech startups. For this study, and in line with (Aidamenbor & Mgbemena, 2008; Okafor & Onwumere, 2012; Söderblom, Samuelsson & Mårtensson, 2013), CAPM, DCF, VCM, RVM, ABM, and ROVM were the six valuation methods considered. A mixed valuation method (MVM) was also included. The mixed valuation method was used to represent a combination of two or more valuation methods and another group for other valuation methods not highlighted in this study.

The relationship between the survey instrument and the research questions and hypotheses including the sample size/period are as shown in Table 3.

Table 3

Relationship between Study Variables

Questionnaire	**Research Question (RQ)**	**Research Hypotheses (RH)**	**Sample Size/Period**
a. What is the name of your institution?			Sample size
b. What field of the information technology sector do you belong to? Internet service providers (ISPs), telecommunication companies, IT infrastructural companies, finance and e-commerce, agriculture, health information technology, mobile application and Engineering, select all that applies			Sample size
c. Which year did you commence business operation?			Sampling period
d. Are you a member of the Nigerian Stock Exchange? Yes/No			Sample size
g. What is your organization's growth strategy, organic or inorganic?	RQ	RH	
h. Has your organization been involved in mergers and acquisitions talks in the last 10 years? Yes/No	RQ	RH	Sampling period
i. Has your organization acquired or merged with any high-tech company in the last 10 years? Yes/No	RQ	RH	Sampling period
j. During negotiations for mergers and acquisitions, does your organization apply CAPM? Yes/No	RQ	RH	
k. During negotiations for mergers and acquisitions, does your organization apply DCF? Yes/No	RQ	RH	
l. During negotiations for mergers and acquisitions, does your organization apply ABM? Yes/No	RQ	RH	
m. During negotiations for mergers and acquisitions, does your organization apply RVM? Yes/No	RQ	RH	

n. During negotiations for mergers and acquisitions, does your organization apply ROVM? Yes/No	RQ	RH
o. During negotiations for mergers and acquisitions, does your organization apply VCM? Yes/No	RQ	RH
p. During negotiations for mergers and acquisitions, does your organization apply MVM? Yes/No	RQ	RH
q. During negotiations for mergers and acquisitions, does your organization apply OR e.g. Multiples, P/E, E.V.A, e.t.c? Yes/No	RQ	RH
r. Which of the following (select all that applied) were used when assessing the valuation for the mergers and acquisitions? i). Capital Asset Pricing Model ii). Discounted Cash Flow Model iii). Asset Based Method iv) Relative Valuation Method v). Real Option Valuation Method vi). Venture Capital Method vii).Mixed Valuation Method viii). Other Valuation Methods	RQ	RH

Methodology

Quantitative research methodology was adopted for this study because this approach supports the scope of the study and it provides an opportunity for collection and analysis of numerical data in line with the procedures set out in (Vance, et al. 2013). Choy (2014) noted that quantitative research method helps to explain a phenomenon through the collection of numerical data and to analyze the data using mathematically based methods.

Survey research design was selected because it provides a means of establishing the connections between the research variables by obtaining the required information directly from the sample units (Aggarwal & Saxena, 2012). Because the expected variables to be analyzed are dichotomous and categorical in nature, only the binary logistic regression model was appropriate

(Hyeoun-Ae, 2013). The main assumption of this model is that dependent variable is discrete and dichotomous (Hyeoun-Ae, 2013). Although the logistic model is not based on the assumption of a linear relationship between the variables (Field, 2014), it however requires a linear relationship between the independent variable and the log odds of an event (Hyeoun-Ae, 2013; Sperandei, 2014).

Hyeoun-Ae (2013) noted that binary logistic regression is used to estimate the chance or probability of an event occurring [P(Y = 1)]. Also, the logistic regression is typically used to obtain odds ratios when there is more than one independent variable (Sperandei, 2014). One main advantage of using the logistic regression is the ability to eliminate confounding effects through an association of all the variables in the study (Sperandei, 2014). Thus, the logit model was used to examine the association between valuation methods and the probability of mergers and acquisitions of high-tech startups.

The dependent variable in the hypothesis is the likelihood of mergers and acquisitions of high-tech startups while the independent variables are the valuation methods. The dependent variable is dichotomous, which means there are only two possible outcomes, a yes or a no response (Field, 2014). The linkage between the independent variables and the dependent variable was tested using the binary logistic regression model (Chueh, 2013). A detailed description of how the variables were operationalized is contained in the Instrumentation and Operationalization of Construct section of this study.

Population

High-tech companies exist almost in every sector of the economy. Putting it differently, Bruner (2014) notes that every company is a high-tech company provided it employs innovation

and a high degree of R&D in delivering its products or services specifically citing the disruptive technologies being used by Uber.

The population consists of 450 high-tech startups involved in mergers and acquisitions between 2006 and 2016, and that were registered with the Corporate Affairs Commission (CAC). During data collection, 498 senior executive members representing the high-tech companies were invited to participate in the survey. Only in few instances were two senior executives from the same company invited to participate in the study, otherwise, only one participant was invited per company. The minimum sample size of 110 was determined using G*Power 3.1 software. As advised by Shi (2015), the number of participants was increased to 498 above the minimum sample size obtained using G*Power 3.1 to ensure increased response and higher accuracy of the research data. Available data from the Association of Telecommunication companies of Nigeria, Security and Exchange Commission of Nigeria was leveraged to corroborate the contact details obtained from the CAC in respect of the target population and for the purposes of data triangulation.

Participants were recruited through SurveyMonkey, an online surveying platform. The contact details as well as the questionnaire were fed into SurveyMonkey and subsequently administered on the research participants. The survey questionnaire was designed in such a way that the identities of the participants are not revealed, and the information provided during the study cannot be traced back to the participants. This helped to ensure that privacy and confidentiality of the participants were not breached. Also, the structure of the questionnaire minimized the chances of any form of ethical violation during the study. In this regard, participants were able to participate anonymously. The questions were focused exclusively on

specific information about the company's funding dynamics and the valuation methods they used during negotiations for mergers and acquisitions.

SurveyMonkey provided a link to the participants to respond to the survey questions. This was after the recruitment process was completed and informed consent obtained from the participants. Industry specific questions were added to fully capture the characteristics of the various subsets that made up the high-tech sector. I had no affiliation with the participating companies, so thoughts of conflict of interest compromising the data collection process and integrity are nonexistent.

Also, the participants did not require my consent to discontinue their participation in the study. To protect the right and welfare of the participating companies, the participants were allowed to withdraw from the study voluntarily. In line with Walden's directive, data collection did not commence fully until the Institutional Review Board (IRB) approved and assigned me an IRB approval number (01-26- 18-0157827).

Sampling Procedure

The sampling procedure was implemented through SurveyMonkey. The questionnaires were forwarded to SurveyMonkey to administer on the sample selected. Sample selection of the participating companies was based on random sampling because of the need to give all the companies equal opportunity to participate in the study (Etikan, Musa, & Alkassim, 2016). The objective of using random sampling technique was to enhance the generalizability of the outcome of the study and to improve the credibility of the selection process (Etikan & Bala, 2017).

In selecting the participating companies, I adhered to the following criteria:

1. The companies must have been in operation for at least five years within the sampling period
2. Participants must have had mergers and acquisitions talks in the last ten years earmarked for the study
3. Participants must have experience in the administration of startups

The statistical power analysis program G*Power 3.1was used to determine minimum sample size (Nakakura, Terao, Nagatomi, Matsuo, Shimizu, Tabuchi, &Kiuchi, 2014). G*Power is a free stand-alone statistical software commonly used in social, behavioral, and biomedical sciences to calculate statistical power and sample size for a wide variety of statistical tests including *t*-tests, *F*-tests, *Z*-tests and chi-square tests, binomial tests and other means related tests (Faul, Erdfelder, Lang, & Buchner, 2007).

G-Power

Using the G*Power 3.1 statistical software, I conducted a preliminary logistic regression z-test to determine the minimum sample size expected in my study. In calculating the sample size, I utilized the following parameters:

Tails = two,

Odd ratio = 3.2891566

α probability of error = 0.05

Power (1-β error probability) = 0.85

P (Y=1; X=1) Ho =0.3

R^2 other X = 0

X distribution = Binomial

X parm $\pi = 0.5$

The test result produced a sample size of 110, an actual power of 0.85137and a critical z value of 1.96. Etikan and Bala (2017) noted that a minimum sample size of 50 was appropriate for a quantitative study. However, as discussed earlier, questionnaires was sent out to 498 participants to achieve a high response rate. A total of 106 completed responses were obtained.

Procedures for Recruitment of Participants

As stated earlier, the participants were recruited through SurveyMonkey and the survey administered electronically. The objective of the study was contained in the invitation letter and the consent letter sent to the participants to guide their understanding of the purpose of the survey, the associated risks and rewards of participating in the study, and the role of the participants. Information about the sampling population and the settings of the study were also included in the consent form. A copy of the recruitment letter is provided in Appendix B and C. Only participants that executed the informed consent letter was allowed to participate in the survey.

Field Test

A field test was conducted to examine the validity of the research instrument being proposed for the study. Pretesting research instruments helps in recognizing and solving the unforeseen problems in the administration of questionnaires such as phrasing, the sequence of questions or its length, identifying the need for any additional questions or elimination of undesired ones (Selltiz, Wrightsman, & Cook, 1976). The inclusion of panel of experts in the review of the theoretical construct assisted in establishing the validity of the questionnaires and reduces the instrumentation issues in the study (Bolarinwa, 2015).

The panel included three experts, one from the academia and two from the field. The test was conducted between October 9, 2017, and October 13, 2017. Before commencing the interview, an email was sent to the experts identified to solicit their support in participating in a field test and to express their opinion on the validity of the instrument. In the e-mail, I presented the background to the study, the purpose statement, the research questions, and hypotheses and the research instrument (questionnaire) ahead of the interview.

The panelists were concerned that the questions as constructed were one-sided and focused only on investors. Therefore, the experts suggested a rewording of questions eight to fifteen in the survey instrument such that the questionnaire could be administered both on startups as well as investors in the startups. The point raised by the panelists about rephrasing the survey questions was taken into consideration in drafting the questionnaire in the survey instrument. Also, to avoid any ambiguity in the understanding of the valuation methods as stated in the questionnaire, suggestions were made to write the valuation method names in full. The recommendation was accepted and accommodated in the questionnaire.

The panel also requested that an additional question is added to the questionnaire to examine other factors outside valuation methods that are usually considered during negotiations for mergers and acquisitions such as the quality of the promoter or management of the startup. This was to examine if the quality of the promoter or management of a startup could impact the negotiations for mergers and acquisitions. The request was declined because of its variation in scope and focus with the study. Overall, the panel was unanimous in their view of the prospect of the study and the validity of the research instrument to measure the variables in the study.

Instrumentation and Operationalization of Constructs

The questionnaire is the survey instrument to be used in the study. The questionnaire was designed in such a manner that participants were able to select any or a combination of the eight business valuations models (CAPM, DCF, ABM, RVM, ROVM, VCM, MVM and others) applicable to their businesses. Researchers (Damodaran, 2012; Penman & Sougiannis, 1998; Söderblom, Samuelsson & Mårtensson, 2013) were unanimous in their submissions that valuation practitioners frequently utilized these valuation models to establish the value of a business. Fernández (2013b) confirmed that valuation models produced similar valuation result when the appropriate variables were considered. In a related study, Reddy, Agrawal, and Nangia (2013) contended that practitioner's level of experience coupled with their knowledge of the field in question affect valuation results and that different valuation methods do produce different valuation results. Okafor and Onwumere (2012) examined the popularity of valuation methods used in the emerging market. Okafor and Onwumere (2012) concluded that valuation methods based on DCF and the other seven models examined were the most popular with corporations, financial advisors, banks and insurance, individual investors and tech companies.

More importantly, valuation is fundamental to accessing financing. The ability to understand what determines the value of a firm and how to estimate that value is a prerequisite for making sensible investment decisions (Damodaran, 2012). Therefore, researchers are unanimous in their view about the application of the valuation methods as instruments for establishing a firm's value. The input variables employed in the survey were nominal and categorical scales of measurement. Binary logistic regression analysis with categorical independent variables was conducted to examine the interconnections between the variables.

Operationalization of Constructs

This quantitative survey study contains eight independent variables namely the (capital asset pricing model, discounted cash flow model, asset-based method, relative valuation model, real options valuation method, venture capital method and mixed valuation method). In the hypothesis: There is no statistically significant probability of impact of valuation methods on the ability of high-tech startups to secure mergers and acquisitions. The purpose of this hypothesis was to test the effect of valuation methods on the likelihood of securing funds through mergers and acquisitions. The valuation methods were represented by proxies of CAPM, DCF, ABM, RVM, ROVM, VCM, MVM and OR

Valuation and the methods used in arriving at the transaction price is an essential factor that investors consider before acquirers make mergers and acquisitions decision (Fernández, 2013b; Reddy, Agrawal, &Nangia, 2013). The dependent variable is dichotomous which means only two outcomes were possible: Yes, for transactions that resulted in mergers and acquisitions and No for transaction did not lead to mergers and acquisitions. Because the dependent variable is binary in nature, in line with the model presented by (Hyde, 2009; Kim &Arbel, 1998), the dependent variable was measured by assigning 1 to transactions that resulted in mergers and acquisitions while 0 was assigned to ones that did not result in mergers and acquisitions.

After all the relevant data were collected from the research participants, the data obtained was subsequently analyzed using the SPSS statistical analytical software. Using the SPSS statistical analytical software, a logistic regression analysis of the resulting data was performed. The resulting equation for the regression as adapted from Field (2014) is expressed as:

$$P(Y) = \frac{1}{1+ e^{-(Bo+B1X1i+B2X2i+B3X3i+B4X4i+B5X5i+B6X6i+B7X7i+B8X8i)}} \quad (21)$$

Where

P(Y) = the probability of dependent variable mergers and acquisitions of startups occurring,

B_o = a constant of the model

X_1 to X_8 = represents the predictor variables (CAPM, DCF, ABM, ROPM, RVM, VCM, MVM and OR) for the regression

B_1 = the coefficient attached to the predictor and *e* is the base of natural logarithms

The binary logistic regression is best used for analyses when the dependent variable is dichotomous which means that only two levels of outcome are possible (Field, 2014; Kudakwashe & Yesuf, 2014). The independent variables are categorical and can be discrete or continuous. The likelihood ratio was used to test the strength of the relationship between the dependent variable and independent variables (Field, 2014). The equation for log-likelihood as adapted from Field (2014) is given below:

$$log - likelihood = \sum_{i=1}^{N}\left[YiIn\left(P(Yi)\right) + (1 - Yi)In\left(1 - P(Yi)\right)\right] \quad (22)$$

The likelihood test was conducted to show the probability of the consummation of mergers and acquisitions of high-tech startups may be predicted by valuation methods used for valuing high-tech startups. The Wald statistics was used to determine the statistical significance given a confidence level of 95%. The odds ratio was then determined as follows:

$$Odds\ ratio = \frac{Odds\ after\ a\ unit\ change\ in\ the\ predictor}{Original\ odds} \quad (23)$$

The Wald statistics known as z is used to assess if a variable significantly predicts an outcome (Field, 2014). The values of the probability will vary from 0 to 1 (Tabachnick & Fidell, 2013). The probability can be determined using the function called the log-likelihood which has

values varying from 0 to -∞ (Hyeoun-Ae, 2013). Parsimony was achieved in the analysis because the explanatory variables were simplified and all predictors included while variables which may not contribute to the test were removed (Field, 2014).

The major challenge with using binary logistic regression is the effect of overdispersion, which are biases in the conclusions reached about the statistical significance of the results (Field, 2014). Overdispersion was to be overcome in the test by rescaling the standard error and confidence interval through increasing the value of the standard error by the square root of the dispersion parameter $\sqrt{\phi}$ (Field, 2014). There was no need to rescale the parameters as the effect of overdispersion was limited in the study.

The explanatory variables X are separated into eight categories. The coefficient of each explanatory variable was determined using the binary logit model (Chueh, 2013). The theoretical rationale underpinning the selection of the valuation methods was discussed in much detail in the literature review section.

CAPM: The capital asset pricing model involves using the required rate of return to determine the value of an investment. Participants were required to state whether or not they use CAPM to evaluate startups. A binary response of Yes or No is expected. To measure this variable, 1 was assigned to responses that indicated the use of CAPM while 0 was assigned to responses that indicated no use of CAPM.

DCF: The DCF is an income valuation model. Participants responded to whether or not they used DCF. Participants responded Yes for the use of DCF and No for no use of DCF. The DCF variable was coded as 1 for responses that indicated the use of DCF while 0 is assigned to responses that indicated no use of DCF.

ABM: This relates to participants who consider ABM as more appropriate to value their businesses. The response to the use of ABM by the participants generated a binary outcome. Thus, 1 was assigned to responses that indicated the use of ABM while 0 is assigned to responses that indicated no use of ABM.

RVM: Relative valuation approach is based on the principles of market valuation method. The participants stated whether or not they apply RVM in valuing startups. RVM was measured by assigning 1 for a Yes response and 0 for a No response.

ROVM: The ROVM incorporates options in the valuation process. The questionnaire was designed in such a way that allowed participants to respond Yes to the use of ROVM and No if ROVM was not used. A Yes response corresponds to 1 and 0 for No.

VCM: This variable was used to measure the degree to which participants apply VCM when valuing startups. The response to the use of VCM by the participants generated a binary outcome which means Yes for the use of VCM and No if VCM was not applied. Thus, 1 was assigned to responses that stated the use of VCM while 0 was assigned to responses that indicated otherwise.

MVM: The mixed valuation models provided a means of measuring the use of two or more valuation models. Participants selected Yes for the use of MVM and No if MVM was not used for valuing startups. A Yes response corresponded to 1 and 0 for No on the logit model.

OR: The OR variable was used to measure the other valuation methods not captured in this study. Participants indicated Yes for the use of other valuation models and No if OR valuation method was not used.

In summary, the resulting equation was tested through the Analyze/Regression tab in SPSS. The independent variables and the dependent variable were evaluated using the logistic

regression model and assessed for statistical significance. Given that the binary logistic model has been highly successful in previous studies (Chueh, 2013; Kudakwashe & Yesuf, 2014; Ramosacaj, Hasani & Dumi, 2015), there was no doubt that the results generated were reliable and met the objective of the study.

Table 4

Summary of Data Collection Variables

Variables	Description	Type	Scale	Scoring	Research Question
QV01 – QV06	Demographic, descriptive	Binominal (Y/N), year, choice of strategy	Nominal	Nominal: descriptive frequency counts	Demographics
QV07	Organization experienced M&A, within 10 years	Criterion (dependent)	Nominal 0 = No 1 = Yes	Binominal indicator	RQ
QV08-QV15	Use/Apply: CAPM, DCF, ABM, RVM, ROVM, VCM, MVM, OR	Predictor1 - Predictor 8 (independent)	Nominal 0 = No 1 = Yes	Binominal indicator	RQ
QV16	Opinion: VM Considered most appropriate ?	Descriptive of predictors	Indicate that all apply	Nominal list, of 8 VMs Frequency counts on 8 choices	NA: Descriptive

Note: Valuation Method (VM)

Data Analysis Plan

The data analysis plan pertains to the utilization of software, the procedures used for data cleaning and screening and the statistical tests used to examine the hypotheses and how the data

are to be reported. The research data obtained through the questionnaire were inputted into Microsoft Excel and then imported into the statistical software SPSS 24.0 for the binary logistic regression analysis. Data cleaning and screening were performed using an analytical process to ensure that only statistically significant data are kept for the analysis (Chueh, 2013).

This study was guided by the following research question:

RQ: To what extent, if any, does valuation method impact the likelihood of securing funds through mergers and acquisitions for high-tech startup organizations?

Ho: There is no statistically significant probability of impact of valuation methods on the ability of high-tech startups to secure mergers and acquisitions

Ha: There is a statistically significant probability of impact of valuation methods on the ability of high-tech startups to secure mergers and acquisitions

The statistical test was used to analyze the research question and hypothesis which was to test if valuation methods had a relationship with securing funds through mergers and acquisitions for high-tech startups. Different statistical models such as Probit, the ordinary least squared regression, and the binary logistic regression model were considered most suitable for the analysis. The dependent variable which is the likelihood of mergers and acquisitions of high-tech startups is dichotomous; hence only two outcomes are possible, a Yes or No. The outcome is coded as 1 for Yes and 0 for No. The independent variables, valuation methods are categorical variables. The binary logistic regression model was used to test the statistical significance using an alpha level of 0.05 and a confidence level of 95%. The binary logistical regression model was then performed to test the statistical significance between the independent variables (valuation

methods) and the dependent variable (likelihood of mergers and acquisitions of high-tech startups).

One of the most documented challenges of using survey data is the inability of the researcher to directly scrutinize the participants during the data collection stage (DeSimone, Harms & DeSimone, 2015). To ensure participants have provided reasonable responses and to avoid instances where low-quality data will influence the study's outcome, the questions have been structured in such a way that it generates the expected response. Participants are expected to respond Yes or No to most of the questions in the survey.

After this study, all the data collected, the financial statements, spreadsheets used for valuation, the models developed during this process and the results of the SPSS statistical analysis will be stored and secured for five years using different electronic storage devices. The data were stored in a floppy disk, universal serial bus (USB) and also burnt into a compact disk. The research data will be available for competent professionals or scholars who want to reanalyze the conclusions made from the study. This is necessary to comply with the APA Code of Ethics and Standards 8.14 on the documentation, storage, retention and maintenance of research data and in line with the guidelines set by the Walden institutional review board.

Table 5

Hypothesis Testing: Summary of Applied Statistical Tests

Null Hypothesis	Predictor (Independent)	Criterion (Dependent)	Test Statistic Parametric Assumptions met (1)	Alternative Test Statistics Parametric Assumptions not met
Ho	QV08 – QV15 Apply: CAPM DCF, ABM, RVM, ROVM, VCM, MVM, OR	QV07: Organization	Binominal Logistic Regression	Chi-Square

Threat to Study Validity

Researchers using quantitative methods share the common belief that the outcome of their quantitative analysis will be objective, credible and reliable (Choy, 2014; Noble & Smith, 2015). However, a combination of threats arising from the variables used in the study might limit the objectivity, credibility, and reliability of their findings. In other words, the validity of the research findings might be threatened. Validity, as a concept in quantitative studies, relates to the degree to which a measuring instrument accurately describes what the instrument is designed to measure (Frankfort-Nachmias, Nachmias & DeWaard, 2015).

Validity can be described as the meaningfulness of the research instruments used in the study. Recently, Heale and Twycross (2015) defined validity as the extent to which the research instruments measure the intended construct. Khorsan and Crawford (2014) stated that research validity explains the extent to which the study's findings are free from bias. Further, they noted that interpreting the output of quantitative studies depends on internal and external validity. Frankfort-Nachmias, Nachmias & DeWaard (2015) pointed out that the stability of

measurements, otherwise known as reliability can pose a threat to validity. In sum, validity deals with trustworthiness, dependability of the research process and whether the study measures what it purports to measure.

Threats to External Validity

Khorsan and Crawford (2014) described external validity in quantitative studies as the degree to which the conclusions made in a study can be generalized beyond the sample used in the study to a larger population, in different settings and at different times. In other words, external validity threats arise when an incorrect inference is drawn from a sample to other social groups at different times and settings. The external validity of this study was not compromised because of the use of random sampling technique during the data collection process.

Furthermore, confounding variables may also strengthen the relationship between the variables because of the difficulty in controlling for all confounding variables in study (Khorsan, & Crawford, 2014). This may have increased threats to internal validity and as such has been acknowledged as one of the limitations of the study. Efforts were made to ensure that the targeted sample was representative of the diverse mix of the industries that comprise the sector. Additionally, the inclusion of change experts as suggested by Howell (2012) also assisted in reducing the possibility of bias in the study.

Representativeness of the research sample and the reactive effects of experimental arrangements have been identified as the main concerns of external validity (Frankfort-Nachmias, Nachmias & DeWaard, 2015). Representativeness refers to the mode of data selection and sampling technique that ensures the generalization of the research findings. One major threat to quantitative survey is the use of a narrow sample base and its implication for the

generalization of the survey's result to a larger population. In this study, 96.0% of the expected minimum sample size was obtained. Since the minimum sample size that was calculated using the statistical software G*Power 3.1 was accurately determined for the study; the threat to statistical conclusion in this regard was minimized.

The challenge with using binary logistic regression is the effect of over dispersion, which are biases in the conclusions reached about the statistical significance of the results (Field, 2014). In this study, there was no significant variation between the observed responses and the responses observed under the binomial assumption. Thus, there was no need to rescale the parameters to address the effect of over dispersion on the findings of the study (Field, 2014).

Benge, Onwuegbuzie, and Robbins (2012) described reactive effects of experimental arrangements, also known as interaction effect as the sensitivity or responsiveness of research participants to aspects of the study. That is, the change in perception or behavior of participants because of their awareness of being subjects of an experiment. Frankfort-Nachmias, Nachmias & DeWaard (2015) described reactive effects of experimental arrangements as those features that might influence a research participant's response. For my study, this aspect of external validity threat does not apply because the study is not laboratory-based experiments that required tests to be conducted on human subjects.

Another critical component of the reactive effects of experimental arrangements is the possible interaction of participants with research instruments or the intervention measures and how that goes to affect participants' responses (Benge, Onwuegbuzie, & Robbins, 2012). Again, human subjects were not tested in my study. Thus, issues of testing reactivity were not applicable to this study. Lastly, external validity is said to depend on clearly defined target population

(Khorsan & Crawford, 2014). In this study, before embarking on data collection, proper delineation and mapping of the source population was made, and this assisted in reducing possible external validity threat arising from wrong definition of the sample population.

Threats to Internal Validity

Internal validity has been argued as a necessary precondition to achieving external validity within the context of quantitative inquiry (Khorsan & Crawford, 2014). Internal validity is concerned with the extent to which the research findings can be attributed to the interactions between the independent and dependent variables (Zohrabi, 2013). Additionally, internal validity has to do with the extent to which the research delivers on its objective which depends on whether the researcher measures what it sets out to measure (Frankfort-Nachmias, Nachmias & DeWaard, 2015).

In quantitative studies, threats to internal validity include testing, instrumentation, selection, history, maturation, mortality, diffusion of treatment and compensatory equalization, rivalry and demoralization (Bolarinwa, 2015; Frankfort-Nachmias, Nachmias & DeWaard, 2015). Explaining all the threats enumerated above is beyond the scope of this study. In order to avoid instrumentation issues in this study, the questionnaire used in collecting data was pretested. The questionnaire was subjected to expert panel review before administering it on the participants. Repeated measurements using the same measuring instruments helped to ascertain the validity of the research instrument. The consistent use of the instruments throughout the study assisted in mitigating threats of internal validity (Walser, 2014).

Another source of internal validity threat is establishing cause and effect. Woodman (2014) identified causal inference as the main issues concerning internal validity. Also, selection

bias is usually a problem in quantitative studies when the use of random sampling technique is limited. Selection bias can also occur in statistical regression when extreme scores become the basis of subject selection. Becker, Rai, Ringle, and Völckner (2013) noted that this might increase the chances of errors in the test result. For this study, internal validity threat as a result of selection bias did not pose a challenge to the study. This was mitigated through the use of SPSS bootstrapping to remove over repeated samples drawn from the original sample in line with the guidance provided by (Baneshi & Talei, 2012).

The contact details of the participants were obtained from secondary sources and this helped to enhance the reliability and validity of the study. The secondary sources are reliable agencies that include the CAC, NSE, SEC, and ATCON. Thus, the data obtained the participants was accurate and reliable given the reputation of the organizations they belong to. Parts of the primary data (Q1 to Q4, see Appendix A) include information readily available at the participants' company's websites, and the rest of the questions was obtained through a survey.

Construct validity is another possible threat to validity. Construct validity in quantitative research is concerned with the adequacy of the operational definition and measurement of the theoretical constructs (Martin, Cohen & Champion, 2013). This relates to how well the measuring instrument measures the intended construct (Heale & Twycross, 2015). To ensure that the research instrument adequately measures the intended construct, the constructs have been fully explicated to avoid any form of slippage (Martin, Cohen & Champion, 2013). Each of the constructs has been fully operationalized in the Operationalization of Constructs section, and this would ensure that irrespective of how the constructs are measured, the results would be the same (Bolarinwa, 2015). Additionally, using the SPSS, the Cronbach's alpha test was conducted to

determine the consistency and reliability of the measuring instrument (Bolarinwa, 2015; Field, 2014). A Cronbach's alpha of 0.772 was obtained, which implies a high level of internal consistency for the scale used in the analyses. As stated earlier, the measuring instrument employed in the study was subjected to expert opinion; as such the data emanating from the questionnaire was deemed to be reliable.

Ethical Procedures

Research ethics involve negotiating the relationships between the researcher and the research participants, protecting the dignity of participants and the publication of the research outcome (Banegas &Villacañas de Castro, 2015). Research ethics borders on ensuring research participants are not exposed to harm in which participants are informed upfront of the risks and rewards associated with the study and that participants are selected systematically without bias (Peter, 2015). Yin (2014) identified confidentiality and anonymity, the full disclosure of research intention, obtaining informed consent, and privacy and consideration for the vulnerable population as ways of preventing ethical issues in quantitative research. In this study, the participants are welcome to participate anonymously; hence threats to privacy are diminished.

Parts of the research data (questions Q1 to Q4) are publicly available and can be obtained directly from the websites of the respective organizations while other research data (questions Q5 to Q16) were obtained directly from the research participants. The companies in which the participants are to be selected are also publicly available on the databases of the Corporate Affairs Commission, Securities and Exchange Commission, the Nigerian Stock Exchange, and the Association of Telecommunication Companies of Nigeria. A combination of some publicly

available data with the research data was obtained from the participants and this reduced the physical or professional risks of participating in the study (Coit, 2016).

Also, data collection did not commence fully until IRB approval was obtained (Approval No. 01-26-18-0157827). During the data collection process, participants were free to participate anonymously and were free to exit the study without my consent. The possibility of conflict of interest arising from the study was minimal as inputs to the survey came mainly from venture capitals, private equity firms, and the high-tech startups and not from the banking sector where I have worked over the years.

All acquired and derived data relating to spreadsheets used for valuation, the models developed during this process, the results of the SPSS statistical analysis and other relevant information about research subjects will be stored and secured electronically on my personal computer using electronic encryption for a period not less than five years before they are properly destroyed. Other researchers may not have access to the research data until the outcome of this study is published.

To be fully equipped for this study and to ensure that applicable ethical standards are followed, I completed a web-based course on Protecting Human Research Participants delivered by the National Institute of Health (NIH). I completed the course on September 21, 2014, with certificate number 1556941.

Summary

This chapter contains the research methodology and rationale for selecting the quantitative survey research design. I outlined how the random sampling technique was applied in collecting data of high-tech startups. Also discussed in this section are research hypotheses,

the sample population, the research instruments and how the research participants were selected. I highlighted how the research variables were operationalized and the statistical procedures for determining the interconnections between the variables.

The research methodology is based on quantitative survey research design. The binary logistic regression model with categorical independent variables was used to examine the impact of valuation models on mergers and acquisitions of startups. The model equation is given as:

$$P(Y) = \frac{1}{1+ e^{-(Bo+B1X1i+B2X2i+B3X3i+B4X4i+B5X5i+B6X6i+B7X7i+B8X8i)}}$$

where P(Y) is the probability of dependent variable mergers and acquisitions of startups occurring, B_o is a constant of the model, X_1 to X_8 represents the predictor variables (CAPM, DCF, ABM, ROPM, RVM, VCM, MVM and OR) for the regression, B_1 is the coefficient attached to the predictor and *e* is the base of natural logarithms.

The G*Power 3.1 statistical software was used to determine the minimum sample size for the study. The result showed that a minimum sample size of 110 was required, and this formed the basis for selecting the research participants. The participants were recruited through SurveyMonkey, and SurveyMonkey subsequently administered the questionnaire on the participants electronically. The survey data obtained in the process were then be analyzed to ascertain the effect of valuation methods on the likelihood of mergers and acquisitions of high-tech startups. Details of these analyses are provided in Chapter 4.

Finally, I discuss the possible limitations of the study and provide measures to reduce their impact on the study. Chapter 4 and Chapter 5 are dedicated to data analysis, interpretation, and to reporting the research findings.

Chapter 4: Results

The research findings of this study are presented in this chapter to show the impact of valuation methods on the likelihood of mergers and acquisitions on high-tech startup organizations. The specific problem addressed in this study was the challenges encountered by owners of startups, as well as investors, in determining acceptable valuation methods that led to securing funds through mergers and acquisitions. Therefore, the purpose of this study was to examine the impact of valuation methods on the likelihood of mergers and acquisitions of high-tech startup organizations in Nigeria. The research question centered on the extent to which valuation methods impact the likelihood of securing funds through mergers and acquisitions for high-tech startup organizations. The hypotheses were as follows:

Ho: There is no statistically significant probability of impact of valuation methods on the ability of high-tech startups to secure mergers and acquisitions

Ha: There is a statistically significant probability of the impact of valuation methods on the ability of high-tech startups to secure mergers and acquisitions

The dependent variable for the study was the likelihood of mergers and acquisitions of high-tech startup organizations. This metric was used because it aligned with the fundamental objective of achieving growth and wealth maximization for shareholders (Garzella & Fiorentino, 2014). The independent variables were valuation methods, namely, the CAPM, DCF, ABM, ROVM, VCM, RVM, MVM and OR for valuation methods not listed in the study. The valuation methods selected are components of valuation theory (Damodaran, 2005) and are in line with previous studies by (Okafor & Onwumere, 2012; Söderblom, Samuelsson & Mårtensson, 2013).

The binary logistic regression model was the statistical method adopted to analyze the research data.

The analyses of the research data together with the statistical results used to examine the research variables are presented in this chapter. Also presented in the chapter are the steps followed in preparing the data, a discussion of the variables in the study, and the methods adopted in analyzing the research question. In addition, I report on the demographics and the descriptive statistics of the sample. Subsequently, I highlight the statistical assumptions associated with conducting binary logistic regression, such as examining the data for outliers and addressing cases of missing data. In short, this chapter is structured as follows: data collection, data treatment, and a summary of the research findings.

Data Collection

Data collection was carried out electronically with the aid of Survey Monkey. Details of the participants were obtained from the Association of Telecommunication Companies of Nigeria, the Securities and Exchange Commission, and Corporate Affairs Commission. The timeframe for data collection was between 2006 and 2016. In order to achieve at least 110 participants for the study, a total of 498 participants were contacted; 109 agreed to participate. Of this 109, one participant did not consent to the terms of study while two abandoned the study, leaving a total of 106 valid responses. This corresponds to 96% of the expected sample size and 21% response rate. Data collection took 4 weeks to complete. Each week, I followed up with a reminder until the fourth week, when I concluded the survey.

Although the response rate was low, the response rate was more encouraging when compared with the average response rate to online surveys of 11.0% (Petchenik & Watermolen,

2011). A G*Power 3.1 analysis conducted prior to data collection suggested that any sample size above 100 was sufficient for the study (Faul, Erdfelder, Buchner, & Lang, 2009). Etikan and Bala (2017) had noted that a minimum sample size of fifty if representative of the population was appropriate for a quantitative study.

Descriptive Statistics

Details emerging from the study indicate that only 33.33% of the participating companies were listed or members of the Nigerian stock exchange while 66.67% are not listed on the exchange. Another feature of the statistics was that 64.65% of the companies surveyed indicated an organic approach to organizational growth as against 35.35% with an inorganic growth strategy. Although 72.0% of the participants reported they had been involved in mergers and acquisitions between 2006 and 2016, only 36.56% acquired or merged with high-tech startup organizations within the period. When critically analyzed, the number of participants who had acquired or merged with high-tech startup organizations was similar to those listed on the exchange as well as those who have inorganic growth strategy as an organization. Additionally, companies utilized different valuation methods during negotiations for mergers and acquisitions.

Table 6

Statistics Showing Participants' Preference of Valuation Methods

Answer Choices	Frequency	Response Rate
Capital Assets Pricing Model	46	52.87%
Discounted Cash flow method	63	72.41%
Asset Based Method	59	67.82%
Relative Valuation Method	39	44.83%
Real Option Valuation Method	21	24.14%
Venture Capital Method	26	29.89%
Mixed Valuation Method	51	58.62%
Other Valuation Methods (e.g. Multiples, Price to earnings ratio (P/E), Expected Valued Added (EVA)	75	86.21%

As seen in Table 6, participants showed a preference for CAPM (52.87%), DCF (72.41%), ABM (67.82%), and OR (86.21%) such as multiples and P/E ratio. The statistics showed that valuation methods such as RVM (44.83%), ROVM (24.14%) and VCM (29.89%) were not that popular in the sector. Further details of the impact of the valuation methods on the likelihood of mergers and acquisitions are presented in the results section.

Participants were drawn from the different segments of the information technology sector. In Table 7, I show the demographic representation of the participants.

Table 7

Demographic Representation of Participants

Answer choices	Frequency	Percentage
Internet service providers (ISPs)	19	19.19%
Telecommunication companies	40	40.40%
IT infrastructural companies	20	20.20%
Finance and e-commerce	63	63.64%
Agriculture	5	5.05%
Health information technology	5	5.05%
Mobile application	33	33.33%
Engineering	5	5.05%
Answered	96	
Skipped	7	

As seen in Table 7, 63.64% of the respondents came from the Finance and e-commerce subsector, 40.40% from Telecommunication companies, and 33.33% from mobile application companies. The sectoral representation of the participants was indicative of where most of the mergers and acquisitions activities occurred within the study period. The survey also met the minimum threshold envisaged in proportional representation; at least 5.0% of all the subsectors were represented in the study (Vincenzo & Tommaso, 2015). Therefore, the external validity of the study was upheld.

Table 8

Descriptive Statistics of the Binary Logistic Regression Variables

Valuation Methods	N	M	SD	SK
Capital Asset Pricing Model	93	0.53	0.502	-0.109
Discounted Cash Flow Method	93	0.75	0.434	-1.191
Asset Based Method	90	0.70	0.461	-0.888
Relative Valuation Method	90	0.49	0.503	0.045
Real Option Valuation Method	90	0.23	0.425	1.282
Venture Capital Method	90	0.30	0.461	0.888
Mixed Valuation Methods	87	0.72	0.450	-1.021
Other valuation methods	87	0.80	0.399	-1.563

The summary of the descriptive statistics of the sample as it relates to the independent variables is as shown in Table 8. Shown in the Table are the numbers of respondents (N) which includes participants who responded Yes and No, the mean (M), standard deviation (SD) and skewness (SK) of the research variables. The numbers of respondents for each of the valuation methods vary because some participants did not respond to all the questions. These statistical measures are quite related in that when determining the standard deviation, the mean was used as the reference point to ascertain the variability of the data point from the mean.

Treatment and Intervention Fidelity

The research data was electronically collected via an online data collection tool called Survey Monkey as described in Chapter 3. Besides providing the contacts of the research participants as obtained from the corporate affairs commission, association of telecommunication companies of Nigeria and Securities and Exchange Commission, I had no further intervention in the data collection process. The data collected were not subjected to further treatments or intervention besides spooling the responses from Survey Monkey, and transforming responses stated as Yes to 1 and No to 0 especially for questions 8 to 15 (see appendix A) which were needed for the analysis. Then, I reorganized the data collected for comparative analyses and in readiness for SPSS analyses. Thus, the integrity process and fidelity of the data received remain intact.

Assumptions for Binary Logistic Regression

Mertler and Vannatta (2010) identified the adequacy of sample size, reviewing data for multicollinearity, and determining and addressing extreme outliers in the data as key assumptions for binary logistic regression. In addition, the dependent variable should be dichotomous, and it should be coded such that outcome or the probability of its occurrence can be expressed as $P(Y = 1)$ (Hyeoun-Ae, 2013). The dependent variable, mergers and acquisitions of high-tech startup organizations is dichotomous with only two possible outcomes; Yes or No satisfies this assumption.

Before conducting the binary logistic regression, I resolved that only completed responses would be fed into SPSS for analysis. Of the 109 participants that indicated interest in the study, one participant opted out by not consenting to the terms of the survey, and two did not

complete the survey; the incomplete responses were removed entirely from the dataset leaving 106 valid inputs whose responses were fed into SPSS for analysis. I performed data screening for the reliability of the sample size, checked for missing data and ensuring the model had little or no multicollinearity. Table 9 shows the collinearity statistics in which only two of the variables had Variance Inflation Factor (VIF) above 3.0 but below the threshold of 5.0 indicating an unlikely relationship with other variables (Hair, Black, & Babin, 2006).

Table 9

Collinearity Statistics

Model	Tolerance	VIF
Capital Asset Pricing Method	.739	1.354
Discounted Cash Flow Method	.451	2.215
Asset Based Method	.456	2.195
Relative Valuation Model	.703	1.422
Real Option Valuation Method	.927	1.078
Venture Capital Method	.786	1.272
Mixed Valuation Method	.317	3.160
Other Valuation Methods	.224	4.468

In order to ensure the test data was ready for analyses, I transformed the responses to question eight to question fifteen and coded them as 1 for Yes 0 for No. Outliers were not found in the sample which was evidenced by the casewise plot not being produced after running the data in SPSS.

Although there were cases of missing data, the impact was not significant. Missing data accounted for 9.30% of the unweighted cases, and the percentage of selected cases included in the analysis was 90.70% which corresponds to sample-to-variable ratio (STV) of 13.25. The ratio of sample to variable used in the analysis was higher when compared to the STV of 3.0 advised by Arrindell and van der Ende (1985) and aligned with the rule of 10 subjects to one variable put forward by Austin and Steyerberg (2015) as necessary in establishing a recognizable pattern in logistic regressions. Therefore, the dataset is considered stable and sufficient for the study since the sample to variable ratio exceeded the recommended threshold. Multicollinearity was not compromised in the study because the tolerance level of 0.2 for the collinearity statistics was not violated (Mertler & Vannatta, 2010). Additionally, I reviewed the scale and the data for internal consistency and reliability by conducting the Cronbach's alpha test. Details of the test are as shown in Table 10.

Table 10

Test of Reliability

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	Number of Items
.772	.781	8

The reliability statistics test produced a Cronbach's alpha of .772, which indicates a high level of internal consistency and reliability of the scale used in the study.

Binary Logistic Regression Results

To determine whether the results of the analysis corroborated with the stated hypothesis in the study, I investigated the findings of the study using different parameters. Firstly, I set the

confidence level (CI) for the analysis at 95% and the alpha value at .05. Also, I determined the odds ratio was the best effect size in the context of this analysis (Field, 2014). Secondly, I determined the level of significance between the null and alternative hypotheses. Thirdly, I assessed the significance of the results based on individual predictors. Fourthly, the results were assessed using the Goodness-of-fit tests, and lastly, I evaluated the predictive power of the model.

To recap, in this study, I sought to examine the impact of valuation methods on the likelihood of mergers and acquisitions of high-tech startup organizations. The null and alternative hypotheses are also restated here before presenting the results of the regression.

Null Hypothesis

There is no statistically significant probability of impact of valuation methods (i.e., capital assets pricing method, discounted cash flow method, asset-based method, relative valuation method, real option valuation method, venture capital method, mixed valuation method, and other valuation methods) on the ability to secure funding through mergers and acquisitions for high-tech startup organizations.

Alternative Hypothesis

There is a statistically significant probability of impact of valuation methods (i.e., capital assets pricing method, discounted cash flow method, asset-based method, relative valuation method, real option valuation method, venture capital method, mixed valuation method, and other valuation methods) on the ability to secure funding through mergers and acquisitions for high-tech startup organizations.

A binary logistic regression analysis was conducted using SPSS with mergers and acquisitions of high-tech startups as the dichotomous criterion and eight predictors: capital assets pricing method, discounted cash flow method, asset-based method, relative valuation method, real options valuation method, venture capital method, mixed valuation method and other valuation methods. Binary logistic regression was used as the investigation technique to analyze the research question because it satisfies the two conditions existing in the current analysis which include that the dependent variable must be dichotomous with only two possible outcomes, which can be reduced to a 0 or 1and must have two or more independent variables that can either be continuous or categorical (Agresti & Franklin, 2012). As stated previously, I measured the dichotomous variable which is a nominal-level indicator to identify whether or not valuation methods impacts the likelihood of mergers and acquisitions of high-tech startup organizations. I coded 1 for Yes and 0 for No.

The result of the chi-square test was statistically not significant x^2 (8) = 0.739; $p > .05$. For the model to be a significant fit for the data, the *p*-value should be lesser than .05 (Field, 2014). The overall fit of a model is predicted using -2 Log Likelihood and the related Chi-square value (Field, 2014). As seen in Table 8, the Omnibus chi-square goodness of fit test produced a good fit but not statistically significant with a chi-square result of x^2 (8) = 5.175; 8 *df*, $p > 0.05$, which indicates that the predictors used in the analysis had no statistically significant impact on the dependent variable which is the likelihood of mergers and acquisitions of high-tech startups.

Although the Omnibus chi-square goodness of fit test result produced a good fit for the data, the result was not statistically significant; as such, we fail to reject the null. Therefore, there is not enough evidence to support the alternate hypothesis that valuation methods (capital assets

pricing method, discounted cash flow method, asset-based method, relative valuation method, real options valuation method, venture capital method, mixed valuation method, and other valuation methods) had significant impact on the likelihood of achieving mergers and acquisitions for high-tech startup organizations.

The classification plot is presented in Figure 3. The classification plot was used to provide a visual demonstration of the correct and incorrect predictions and all cases for which the predictions were through on the right-hand side of the plot (Field, 2014). As seen in Figure 3, the classification plot indicated membership of Yes, signifying the occurrence of mergers and acquisitions of high-tech startups as the predicted probability is closer to 1 at 0.8 given a cut value of 0.5.

```
       Step number: 1

             Observed Groups and Predicted Probabilities

      16 +                                                                                                    +
         I                                                                                                    I
         I                                                                                                    I
F        I                                                                                                    I
R     12 +                                                Y                                                   +
E        I                                                Y                                                   I
Q        I                                                Y                                                   I
U        I                                    Y           Y                                                   I
E      8 +                                    Y           Y                                                   +
N        I                                    Y           Y                                                   I
C        I                             Y      Y          YN       YY                                          I
Y        I                             Y      N          NN       YY                                          I
       4 +                             Y      NY      Y  NNY      YY                                          +
         I                             NY     NY      N  NNY    YYNY       Y                                  I
         I                             NN     NN      NN NNN    NNNY Y     Y       Y                          I
         I                          N YNN     NNNN    NNYNNNN Y NNNN N N   N  YY   Y Y         Y              I
Predicted ---------+---------+---------+---------+---------+---------+---------+---------+---------+----------
  Prob:   0       .1        .2        .3        .4        .5        .6        .7        .8        .9         1
  Group:  NNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNYYYYYYYYYYYYYYYYYYYYYYYYYYYYYYYYYYYYYYYYYYYYYYYYYY

          Predicted Probability is of Membership for Yes
          The Cut Value is .50
          Symbols: N - No
                   Y - Yes
          Each Symbol Represents 1 Case.
```

Figure 3. *Classification plot for the model*

The Hosmer-Lemeshow goodness-of-fit statistic test was conducted to determine whether the model as built approximately described the data. The Hosmer-Lemeshow goodness-of-fit

statistic test is used in logistic regression to group cases in the deciles of risk by comparing the expected probability within the observed probability (Chueh, 2013). The result of the Hosmer-Lemeshow goodness-of-fit statistic showed the estimation model was about 42.9% adequately described by the data as shown in Table 11.

Table 11

Overall Model Fit Statistics

Test	X^2	*df*	*Sig*
Omnibus Tests of Model Coefficients	5.175	8	0.739
Hosmer-Lemeshow Goodness-of-fit test	7.000	7	0.429

The Hosmer-Lemeshow goodness of fit test indicated a good fit with x^2 (7) = 7.0, $p > .05$ and a significant value of 0.429. The Hosmer-Lemeshow statistic suggests a good fit if the significance value is higher than 0.05 (Peng, Lee, & Ingersoll, 2002). The regression results as indicated in Omnibus tests of model coefficients confirms an improvement in the model x^2 (8) = 5.175 using the -2 Log Likelihood indicator. The improvement in the model is evident in the reduction from 120.504 at the initial iteration to 115.329 after the intervention and third iteration. The Cox & Snell R-square and the Negelkerke R-square, which is a pseudo r-squared statistics, measures the variance between the dependent and independent variables that is explained by model to a maximum value of 1 (Field, 2014). The result of the Cox & Snell R-square and the Negelkerke R-square statistic indicated a variance of 5.8% and 7.7% respectively in the dependent variable associated with the independent that is explained by the model (Chueh, 2013).

Table 12

Model Summary of the Binary Logistic Regression

Step	-2 log-likelihood	Cox & Snell R-square	Negelkerke R-square
Block 0	120.504	-	-
Block 1	115.329[a]	0.058	0.077

[a] Estimation terminated at iteration number 8 because parameter estimates changed by less than .001.

Equally informative about the output of the analyses was the output of the classification table which is shown in Table 13.

Table 13

Classification Table of the Estimation Model

Observed	Predicted		% Correct
	Mergers and Acquisitions		
	No	Yes	
Step 0			
No	45	0	100
Yes	42	0	0
Overall % correct			51.7
Step 1			
Yes	33	12	73.3
No	22	20	47.6
Overall % correct			60.9

Note. Cut off value of .500

The classification table is used to depict the extent to which the observed probabilities agree with the predicted probabilities (Field, 2014). The classification table showed how well the model has performed by classifying the improvement from one step to another. As shown in the classification table, at a cut-off of .500 (50%), the model is estimated to produce accurate

predictions 60.90% of the time. The contributions of individual predictors to the model and the statistical significance of each predictor are shown in Table14.

Table 14

Coefficient Estimates of the Logistic Regression Predicting Likelihood of Mergers and Acquisitions Based on the Model

Independent Variables	B	S.E	Wald	df	Sig	Exp(B)	95% CI for EXP(B) Lower	Upper
Capital Asset Pricing Model	.339	.510	.441	1	.507	1.403	.516	3.814
Discounted Cash flow Method	.517	.780	.439	1	.507	1.677	.364	7.729
Asset Based Method	.840	.738	1.296	1	.255	.432	.102	1.834
Relative Valuation Method	-.796	.531	2.251	1	.134	.451	.159	1.276
Real Option Valuation Method	.719	.570	1.591	1	.207	2.052	.672	6.269
Venture Capital Method	.055	.547	.010*	1	.920	1.057	.362	3.089
Mixed Valuation Method	.080	.783	.010*	1	.918	.923	.199	4.285
Other Valuation Methods	.371	1.152	.104	1	.748	1.449	.152	13.855
Constant	-.057	.518	.012*	1	.912	.944		

The Wald statistic in the table is computed as the ratio of the coefficient to its Standard error, squared, and Exp(B) is the ratio-change in the odds of the event occurring to a one-unit change in the predictor, also referred to as the odds ratio (Field, 2014). If the Wald statistic is smaller than .05, therefore the parameter was a good fit for the model. Shown in Table 13 are the two predictors that satisfy this assumption. The Exp(B) with a 95% confidence level (CI) was used to determine the level of contribution of each predictor to the model. Although the 95% CI

was not meant to ascertain the statistical significance of the model (Peng, Lee, & Ingersoll, 2002), it was a proxy used to establish the presence of statistical significance (Hyeoun-Ae, 2013). Similarly, if the *b* coefficient of each predictor which is determined by the z-statistic and computed using equation 24 is significantly different from zero, it can be assumed that the predictor made a significant contribution to the outcome of the predictive model (Field, 2014).

$$z = \frac{b}{SE_b} \tag{24}$$

Table 15

Z-statistics of Each Predictor's Contribution to the Model

Independent Variables	B	S.E	*Z*
Capital Asset Pricing Model	.339	.510	.664
Discounted Cash flow Method	.517	.780	.663
Asset Based Method	.840	.738	1.138
Relative Valuation Method	-.796	.531	1.500
Real Option Valuation Method	.719	.570	1.261
Venture Capital Method	.055	.547	.100
Mixed Valuation Method	.080	.783	.100
Other Valuation Methods	.371	1.152	.322
Constant	-.057	.518	.110

The z-statistic for each of the predictors is given in Table 15. Of the eight predictors, only the venture capital method and the mixed valuation method had z-statistic scores closer to zero; otherwise, the six other predictors have z-statistic scores significantly higher than zero.

Using the output of the Wald statistics on Table 14, the likelihood of mergers and acquisitions as predicted by each of the variables is as shown in Table 16 below.

Table 16

Predicting Likelihood of Mergers and Acquisitions Based on Individual Predictors

Independent Variables	Odds	P(Y) %
Capital Asset Pricing Model	1.403	58.38
Discounted Cash flow Method	1.677	62.64
Asset Based Method	.432	30.17
Relative Valuation Method	.451	31.08
Real Option Valuation Method	2.052	67.23
Venture Capital Method	1.057	51.39
Mixed Valuation Method	.923	48.00
Other Valuation Methods	1.449	59.17
Constant	.944	48.56

For instance, the probability of securing mergers and acquisitions using capital asset pricing model was determined as follows:

$$P(Y) = \frac{Odds}{1+Odds} \tag{25}$$

$$P(Y) = \frac{1.403}{1+1.403} = 58.38\%$$

This implies that the probability of mergers and acquisitions occurring using CAPM was 58.40% and 62.64% for DCF. In order to determine the probability of mergers and acquisitions occurring considering all the predictive variables, I utilized the equation 21 to compute the likelihood of mergers and acquisitions occurring based on the eight independent predictors.

$$P(Y) = \frac{1}{1 + e^{-(Bo+B1X1i+B2X2i+B3X3i+B4X4i+B5X5i+B6X6i+B7X7i+B8X8i)}}$$

There are three unknown quantities in the equation, the coefficient of the constant B_o, the coefficient of the predictors (B_1 to B_8), and the value of the predictor itself (X_1 to X_8). The value of constant B_o and the coefficient of the predictors are as given in Table 13. The value of the predictor itself (X_1 to X_8) was then inputted; initially for X equals 0 and next for X equals 1. The actual calculation was carried out using Microsoft Excel. The probability of mergers and acquisitions occurring was computed by substituting 0 for the value of the predictors (X_1 to X_8) and the resulting equation expressed as follows:

$P(Y)$

$$= \frac{1}{1 + e^{-(-.057+.339CAPMx0+.517DCFx0+.840ABMx0+(-.796RVMx0)+.197ROVMx0+.055VCMx0+.080MVMx0+.371ORx0)}}$$

Let the denominator be *k* so that equation 21 can be reduced to

$$P(mergers\ and\ acquisition\ occurring) = \frac{1}{k}$$

K = $1+ e^{-(-.057+.339\ x\ 0+.517x0+.840x0+(-.796x0)+.719x0+.055x0+.080x0+.371x0)}$

K = $1+ e^{-(-.057)}$ = 2.0587

Therefore $P(mergers\ and\ acquisition\ occurring) = \frac{1}{2.0587} = .486$

$P(mergers\ and\ acquisition\ not\ occurring) =$ 1 - $(mergers\ and\ acquisition\ occurring)$

= 1-.486

= .514

The odds = $\frac{.486}{.514}$ = .946

In order to determine the Odds after a one unit change in the predictor variable. I determined the odds of mergers and acquisitions occurring after the intervention by substituting 1 as the values of X_1 to X_8 and the equation is expressed as follows:

$$P(Y) = \frac{1}{1 + e^{-(-.057+.339CAPMx1+.517DCFx1+.840ABMx1+(-.796RVMx1)+.197ROVMx1+.055VCMx1+.080MVMx1+.371ORx1)}}$$

The model equation can be reduced to

$$P(mergers\ and\ acquisition\ occurring) = \frac{1}{k}$$

Such that K = $1+ e^{-(-.057+.339\ x\ 1+.517x1+.840x1+(-.796x1)+.719x1+.055x1+.080x1+.371x1)}$

K = $1+ e^{-(2.068)}$ = 1.126

Therefore $P(mergers\ and\ acquisition\ occurring) = \frac{1}{1.126}$ = 0.888

$P(mergers\ and\ acquisition\ not\ occurring) =$ 1 - $(mergers\ and\ acquisition\ occurring)$

= 1 -.888

= .112

Odds of mergers and acquisitions occurring was computed as = $\frac{.888}{.112}$ = 7.928

Following Field's (2014) instruction, the odds ratio for the model was determined as follows:

Odds ratio = $\frac{Odds\ after\ a\ unit\ change\ in\ the\ predictor}{Original\ odds}$

= $\frac{7.928}{.946}$

= 8.38

The model approximated the behavior of the data because if the odds ratio for individual predictor as indicated by Exp(B) in Table 13 is greater than 1, the odds of mergers and acquisitions occurring increases. The implications of the research findings are further explained in Chapter 5 in line with the theoretical framework for this study.

Summary and Transition

In this Chapter, I presented an overview of the data preparation technique adopted for the analysis. The procedure for the data analysis and treatment were also presented. The descriptive statistics revealed the underlying patterns in the data. The data showed that participants had preference other valuation methods (86.21%) such as multiples and P/E ratio, discounted cash flow method (72.41%), asset based method (67.82%) and capital asset pricing model (52.87%). Of the 106 respondents, 72.0% of the participants indicated they had been involved in mergers and acquisitions between 2006 and 2016 with only 36.56% acquiring or merging with a high-tech startup organization within the period.

Included in this chapter were the actual findings of the study based on the model adopted. I investigated the research question and hypotheses using binary logistic regression. The results of the study showed that binary logistic regression was statistically not significant at $x^2(8) = 0.739$; $p > .05$, hence, the failure to reject of the null hypothesis that there is no statistically significant probability of the impact of valuation methods on the ability of high-tech startups to secure funding through mergers and acquisitions.

In Chapter 5, I present a further discussion on the findings in the context of the theoretical framework that underpins the research. Also, I draw conclusions based on the findings of the study and provide recommendations that future researchers may wish to explore

as well as highlight the contributions of the study to the body of knowledge and positive social change.

Chapter 5: Discussion, Conclusions, and Recommendations

This chapter covers the following topics: an overview of the objective of this study, a summary of the statistical findings of the study, an interpretation of the statistical results in relation to the research question, the conclusions made from the study, recommendations for future studies, the limitations of the study and the implication for positive social change.

Overview

Determining the value of startups has been a contentious issue because of lack of historical data and many uncertain factors about the future (Festel, Wuermseher & Cattaneo, 2013). Therefore, identification of appropriate valuation methods for valuing startups is crucial to establishing value and to accessing funding through mergers or acquisitions (Aggelopoulos, 2017; Loukianova, Nikulin, Vedernikov, 2017). As I maintain throughout this dissertation, there is need to determine acceptable valuation methods that lead to securing funds through mergers and acquisitions in order to limit valuation challenges and to minimize the significant discounts paid on high-tech startups (Cohen, Diether, & Malloy, 2013; Mangipudi, Subramanian, & Vasu, 2013).

The purpose of this quantitative survey study was to examine the effect of valuation methods on the likelihood of mergers and acquisitions of high-tech startup organizations in the Nigerian capital market. To achieve this objective, binary logistic regression was conducted to examine the effect of valuation methods on the likelihood of securing funds via mergers and acquisitions for high-tech startups. The overarching research question for this study was as follows: To what extent, if any, does valuation method impact the likelihood of securing funds through mergers and acquisitions for high-tech startup organizations?

The dichotomous criterion was the mergers and acquisitions of high-tech startups, while the predictors included CAPM, DCF, VCM, RVM, ABM, ROVM, MVM, and OR for other valuation methods not stated in the study. An online survey was conducted in which 106 responses were obtained. The data were analyzed using the binary logistic regression model in SPSS. This was followed by the development of the descriptive and overall model fit statistics for the study (see Chapter 4). The model equation for the analyses was as follows:

$$P(Y) = \frac{1}{1+ e^{-(Bo+B1X1i+B2X2i+B3X3i+B4X4i+B5X5i+B6X6i+B7X7i+B8X8i)}}$$

The research findings showed that binary logistic regression was not statistically significant at $x^2(8) = 0.739$; $p > .05$; hence, the failure to reject the null hypothesis (there is no statistically significant probability of the impact of valuation methods on the ability of high-tech startups to secure funds through mergers and acquisitions). This implies that valuation methods do not significantly determine the likelihood of mergers and acquisitions of high-tech startup organizations in Nigeria.

The results of the study indicated that participants had a preference for OR (86.21%) such as multiples and P/E ratio, DCF (72.41%), ABM (67.82%) and CAPM (52.87%). It was not surprising to find that the ROVM and the VCM were not popular within the industry because of their perceived complexities (Schwartz, 2013). The result also confirmed a limited number of mergers and acquisitions occurred in the high-tech industry as only 36.56% acquired or merged with a high-tech startup organization within the period. Furthermore, the findings of the study contributed to the literature on valuation methods which before now have little or no empirical studies on the impact of valuation methods on the likelihood of securing funds through mergers and acquisitions for high-tech startup organizations. In the next section, I discuss further-the

research findings especially in the context of the theoretical framework as highlighted in Chapter 2.

Discussion and Interpretation of the Findings

In this section, I discuss the key research findings and assess whether they confirm or disconfirm with existing literature and how the conclusion of the study extends the body of knowledge. Specifically, I review the research findings in line with theories adopted for the study namely the valuation theory and the mergers and acquisition theory (wealth maximization theory, turnaround theory, and information asymmetry theory).

The purpose of this study was to examine the effect of valuation methods on the likelihood of mergers and acquisitions of high-tech startup organizations in the Nigerian capital market. In order to achieve this, a total of 498 participants were contacted with a view to achieving at least 110 participants for the study. Of the 109 participants that indicated interest in the survey, one did not consent to further participation in the study while two abandoned the study leaving a total of 106 participants for the study. The response rate corresponds to 96% of the expected sample size and 21 % response rate. Data collection was accomplished using survey monkey and completed within four weeks.

Statistical results revealed a non-significant relationship at $x^2(8) = 0.739$; $p > .05$. This implies a non-significant probability of the impact of valuation methods on the ability of high-tech startups to secure funding through mergers and acquisitions. The model accurately predicted the behavior of the data used for the analysis.

Based on the research question, that is, to what extent, if any, if any does valuation methods impact the likelihood of securing funds through mergers and acquisitions for high-tech

startup organizations, I conducted a statistical analysis using SPSS, by setting all statistically significant results at a *p* level of 0.05. From the analysis of the data presented in Chapter 4, there is evidence not to reject the null which means there is a non-significant probability of valuation methods impacting the ability of high-tech startups to secure funding via mergers and acquisitions.

In Chapter 4, I presented the results of the Hosmer and Lemeshow statistic test in which I found the model to be a good fit. The statistic showed that the estimation model was about 42.9% adequately described by the data as shown in Table 11. Field (2014) noted that well-fitting models exhibit non-significance on the H-L goodness-of-fit test which therefore indicates that the prediction from the model differs insignificantly from the observed. An examination of the Omnibus chi-square goodness of fit test indicated a statistically not significant outcome given a chi-square result of x^2 (8) = 5.175; 8 *df*, p > 0.05. The result further confirmed that the predictors used in the analysis had a statistically not significant impact on the dependent variable which is mergers and acquisitions of high-tech startups. A review of the classification plot shows that the graph included all cases for which the dichotomous criterion was true. The classification plot is a histogram that indicates all cases for which an outcome is predicted. As shown in figure 3, the classification plot was a good fit for the data as it indicated a membership of Yes. According to Field (2014), the more the cases cluster at each end of the graph, the more the plot will show which outcome actually occurred.

The odds to determine the effectiveness of the model was also established. For the null hypothesis, I determined the odds for the model when the coefficients in the model equation take the value zero. The probability of mergers and acquisitions occurring was established to be .486

while the likelihood of mergers and acquisition not occurring was calculated to be .514, and this yielded an odds ratio of .946. When the value of the odds ratio is lower than 1 the probability of the event occurring, in this case, mergers and acquisition arising decreases (Hyeoun-Ae, 2013).

Conversely, when the odds were determined using the alternative hypothesis, the likelihood of mergers and acquisitions occurring was .888 while the probability of mergers and acquisitions not occurring was determined to be .112. The odds ratio using the alternative hypothesis improved significantly to 7.928, and the odds ratio for the model was determined to be 8.38. This implies that when there is a one unit increase in the independent variable, the odds that mergers and acquisitions can be predicted increases by a factor of around 8.38.

Table 17

Interpretation Structure of Research Findings

Research question	**Guiding theory /model**	**Confirm / disconfirm extant knowledge**
• To what extent, if any, does valuation method impact the likelihood of securing funds through mergers and acquisitions for high-tech startup	• Valuation theory • Wealth maximization theory • Turnaround theory • Information asymmetry	• The variables created based on these theories extend the body of knowledge
	• Binary logistic regression	• The research findings confirm to existing knowledge that the outputs of the binary logistic regression can be used to determine the likelihood of mergers and acquisitions (Agresti & Finlay, 2009).

Based on existing literature and as discussed in Chapter 2, valuation methods approximated the features of valuation theory (Damodaran, 2005, Modigliani & Miller, 1958). In

this study, I sought to know whether or not valuation methods predicted the likelihood of securing funds via mergers and acquisitions for startups. The findings of the study provided evidence sufficient to support the null hypothesis that there is no statistically significant probability of impact of valuation methods on the ability of high-tech startups to secure mergers and acquisitions.

The study does provide evidence that binary logistic model can be used to predict the likelihood of mergers and acquisitions (Agresti & Finlay, 2009). This outcome supports Beccalli and Frantz's (2013) work in which they utilized the predictive power of binary logistic regression to establish the determinants of mergers and acquisitions in banking. The predictive accuracy of binary logistic regression has been tested in Branch and Yang (2010) in which they used the logit model to assess the market's ability to predict the eventual outcome of an announced takeover attempt. The model also aligns with observations made in Beccalli and Frantz (2013) that probabilities exceeding a higher threshold, 50%, 60%, or 80%, predict involvement in mergers and acquisitions while those with probabilities below, 50%, 40%, or 20%, do not predict involvement in mergers and acquisitions.

The probability of mergers and acquisitions occurring using CAPM was 58.40%. Mergers and acquisitions is 1.677 times more likely to be achieved using DCF method. From the statistics, the probability of securing mergers and acquisitions of high-tech startups using DCF was 62.60%. The statistics for the real options valuation method predictor produced an odd of 2.052 with the likelihood of occurrence of 67.2%. Conversely, the asset based method, the relative valuation methods, as well as the mixed valuation method, had lower odds of predicting mergers and acquisitions of high-tech startups with the probabilities of occurrence at 30.2%,

31.10%, and 48.0% respectively. As noted, five of the predictors used in the model (capital asset pricing model, discounted cash flow method, real options valuation method, venture capital method, and other valuation methods) significantly predicted the likelihood of mergers and acquisitions of high-tech startups organizations.

The results of the descriptive statistics further supported the assumption that establishing the value of an entity such as high-tech startups was a complicated process in which different valuation methods may need to be employed to determine its fair value or market value (Xiangying, Yueyan, & Xianhua, 2015). About 58% of the respondents combine different valuation methods during negotiations for mergers and acquisitions. Another 86.0% reported they utilized other valuation methods (such as multiples, P/E ratio, and economic value added) to determine the value of high-tech startup during negotiations for mergers and acquisitions.

Possible Explanation for Non-significant Statistics

One possible reason for the not significant statistics could be the population size effect. Kraemer and Blasey (2015) described the population size effect as the degree to which there is evidence to support the alternative hypothesis against the null based on the population from which the sample was drawn. The population size effect may have limited the ability of the statistical test to identify significant relationships between the variables in the study which may have resulted from a Type II error Neuman (2011). Type II error refers to the erroneous acceptance of a false null hypothesis when in fact a relationship exists within the parent population from which the sample was drawn (Bertini, 2016; Kim, 2015).

To avoid the possibility of Type II error in the study, prior to the data collection process, I used the G*Power 3.1 statistical software to determine the minimum sample size using an alpha

of 0.05 and a confidence level of 0.95 (Faul, Erdfelder, Buchner, & Lang, 2009). The effect size for the two-tailed approach was restricted to 0.10 in order to conduct a logistic regression with eight independent variables. The test result produced a sample size of 110 as against the 106 used for the actual study. The effect of Type II error was not expected because 96.0% of the sample size was achieved. The effect of Type II error was not expected to be significant on the outcome of the study because as noted by Etikan and Bala (2017), a minimum sample size of 50 was appropriate for a quantitative study. Also following the rule of 10 subjects to one variable put forward by Austin and Steyerberg (2015) as necessary for establishing a recognizable pattern in logistic regressions, the present study has a subject to variable ratio of 13.25 which is higher than the rule of 10 subjects to one variable advised by (Austin & Steyerberg, 2015). Consequently, the effect of Type II error as a function of the population size effect on the study was limited and does not diminish other findings besides the likelihood of association made from the study.

The research design or methodology adopted for the study might be another possible reason for the not significant statistics observed in the study. The choice of quantitative survey research was considered appropriate for the study. The quantitative survey research is best used to draw statistical inferences from a large sample that is representative of the intended population when using other research designs might prove difficult (Aggarwal & Saxena, 2012). I used the quantitative survey research to determine the impact of valuation methods on the likelihood of securing funds through mergers and acquisitions for high-tech startup organizations.

To test the hypotheses, an online electronic survey data was collected from 106 participants drawn from 450 high-tech startup companies in which senior executives of the

organizations were selected via a random sampling technique. Of the 498 participants contacted, 106 participants completed the survey and their inputs were spooled and then subjected to further analyses using SPSS. The random sampling technique used in the study provided every sampling unit the chance of being selected into the sample (Dixon, Singleton, & Straits, 2015). Thus, it could be argued that the study was based on a sound methodology.

In designing the questionnaire for the survey, I ensured the questions were structured in such a way that the responses yielded expected results. Inputs for the survey came mainly from finance and e-commerce (venture capitals, private equity firms, investment banking firms), mobile application companies, and telecommunication companies. Hence, the data collected could be deemed to be representative. More importantly, participation in the study was anonymous such that the information provided could not be traced to the participants especially when the questionnaire did not require their names or the organizations in which they work.

The absence of controlled group in the design might well be a reason for the not significant statistics recorded from the study. Karlson, Holm, and Breen (2012) noted that confounding variables could impact the likelihood of association between the dependent and independent variables. Agresti and Franklin (2012) attributed the cause of non-significant statistics to the absence of a controlled group, as the model might not have taken into consideration all the relevant variables for the analysis. It may well be the case that spurious factors not accounted for in the model may have led to that result (Neuman, 2011).

The absence of a statistically significant relationship between the dichotomous criterion and the predictive model may have been driven by spuriousness in the model due to the impact

of an unaccounted for variable within logit model resulting in a false obscuring of the relationship between the variables in the study (Bertini, 2016; Woolridge, 2013).

The likely variables within the context of this study that might have been unaccounted for may be the nature, size or age of the company. These three variables if accounted for in the model may have had an impact on the outcome of the study. Researchers have found that the nature, size or age of a company could be used to predicts the likelihood of mergers and acquisitions (Elbertsen, Benders, & Nijssen, 2006; Filipovic, 2012). Ucer (2009) and Erdogan(2012) also found that the likelihood of a company being acquired increases with an increase in size and age of the firm. It may well be the case that if these variables were accounted for in the regression equation, the test results might have been different.

Limitation of the Study

The limitation of this study may be traced to the research design and methodology which may have resulted in the not significant statistics recorded from the test. As previously noted, the inability to account for confounding variables in the regression equation may have attenuated the possibility of generalizing the outcome of this study. A fall out of this is also the inability to establish causation which inherent in cross-sectional studies (Altman & Krzywinski, 2015; Barrowman, 2014; Deilami, Hayes & Kamruzzaman, 2016). Thus, I could only test for association between the variables in the study. Consequently, only association of the impact of valuation methods and the likelihood of mergers and acquisitions of high-tech startups can be inferred from this study.

The use of binary logistic regression model alone for the study may not have been perfectly suited for the data. Rodrigues and Stevenson (2012) suggested a weighted combination

of more than one model to test the likelihood of association between the variables in the study and to predict the possibility of mergers and acquisitions. They argued that combining more than one model yields a relatively high prediction rate. Since this approach to predicting acquisitions has yet to be tested, I intend to continue to develop this model in my future studies.

Another limitation of the study might have resulted from the inability to achieve 100% of the expected sample size. Insufficient data imply that only available data will be used. The implication of this on the study was limited because 96.0% of the expected sample size was obtained coupled with the rule of 10 subjects to one variable being surpassed in the study. Also, because the number of participants contacted exceeded the number of high-tech startups, chances are that more than one participant from a company may have responded to the survey leading to duplicated responses. The impact of this on the study was insignificant.

Additionally, the model theories employed in the study (including valuation theory, wealth maximization theory, turnaround theory and information asymmetry theory) to investigate the hypothesis are not exhaustive. As such, it may be far-fetched explaining the outcome of this study in the context of some of the theories employed in the study.

Recommendation for Further Actions

The outcome of this study may impact two primary stakeholders – the business community that is financial houses which includes but not limited to entities listed on major trading platforms in Nigeria such as the Nigerian Stock Exchange, the NASD OTC exchange, and the Commodities exchange. Organizations listed on these platforms are continually looking for mergers and acquisitions opportunities. The findings of this study indicating a preference for discounted cash flow methods, asset-based methods, mixed valuation methods and other

valuation methods over other forms of valuation methods during negotiations for mergers and acquisitions are of particular interest to the investment banking community, portfolio managers, and owners of high-tech startups as well as investors.

The second group of stakeholder who might be impacted by the findings of this study is the research community. Future researchers may want to consider using weighted combination model to examine the impact of valuation methods on the likelihood of mergers and acquisitions as suggested by (Rodrigues & Stevenson, 2012). Also, I strongly recommend an increase in the sample size by threefold to address potential type II errors and to enhance the likelihood of association between the independent and independent variables. Expanding the sampling frame may be followed by extending the timeframe of the study beyond the precincts of 2006 and 2016, or consider another timeframe entirely.

Additionally, future researchers may wish to improve on the survey instrument used in the study by including additional questions that could capture the nature, size, and age of the company. If these variables are controlled for in future studies by including the variables in the regression equation, it may help to address the effect of confounding variable as well as prevent spurious factors from affecting the outcome of the study (Woolridge, 2013). The inclusion of these variables must be done with caution as it may breach the confidentiality of the participating companies and somewhat defeat the whole essence of anonymity adopted in online surveys.

Future researchers may want to include more theories to the ones used in this study or employ different theories that might assist to predict mergers and acquisitions. This may help in identifying more firm proxies that could be used to enhance the model to predict mergers and acquisitions. Finally, media houses in the country may find the results useful in educating the

investing public. Policy makers may find the model developed useful in predicting mergers and acquisitions and draw up related policies to support startup organizations.

Implications

The contributions of the findings of this study to the body of knowledge are discussed in this section in the context of its implication for positive social change at the individual, organizational, societal levels. The contributions of this study have significant implications for positive social change. One of the research findings of this study is that investors, as well as owners of high-tech startup, have a preference for discounted cash flow method, asset-based method, mixed valuation methods and other valuation methods such as multiples, P/E ratio and economic value added during negotiations for mergers and acquisitions.

The findings of the study may assist owners of startups to determine appropriate valuation methods used in the industry thereby reducing the valuation challenges experienced during negotiations for mergers and acquisitions. Thus, if startups are appropriately priced, it becomes easy to attract funding especially via mergers and acquisitions (Gómez-Bezares, Przychodzen, & Przychodzen, 2016). Consequently, as high-tech organizations become successful, they are able to create jobs and contribute to the social development of the communities they do business (Hollensbe, Wookey, Hickey, George, & Nichols, 2014).

The findings of this study also have significant implication to the field of management. Besides contributing to the body of knowledge, the findings of the study might help to reduce valuation challenges. Researchers may build on the logit model developed in this study to predict mergers and acquisitions. The existing literature about the startup phenomenon has been

extended in the study. The results indicated that most investors adopt a combination of valuation methods in estimating the value of high-tech startups.

Although, the model yielded mixed results, one of the findings showed that the odds of achieving mergers and acquisitions increases when capital asset pricing model, the discounted cash flow method, venture capital method, and real options valuation methods are used during negotiations for mergers and acquisitions. Real option valuation method is not seldom used in the industry possibly because of the complexities associated with its application (Schwartz, 2013), but the test results indicate that the odds of mergers and acquisitions occurring increases with the use of real options valuation model. Prior to this study, and to the best of my knowledge, there is yet to be any empirical study that produced this outcome. This is also perhaps the first time valuation methods were used as a predictive criterion for mergers and acquisitions. Therefore, future researchers may benefit from additional insights presented in the study.

As stated in Chapter 1, I hoped that investment banking firms, private equity firms, venture capitals, and other organizations saddled with valuing young firms might benefit from additional information relating to startup valuation presented in this study. One of the findings of the study showed that valuation methods were not sufficient predictors of mergers and acquisitions high-tech startups. I recommend practitioners to build on this model by adding other proxies such as nature, size and age of the company to predict mergers and acquisitions. The predictive model created in the study is backed up by applicable theories and new analytical concepts which are expected to receive attention from both the academia and the business community around the world.

Conclusion

In conclusion, the objective of this study was to examine the impact of valuation methods on the likelihood of mergers and acquisitions of high-tech startups. Survey data was collected electronically from 106 participants from the high-tech sector in Nigeria. Contrary to some prior studies, the results of this study provided no evidence to support the claim that valuation methods are predictors of mergers and acquisitions. The research presented new information on the preference of valuation methods (especially discounted cash flow method, asset-based method, and mixed valuation method) used during negotiations for mergers and acquisitions.

However, in support of existing literature, I document the odds of achieving mergers and acquisitions using the eight predictors in the study. The findings of the study show that the odds of achieving mergers and acquisitions increases with the use of real options valuation method, discounted cash flow methods, capital asset pricing method, and venture capital methods. Along these lines, the model developed for the study provided evidence in support of the existing theory that the likelihood of achieving mergers and acquisitions can be determined via the binary logistic regression. The slow pace of growth in the high-tech sector needs no further interrogation as most companies surveyed showed a preference for growing organically. These findings should guide future direction on the application of valuation methods in the industry.

Altogether, this study provides evidence that valuation methods are not predictors for mergers and acquisition but that the odds of achieving mergers and acquisition increase with the use of specific valuation methods.

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Appendix A: Questionnaire

Impact of Valuation Methods on Mergers and Acquisitions Survey

1. What field of the information technology sector do you belong to?

   Internet service providers (ISPs), telecommunication companies, IT infrastructural companies, finance and e-commerce, agriculture, health information technology, mobile application and Engineering, select all that applies
2. Which year did your company commence operation?
3. Are you a member of the Nigerian Stock Exchange? Yes/No
4. What is your organization's growth strategy, organic or inorganic?
5. Has your organization been involved in mergers and acquisitions talks in the last 10 years? Yes/No
6. Has your organization acquired or merged with any high-tech company in the last 10 years? Yes/No
7. During negotiations for mergers and acquisitions, does your organization apply Capital Asset Pricing Model? Yes/No
8. During negotiations for mergers and acquisitions, does your organization apply Discounted Cash Flow Method? Yes/No
9. During negotiations for mergers and acquisitions, does your organization apply Asset Based Method? Yes/No
10. During negotiations for mergers and acquisitions, does your organization apply Relative Valuation Method? Yes/No

11. During negotiations for mergers and acquisitions, does your organization apply Real Option Valuation Method? Yes/No
12. During negotiations for mergers and acquisitions, does your organization apply Venture Capital Method? Yes/No
13. During negotiations for mergers and acquisitions, does your organization apply Mixed Valuation Methods? Yes/No
14. During negotiations for mergers and acquisitions, does your organization apply other valuation methods e.g Multiples, Price to earnings ratio (P/E), Expected Valued Added (EVA). e.t.c? Yes/No
15. Which of the following (select all that applied) were used when assessing the valuation for the mergers and acquisitions?
    i. Capital Asset Pricing Model
    ii. Discounted Cash Flow Method
    iii. Asset Based Method
    iv. Relative Valuation Method
    v. Real Option Valuation Method
    vi. Venture Capital Method
    vii. Mixed Valuation Methods
    viii. Other valuation methods e.g Multiples, Price to earnings ratio (P/E), Expected Valued Added (EVA). e.t.c

Thank you for participating