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The Impact of Marketing On The Agribusiness Economic Sales Function

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THE IMPACT OF MARKETING ON THE AGRIBUSINESS ECONOMIC
SALES FUNCTION

by

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Bachelor of Science, Southern Illinois University
at Carbondale, 2014

A Research Paper Submitted in Partial Fulfillment
of the Requirement for the Master of Science Degree

Department of Agribusiness Economics
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RESEARCH PAPER APPROVAL

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SALES FUNCTION

By

Alex J Bone

A Research Paper Submitted in Partial

Fulfillment of the Requirements

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Master of Science

in the field of Agribusiness Economics

Approved by:

Department Chair, Agribusiness Economics, Chair

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Graduate School

Southern Illinois University Carbondale

May 18, 2015

AN ABSTRACT OF THE RESEARCH PAPER OF

Alex J Bone, for the Master of Science degree in Agribusiness Economics, presented on May 5, 2015, at Southern Illinois University Carbondale.

TITLE: THE IMPACT OF MARKETING ON THE AGRIBUSINESS ECONOMIC SALES FUNCTION

MAJOR PROFESSOR: Dr. Ira Altman

The purpose of this study is to exam the effect of marketing on the agribusiness economic sales functions in the agricultural manufacturing industry using financial metrics. For the purpose of this study the agricultural manufacturing industry will be broken into four separate sectors. These sectors are: agricultural machinery manufacturing, processing and agronomy-based manufacturers, automotive/automotive part manufacturers, and other agricultural manufacturers.

The resource-based view is used to target sectors competitive advantage in this research. Applied business knowledge will support the application of the research. The financial metrics used in this study were extracted from Bloomberg Terminal in the College of Business at Southern Illinois University at Carbondale. The Security and Exchange Commission (SEC) rated data compiled consist of numerical values representing expenditure, return on investments, and product segmentation in terms of individual allocation, segment value, and segment count. Ordinary Least Square Method will be used to analyze the data while incorporating dummy variables to differentiate between sector types.

From this research it can be deduced that marketing has a large impact on the sales forces functions explained by the operating return on assets and return on investment capital. The predicted outcome for operating return on assets and return on investment capital are rhetorical suggesting operating return on assets and return on investment capital are good indicators of the

impact of marketing on the agribusiness economics sales functions. In contrast, it is believed that sales are a vague indicator of performance and cannot be used as a performance metric.

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CHAPTER I – MARKETING AND SALES FUNCTIONS

Introduction

The performance and resulting success of a salesforce is dependent on many variables. One of the most important variables is marketing. Through the understanding of marketing and its function in sales, the salesforce can become inherently more efficient and effective. Though, at times, sales and marketing are viewed as the same, the two business functions are fundamentally different. By distinguishing between the two components of business, more efficient and effective use of marketing tools can be implemented, enhancing the productivity of the salesforce. The allocation of resources and the efficient utilization of these resources determine the success of performance variables. Marketing accomplishes the proper allocation of resources while providing needed information to determine market orientation. Marketing is a component in strategy development and objective recognition in post and preliminary sales processes, by understanding marketing's role on the sales functions the salesforce can reach strategic organizational objectives, ultimately increasing profit, while maximizing the utility of tools and resources. Marketing accomplishes this through asset management, investment management, environment awareness, collaboration, and product knowledge, development, and evaluation (Margolis 2014, p.53).

Marketing is defined as: “an organizational function and a set of processes for creating, communicating, and delivering value to customers and for managing customer relationships in ways that benefit the organization and its stakeholders” (Gundlach and Wilkie 2007, p.259). Marketing is an infrastructural building block of our economy, culture, and society. Thus, this research introduces the inquiry into the impact of marketing on the agribusiness sales function. By focusing on publically traded firms, marketing will quantify results on detailed reports of

agricultural manufacturing firms to address inefficiencies and false indicators of return on investment to provide a better representation of a firm to stakeholders. The study addresses these objectives: 1) assess the coordination between marketing and sales, identifying the functions of both sales and marketing, 2) identify target market within the agricultural manufacturing industries based on research development and product segmentation, 3) develop a marketing-mix to better control the firm's influence on target market environment and purchase behavior, and 4) orchestrate marketing communication, collaboration, and integration into agribusiness economics sales functions. The data presents monetary values of agricultural manufacturing firms based on resource allocation, research and development, operating performance, and inventory rotation and stagnation. The monetary values represent dollars spent on sales and provide very little descriptive evidence of marketing's role in the sales functions, but rather statistical evidence to explore the changing role of marketing on the sale function. Extracted from the Bloomberg Terminal, the data is SIC rated and displays actual values reported by individual firms required by Federal Law.

The research broadens the descriptive evidence to make implications on the performance of marketing, aside from sales and analyzes agricultural manufacturing firms. The term agricultural manufactures encompasses agricultural machinery manufacturers, processing and agronomy-based manufacturers, automotive/automotive part manufactures, and various other agricultural manufacturers, all of which have an influence on collaboration and adoption of new strategies and objectives. The statistical analysis of the data collected will help to understand the impact of marketing on agribusiness economics sales function. The data assesses marketing factors which influence the activities of agribusiness economic salespeople in the agriculture manufacturing industry; this is not limited to any geographic region. In addition to the research

objectives, the study will answer the question of how marketing impacts the agribusiness economic sale functions and the interdependence of marketing and sales. The data collected will assess marketing's influence and impact on the salesforce activities and resulting impact on the market orientation as it compares to sales function. Researching the impact of marketing on the agribusiness economics sales function will help a firm and/or salesforce to better select the tools used to accomplish the sales, marketing, business, and corporate goals of production. Special interest will be placed on the primary sales functions in marketing: product, price, place, promotion as well as economics decision tools addressing question pertaining to what, when how, and who as concepts of allocation, scarcity, time, and goals and objectives are applied.

Throughout the course of the research, the analysis and statistical inference will try to answer how an agricultural manufacturer can better align its marketing goals with the needs, objectives, and strategies of the overall business functions to ultimately increase profit. While incorporating budgeted activities into the model, the study looks to improve the efficiency and effectiveness of all marketing activities, extending its inquiry into understanding firms return on investments to adjust budget constraints and allocate resources accordingly. Using linear multiple regression modeling, the study will statistically quantify sales, operating return on assets, and return on investment capital as a function of inventory turnover ratio, inventory to sales ratio, research and development to sales, advertising expense, marketable securities, capital expenditure to sales, product segmentation revenue value, product operating income value, segmentation of assets, and number of segments per firm.

Evidence from fiscal year 2014 will be used. The research will aid a firm or person in making more informed decisions based on past results when selecting marketing strategies. Special interest will be directed towards the alignment and collaboration of marketing strategies

and objectives with sales strategies and objectives to achieve the optimal rate of efficiency within an agriculture manufacturing firm.

Literature Review

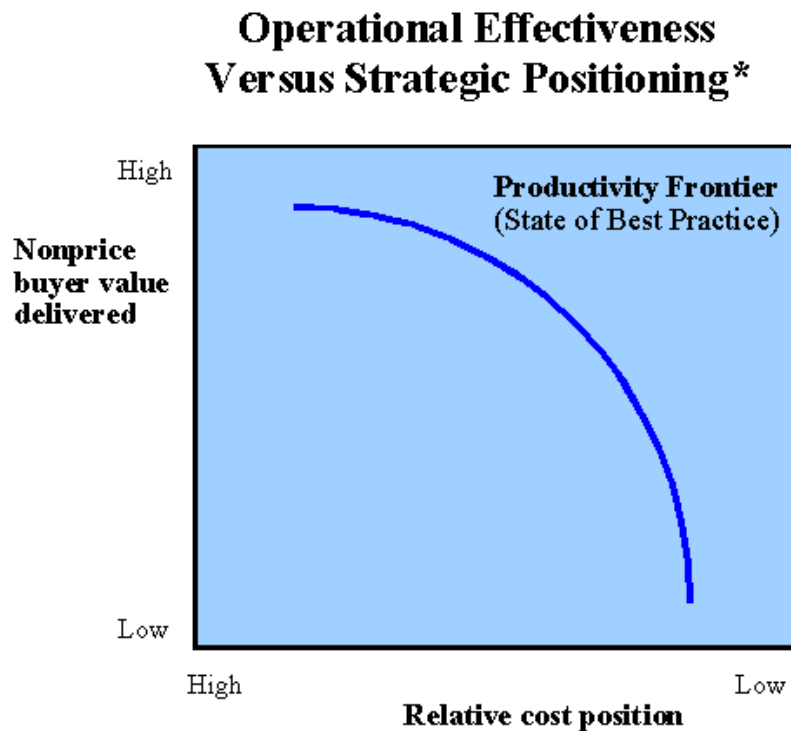
In “The Agricultural Marketing System,” V. James Rhodes states that economic principles are essential to understanding marketing, but raises the belief that while essential, marketing is only part of economics, which implies there is a need to have an understanding of economics as its own field of study before addressing marketing as part of strategy management within a firm (16). The overlap of marketing and economics sets the foundation to support this research. Presumably economics addresses principles about supply and demand and the exploiting forces (Rhodes 1987). “Economics is the allocation of scarce resources between competing ends for the maximization of those chosen ends over time, with provisions for maintaining and modifying the system of choice” (Snodgrass and Wallace 1964). The definition includes the concept for explaining resource allocation, limitations of time, resource scarcity, and strategic management through goal and objective establishment (Snodgrass and Wallace 1964). Economics is a behavior science that is used in decision making that draws linkages between personal insight, training, and judgement to raise relevant questions pertaining to different situations. In many situations the behavior being measured is a monetary measurement, as is the case in this research; this is where strategy management within economics establishes a relationship to marketing. Marketing principles revolve around the “four P’s:” product, price, place, and promotion. By incorporating these variables into economic decision models where questions of what, when, how, and who are answered, economists and marketers can achieve optimum results. This fundamental model is called the marketing-mix.

Issues arise when unexpected negative influences distort previously established strategies and goals, which is the nature of human behavior, hence the need for a structurally sound base of economic knowledge. Rhodes states the key questions that arise when developing a structural base are: what should be produced and how much, is the product produced efficiently and by whom shall the product be produced for, and who is the target market the product is being produced for (16)? The point and highly debated ideologies, regardless of the question, strengthen the structural base, therefore strengthening the firm's market mix. Agribusinesses typically do not have influence over prices, implying the prices are determined by supply-and-demand, forces outside the agribusiness firm's control (Rhodes 1987). In the same context, economics assist in describing competition through imperfections such as differentiation and economies of scale to better understand price functions; both of which are described in the resource-based view of the firm addressed later in this text. Therefore, the theoretical understanding of existing competition is required. By combining an economic and management foundation with science, firms can eliminate the abstract nature and induce institutional guidelines through the use of a conceptual model (Rhodes 1987). These institutional guidelines provide structure and operational effectiveness that separate firms through the creation of unique and valuable positions known as strategy (Porter, What is Strategy?, 10).

Operational effectiveness and strategy are two different functions. Explained in Michael E. Porters article, "What is Strategy?," strategy is about being different, purposely choosing activities based on a mix of value (What is Strategy? 1996, p.6). As for operational effectiveness, this is performing similar activities better than rivals creating means of efficiency (Porter, What is Strategy? 1996, p.5). Operational effectiveness is best described by the productivity frontier. The illustration below is the sum of all best practices at any given time; the frontier is the

accumulation of process and manufacturing for a firm's activities. The closer a firm is to the origin, the more efficient its operational effectiveness is. The only deficiency is in technological adoption, due to the constant shift outward due to the introduction of new technology. Utilizing both operational effectiveness and strategy firms creates strategic position. The origins of positioning in agriculture manufacturing stem from variety based positioning, which can be seen through segmentation and specialization (Porter, What is Strategy?, 8). For the purpose of this study, product segmentation revenue value and Bloomberg Industry Classification System (BICS) product segment count are variables indicating the monetary value individual firms allocate to each division.

Figure 1



Michael Porter's article, "The Five Competitive Forces that Shape Strategy," introduces competition as a proponent to increase profitability concerning the five competitive forces: 1)

threat of entry, 2) the power of suppliers, 3) the power of buyers, 4) the threat of substitutes, and 5) rivalry among existing competitors with the influence of marketing on profitability (2008, p.26-32). Porter goes on to explain that every firm should know limitations of the industry it which it operates and how it changes over time to reveal significant aspects about the environment the firm operates (The Five Competitive Forces That Shape Strategy 2008, p.35). By understanding the industry structure, firms can construct a tactical response to compete and alter industry structure to favor firm performance, exploiting the alteration and ultimately establishing a competitive advantage (Porter, The Five Competitive Forces That Shape Strategy 2008, p.35). As for analyzing manufacturing firm's performance in terms of resource allocation, Michael Porter assists in providing a position for firms to analyze their spending with return on investment. This opens the doors to look at asset management and strategic placement in a competitive environment addressed in the resource-based view.

The institutional guidelines provide very little empirical evidence to suggest there is collaboration between sales and marketing within organizations, implying the working relationship between sale and marketing needs improvement according to Kenneth Le Meunier-FitzHugh and Nigel F. Piercy in the "Drivers of sales and marketing collaboration in business-to-business selling organizations" (2009, p.612). The interdependence gives reason to define these two fields prior to addressing the role of marketing within Agribusiness Economics sales function role. Le Meunier-Fitzhugh and Piercy addresses the idea that organizations do not deviate between sales and marketing due to the customer interface constraints and market presence demands, but recognizes the salesforce functions as an influencing factor in implementing business and marketing strategy (Drivers of Sales and marketing collaboration in business-to-business selling organizations 2009, p.612). Not explicitly distinguished, the sales

and marketing functions cooperate cross functionally, meaning their functionality operates on two different dimensions: orientation and competencies (Ernest, Hoyer and Rubsaamen 2010, p.81). In contrast, orientation and competencies provide rationale for each department to have its own strategic design due to environment audience and behavioral requirements and responsibilities automatically assigned by individual competencies (Ernest, Hoyer and Rubsaamen 2010, p.81-82).

When defining sales, specifically the function, the view becomes evident that “sales contribute to conceiving, producing, and delivering customer value by understanding customers’ and/or sellers’ needs and fulfilling these needs with the bundle of goods and services” (Haas, Snehota and Corsaro 2011). This is not far from the definition of marketing stating, marketing is an organizational function and a set of processes for creating, communicating, and delivering value to customers and for managing customer relationships in ways that benefit the organization and its stakeholders (Gundlach and Wilkie 2007, p.259). Cross analyzing these two components of business, it can be noted that the concept of interaction between marketing and sales functions co-exist to create relationship value. By joining and exploring the role of marketing in creating valued business relationships allows for the conception of the value-created process seen in marketing as a discipline; exchange management has also introduced the concept of marketing, setting the foundation for understanding the marketing environment and purchasing behavior (Haas, Snehota and Corsaro 2011, p.95). The fundamental market mix incorporates rational characteristics that join sales and marketing functions for coordination, communication, and market intelligence to increase operational efficiencies (Le Meunier-FitzHugh and Piercy F 2009, p.614). Establishing these efficiencies through jointness, balanced initiative, interacted value, and socio-cognitive construction management can establish the interdependent

relationship between sales and marketing ultimately portraying value to satisfy human wants (Haas, Snehota and Corsaro 2011, p.96). The collaboration exposes a different perspective for managers to assess the firm's current organizational strategies, sales approach, and marketing approach to strength competitive positions. By strengthening competitive position through collaboration managers are able to recognize deficiencies in marketing and sales functions through asset management and capital-investment allocation; that of which investment functions provide clients with returns and results (Margolis 2014, p.53).

Gregory T. Gundlach and William L. Wilkie previously defined marketing as: “an organizational function and a set of processes for creating, communicating, and delivering value to customers and for managing customer relationships in ways that benefit the organization and its stakeholders” (2007, p.259). From this definition of marketing, economics implications can be drawn, linking it to micro and macro views. The macro approach to agricultural marketing is defined as the performance of all business activities involved in the forward flow of goods and services from producers to consumers (Rhodes 1987, p.6). Furthermore, the micro approach to agricultural marketing is defined as the performance of business activities that direct the forward flow of goods and services to consumers and accomplish the firm's objectives (Rhodes 1987, p.10). By differentiating between the two views and standardizing marketing functions, conclusions can be drawn to support evidence that descriptive marketing and financial metrics can be analyzed to create competitive advantage in terms of sufficiency, resource allocation, asset management, and investment management.

From here the analysis shifts to the question of, what is a marketing function, aside from the sales function. “A marketing function is defined as a service, an act, or an operation performed in the production or distribution of goods to satisfy human wants,” classified by

functions of exchange, distribution, and trade facilitating functions (Holtzclaw 1935). The need to measure the impact of marketing on the sales functions is to increase operational efficiencies while increasing collaboration and creating measures of performance to increase interdependence. Likewise, the firm's orientation assists in capturing the market and accomplishing the organizational goals and while following the strategy. By targeting the functionality of marketing, alterations can be imposed to determine operational effectiveness's influence on the orientation. Most agribusiness firms operate on a sales-oriented product identification basis while a large portion are becoming marketing-oriented, capturing larger influencing variables that influence sales performance as a function of marketing (Rhodes 1987). The ability for an agribusiness firm to profit from marketing oriented structure stems from the differences in marketing structures achievable opportunities (Rhodes 1987). These identifiers are the supporting evidence and difference between those firms who hold product inventories in fluctuating markets (Rhodes 1987). Furthermore, Mark J. Lawless in "The View from the Sales and Marketing Organizations," says having a greater market-oriented structure supports the use of more tactical and strategic tools to optimize performance measures and estimates (2014, p.14). In the case of manufacturers, this is limited to the prices paid for raw materials, uniformed influence on procurement prices, and adverse reactions on selling prices (Rhodes 1987). This is the origination of firms who set prices versus setting margin (Rhodes 1987). Thus many firms enhance their marketing security and profits from diversifying activities, seen in the form of promotional campaigns such as personal selling, advertising, or promotion, which is not realistic in an atomistic firm (Rhodes 1987).

Aside from the sales oriented product identification, researchers propose that marketing-oriented product identification offers aggressive opportunities for firms seeking growth (Rhodes

1987). Coordination of aggressive activities through marketing requires reflection and alignment with the goal and organizational needs of the firm (Rhodes 1987). The technique that captures market share agonistically is advertising as a component of the marketing-mix (Rhodes 1987). The impersonal mass media principal must accomplish the objectives of marketing, creating awareness while emphasizing brand recognition while creating a competitive advantage through strategic positioning and intrinsic component in researching marketing's impact on the agribusiness economics sales functions (Rhodes 1987).

Agribusiness economics has advanced the understanding of marketing coordination by introducing economic reasoning and various theoretical models to advance marketing and management (King, et al. 2010, p.556). The advances assisted in the improvement of coordination between the function of marketing with supply chain management in order to increase market structure performance (King, et al. 2010, p.556-563). In the work of Robert P. King, et al. it was stated, strategy creates linkages to assist in the formation, interpretation, and monitoring the business environment (King, et al. 2010). The theoretical models provide cooperative analysis to govern organizational design and quality stemmed frameworks (King, et al. 2010).

From an industry perspective, the economic model proven to be extremely useful in strategy development is industrial organization economics (Hansen and Wernerfelt 1989, p.400). Industrial organization economic approach states a theoretical approach that exudes influences of market structure on firms' strategic performance (Hansen and Wernerfelt 1989, p.400). Analyzing characteristics of firm's profitability implications can be drawn to assume a significant impact on explanatory variables can inherently influence industry characteristic, alter competitive competition and distort firm's resource channeling (Hansen and Wernerfelt 1989,

p.400). Industrial organization economic model describes industry profitability based on firm size, market share, market power, capital intensity, and growth concentration, but lacks justification for firms to alter strategy to include marketing in strategic development (Hansen and Wernerfelt 1989, p.400). For the purpose of this research, emphasis is laid upon sector performance of the manufacturing industry. Drawing implications from industrial organization economics will strengthen the debate pertaining to the impact of marketing on agribusiness economics sales functions. In contrast, the resource based view will provide a theoretical perspective from the firm's point of view as compared to the industry perspective.

As the research looks to introduce the organizational structure of marketing-oriented business efficiencies through marketing and financial metrics, it also delivers a theoretical perspective addressing organizational competencies associated with the internal structure of the organization incorporating the resources and capabilities of the firm to better meet the emerging challenges of a competitive market (Szymaniec-Mlicka 2014, p.20). The operational efficiency in conjunction with the operating environment, as a public organization, assumes there is natural interaction of the environment and the organization. The environment in the research refers to the factors and forces that affect the firm's ability to make and maintain efficient and effective relationships. The resource-based view translates vulnerability from lack of knowledge, unpredictable changes, and results from environmental turbulence into expectations for stakeholders implying resources-based theory is a more stable resource for predicting competencies and creating sustainable competitive advantage (Szymaniec-Mlicka 2014, p.20). Aside from resource-based view, alternative approaches to describe competition include product market competition, which is captured in the Bertrand price competition and Cournot quantity competition (Costa, Cool and Dierickx 2013, p.447). These valuable models describe quantity

and price competition, but are limited to supply and demand functions and are adjusted for “buy-all-sell-all” situations due to flexible production and inventory cost, all of which become sunk cost. The resource-based view identifies important differences between price and quantity competition to create sustainable competitive advantages. Thus, by eliminating the need for Bertrand and Cournot models of competition, sustainable competitive advantage can be achieved. Furthermore, the competitive effects of resource-based view enable strategic substitutes to increase output with the intent of increasing profits (Costa, Cool and Dierickx 2013, p.447).

From a different perspective, resource-based theory has been criticized for being broad and lacking subject diversification (Costa, Cool and Dierickx 2013, p.446). According to various other theories, sustainable competitive advantage stems from the possession of heterogeneous resources, which is not captured in the resource-based view. The differentiation increases customer’s perceived value and warrants a more economical competitive advantage (Costa, Cool and Dierickx 2013, p.445). Furthermore, it has been argued that the resource-based view does not analyze market power in terms of product deployment, but only considers its own market power (Costa, Cool and Dierickx 2013, p.446). The deployment of resources and their contributions to the firm’s strategic goals alters the validity of the resource-based view.

The resource based view holds true under quantity competition, providing the sustainable competitive advantage through cost reducing measures and return from resources, thus challenging the proper allocation of scarce resources (Costa, Cool and Dierickx 2013, p.447). In contrast, price competition creates false perception of a firms’ return on resources. This approach to competition, on the surface, portrays sustainable competitive advantage, but ultimately results in a decrease in return, which can be attributed to the reduction of cost that, in return, conveys

low marginal cost. The low marginal cost translates in to price reduction, thus causing a domino effect on its competitors. That is, until the price reaches a low enough level that product market entry barriers are low enough competition increases, ultimately decreasing firm's returns due to saturation (Costa, Cool and Dierickx 2013, p.447).

The negative implications drawn from the resource-based view were taken into consideration in the work of Luis Almeida Costa, Karel Cool, and Ingemar Dierickx, in "The competitive implications of the deployment of unique resources." By contrasting product marketing deployment methods in an oligopoly model with the resource-based model to disperse supply and demand shift effects, a competitive advantage can be created and according to Costa, Cool, and Dierickx, "competitive advantage is essential for superior value creation" (Costa, Cool and Dierickx 2013). The justification for using the resource-based view stems from the available publications written by marketing scholars. By differentiating between competitive influences, marketers will be able to better align marketing strategy with sales strategy while detailing functions of collaboration, integration, and communication of marketing and sales functions to ultimately increase returns to portray shareholder value. The analysis of financial metrics will be used to assess marketing-mix performance and establish a competitive advantage.

As stated in the work of Ronald L. Goettler and Brett R. Gordon, competition is fostered from innovation, implying innovation drives consumer welfare and firm profitability (Goettler and Gordon 2012, p.1). The magnitude endured through innovation is dictated by products substitutability, entry cost, and innovative spillovers (Goettler and Gordon 2012, p.1). As a component of innovation, these attributes assist in the alignment of operational effectiveness (operational strategy) and competitive strategy (Laosirihongthong, Choon Tan and Kannan 2010, p.5943-5944). By distinguishing between drivers of innovation and understanding strategic

objectives marketing positively impacts manufacturing performance through market focus and segmentation (Laosirihongthong, Choon Tan and Kannan 2010, p.5945). For the purpose of this research, Laosirihongthong, Tan, and Kannan support the hypothesis that the number of sectors in a manufacturing environment is inversely related to manufacturing performance (Laosirihongthong, Choon Tan and Kannan 2010, p.5945). In the case of manufacturing firms, the implications drawn from this statement will be analyzed in the research to support the theory that a thorough understanding of marketing's impact on the sales function is essential to achieve optimal performance. Through the development of multiple regression models, discussed in the next section, manufacturing performance will describe target market and focus. From prior research, it can be argued that by focusing on target markets and performing well in niche areas, firms are more responsive to environmental changes, increasing innovation and product customization (Laosirihongthong, Choon Tan and Kannan 2010, p.5945).

The corollary that firms make decisions based from specific manufacturing practices justifies the research. By using financial metrics marketing decisions can be quantitatively justified. From the work of Ofer Mintz and Imran S. Currim, linkages connect marketing-mix activities with financial metrics (2013, p.17-40). Their work creates rationale to construct such hypotheses to support the use of financial metrics in marketing, measuring the impact of marketing on sales functions. By incorporating strategy, metric orientation, and proposing theoretical abstract describing firm characteristics, using the resource-based view, Mintz and Currim's conceptual model uses this information for decision making (2013, p.20-25). Much like Mintz and Currin's study, the research will utilize financial metrics to describe the manufacturing industry. The dependent financial metrics being analyzed in this research include sales, operating return on assets, and return on investment capital. To describe the dependent

variables this study will use 10 independent variables (explanatory variables). These include inventory turnover ratio, inventory to sales ratio, research and development expenditure to net sales, advertising expense, marketable securities, capital expenditure to sales, product segmentation revenue value, and product operating income value, segmentation of assets, and BICS segment count.

Prior to the justification to the use of these variables in the research it is necessary to understand what exactly defines capital. Because capital is referenced in this text, working knowledge and justification will provide clarification to why it is such an important component to define. Capital in terms of tangibility is expressed as a physical domain including items such as equipment, construction of any nature, machinery, and producers' inventories; moreover, intangibles include capital investments such as education, technical training, and managerial knowledge (Snodgrass and Wallace 1964). The tangibility of capital has not always been defined in this context though; traditionally capital was defined "as all the forms of reproducible wealth or goods used directly or indirectly in the production process;" based on tangible items with a discrepancy between human value and the value of goods and services in future development (Snodgrass and Wallace 1964). From this new perspective, the definition arose stating that capital is a factor of production which encompasses the flow and generation of income over a period of time. The measurement of capital captures three components that will be used in this research. These components were addressed by Milton M. Snodgrass and Luther T. Wallace in the text, "Agriculture, Economics, and Growth" stating that total accumulation of funds, total of all expenditures, and enumeration and evaluation of the production of all physical goods are measures of capital (1964, p.102). The intangible perspective broadens capitals characteristics increasing the durability, reduced mobility, and time in project accomplishments. These

characteristics apply to research and development in an effort to justify rotation of education, knowledge, and technical abilities after training considering cost, time, and effort (Snodgrass and Wallace 1964). The values created through capital expenditure to sales for the purpose of this research evaluate the performance metrics to measure marketing impact on the sales functions.

The use of each of these variables is supported through the resource-based view of creating competitive advantage, increased profits, conceptual marketing models, and through marketing, mixed components. Through definition, each variable is proven to measure performance, both in terms of quantity and price. In particular, inventory turnover ratio is “the ratio showing how many times a company's inventory is sold and replaced over a period (Bloomberg Finance LP 2015).”

$$\frac{\text{Trailing 12 Month Cost of Goods Sold}}{\text{Average Inventory}}$$

The inventory turnover ratio pertains to the succession of supplying, producing, and distributing efficiently and effectively (Burja and Burja 2010, p.45). The lower the ratio, the more efficient inventory is rotating, simultaneously increasing profit (Burja and Burja 2010, p.45). The next performance variable being analyzed is inventory to sales ratio. This performance metric is used to determine the amount of inventory on hand to support net sales. The importance of the metric is seen in the description of goods, and not services, and is an indicator for future production, a remnant for future knowledge, and a measure of supply chain efficiency (Ramey and Vine 2004, p.959). Calculated as:

Inventory
Trailing 12 Months Sales

Subsequently, research and development (R&D) expenditure to net sales ratio is useful to compare the effectiveness and efficiency of R&D expenditures between companies in the same industry. This ratio challenges allocation methods and influences strategy on the premises of adoption, innovation, and flexibility of the business.

$$\frac{\text{R\&D Expenses}}{\text{Net Sales}} \times 100$$

The next explanatory variable is advertising expense. According to Bloomberg Finance LP, this is a figure as reported by the business through the Security and Exchange Commission (SEC) (Bloomberg Finance LP 2015). All publically traded companies report \$0.00 advertising revenue, thus, advertising expense is not a performance metric but rather an indicator to resource allocation and descriptive variable for increasing operational effectiveness and strategic positioning.

Following advertising expense is marketable securities which include cash and liquid securities that can be converted into cash quickly at a reasonable price” (Bloomberg Finance LP 2015). Calculated as:

Cash + Short Term Investments and Marketable Securities + Long Term Marketable Securities

Marketable securities for the purpose of the study are used as a form of measurement. By using this metric, measures of liquidity and financial depth will support the alterations to strategy through averted funds. Next, capital expenditure to sales ratio measures the percentage of capital expenditures to sales. This metric measures a firm's ability to acquire long term sales assets.

$$\frac{\text{Capital Expenditures} \times (1)}{\text{Net Sales}} \times 100$$

The magnitude of the capital expenditure to sale determines the firm's ability to invest in itself through capital expenditure. Therefore a large ratio is a positive sign that is seen in salesforce/function growth. Capital expenditure to sales is important to this research because it is industry specific. Moving forward, product segmentation revenue value, according to Bloomberg Finance LP, is geographic segmentation metric used to eliminate constraints posed by the number of products (Bloomberg Finance LP 2015) and specifies the revenue for a firm's segments (Bloomberg Finance LP 2015). The figure is provided and calculated by the business in which the research analyzing.

Next is the product operating income value, as seen in previous explanatory variables, product operating income value is a single dimension variable measuring performance on the basis of profit and operating cost to achieve the optimal operational effectiveness. This is accomplished by deducting cost of goods sold/wages and depreciation from profits (Bloomberg Finance LP 2015).

$$\text{Profit} - \text{Cost of Goods Sold (including wages)} - \text{Depreciation}$$

Segmentation of assets is a decision metric that assists in analyzing financial burdens based on the basis of segmentation to control risk associated with cash flow from operation. By using segmentation of assets, product characteristics can be used to influence the cash flow (Beeson, et al. 1990, p.407). Furthermore, the financial metric is an indicator of segment liquidity (Beeson, et al. 1990, p.407) that encompasses concepts of opportunities cost by averting funds to acquire assets. The last explanatory variable is the segment count provided through Bloomberg industry classification system (BICS). By keeping track of the number of segments, individual firms using the study will statistically analyze the correlation of the variable with dependent variables used to measure marketing's impact on the sales functions. The BICS product segment count recognizes external products shown through the Peer Product Comparison (PPC) required for all publically traded firms (Bloomberg Finance LP 2015).

The previously described explanatory (independent) variables used to describe the dependent variables in this research include: sales, operating return on assets, and return on investment capital. The first financial metric analyzed is sales, defined as an exchange of a good or service to meet personal, financial, and business expectations with the intention of generating profit. Due to the nature of sales and its popularity over other performance metrics, the variable is expected to be misleading when determining return or resource allocation in the case of this research. Second is operating return on assets, a measure of a firms' profitability and its ability to deploy its operating assets to generate operating profits. Operating return on assets is calculated as:

$$\frac{\text{Trailing 12 Months Operating Income}}{\frac{\text{Total Assets Beginning Balance} + \text{Total Assets Ending Balance}}{2}} \times 100$$

Using operating return on assets as a metric, a business will be able to differentiate between its normal performance metric to establish an argument based on income and investments to provide a more descriptive measure of return on investment. Last is return on investment capital that measures the effectiveness of a firm's source of capital invested in operations (Bloomberg Finance LP 2015). When applied to manufacturing, industry operating return on investment provides versatile and simplistic figures used to compare products across the industry, thus creating competitive advantage, or used internally when determining efficiencies.

$$\frac{\text{Trailing 12 Months Net Operating Profit After Tax}}{\text{Average Invested Capital}} \times 100$$

In the context of the research, the manufacturing industry will be divided into four sectors in order to determine implications and challenge the proper allocation of resources in a competitive market. The efficient, effective, and accurate presentation of the findings for each sector will eliminate industry bias, and allow for a customized and strengthened argument to how marketing impacts the agribusiness economic sales functions. Each sector will have a different sample size due to data availability and each sector might encompass manufactures that product in more than one sector, but for simplicity the sector to which each firm is assigned will determine the focus of that company for the sake of research. The four sectors include 1) agricultural machinery manufacturers, 2) processors and agronomy based manufacturers, 3) automotive and automotive part manufacturers, and 4) other agricultural manufacturers.

TABLE 1

Agricultural Machinery Manufacturers			
Reference	Ticker Symbol	Corporation	Sector
1	AGCO	AGCO Corporation	1
2	ALG	Alamo Group, Inc.	1
3	ARTW	Art's Way Manufacturing Company	1
4	BGG	Briggs and Stratton	1
5	BUCY	Bucyrus International	1
6	CAT	Caterpillar Inc.	1
7	CMCO	Columbus McKinnon Corp.	1
8	CNH	CNH Industrial N.V.	1
9	DE	Deere and Company	1
10	F	Ford Motor Company	1
11	FAST	Fastenal Company	1
12	GENC	GenCorp Industries, Inc.	1
13	HIT	Hitachi, Ltd.	1
14	HMC	Honda Motor Company	1
15	HUSQF	Husqvarna	1
16	IBM	International Business Machines	1
17	IRBT	IRobot	1
18	JOYG	Joy Global	1
19	KUBTY	Kubota Corporation	1
20	KWHIF	Kawasaki Heavy Industries Ltd	1
21	LECO	Lincoln Electric Holdings, Inc.	1
22	LNN	Lindsay Corporation	1
23	MTW	Manitowoc Company	1
24	OGNG	Bravo Enterprises Ltd	1
25	RR	Rolls Royce Holdings plc	1
26	SHLD	Sears	1
27	SOM	Somero Enterprises, Inc.	1
28	SOYL	American Soil Technologies, Inc.	1
29	TEX	Terex Corporation	1
30	TITN	Titan Machinery, Inc.	1
31	TTC	Toro Company	1
32	VV	Versatile Systems Inc.	1

TABLE 2

Processing and Agronomy Based Manufacturers			
Reference	Ticker Symbol	Corporation	Sector
33	ADM	Archer-Daniels-Midland Company	2
34	AGU	Agrium Inc.	2
35	AMRS	Amyris Inc	2
36	ANDE	The Andersons, Inc.	2
37	ANV	Allied Corporation	2
38	APD	Air Product & Chemical	2
39	AVD	American Vanguard Corp.	2
40	BAS	BASF	2
41	BAYN	Bayer Pharmaceuticals	2
42	BDBD	Boulder Brands Inc.	2
43	BFRE	BlueFire Renewables Inc	2
44	BG	Bunge Limited	2
45	CAG	ConAgra Foods	2
46	CE	Celanese	2
47	CF	CF Industries Holdings, Inc.	2
48	CHD	Church & Dwight	2
49	CHMT	Chemtura	2
50	CQB	Chiquita Brands Internation	2
51	DD	DuPont	2
52	DF	Dean Foods	2
53	DOW	The Dow Chemical Company	2
54	ECL	Ecolab	2
55	EMN	Eastman Chemical Company	2
56	EVGN	Evogene	2
57	EVK	Evonik Industries	2
58	FMC	FMC Corp.	2
59	GIS	General Mills	2
60	GPRE	Green Plains Inc	2
61	GRA	W.R. Grace and Company	2
62	HRL	Hormel Food Company	2
63	INGR	Ingredion Incorporated	2
64	IPI	Intrepid Potash	2
65	K	Kellogg's	2
66	KMGB	KMG Chemicals	2
67	KRFT	Kraft Foods	2
68	KWR	Quaker Chemical Corporation	2

Processing and Agronomy Based Manufacturers Continued			
69	KWS	KWS SAAT	2
70	LXS	Lanxess	2
71	MON	Monsanto Company	2
72	MOS	The Mosaic Company	2
73	POT	Potash Corp. of Saskatchewan, Inc.	2
74	RIN	Vilmorin & Cie	2
75	RTK	Rentech	2
76	SAP	Saputo Inc.	2
77	SXT	Sensient Technology	2
78	SYT	Syngenta	2
79	SZU	Sudzucker	2
80	TATE.L	Tate & Lyle plc	2
81	TNH	Terra Nitogren Company	2
82	WDFC	WD-40	2

TABLE 3

Automotive/Automotive Parts Manufacturers			
Reference	Ticker Symbol	Corporation	Sector
83	ACAT	Arctic Cat Inc	3
84	AMTY	Amerityre Corp	3
85	BMW	Bayerische Motoren Werke AG	3
86	CMI	Cummins Inc.	3
87	CTB	Cooper Tire and Rubber Company	3
88	FCAU	Fiat Chrysler	3
89	GE	General Electric Company	3
90	GM	General Motors	3
91	GT	Goodyear Tire and Rubber Company	3
92	HY	Hyster-Yale Materials Handling Inc	3
93	KGTO	Kogeto Inc	3
94	MLR	Miller Industries, Inc.	3
95	MMTOF	Mitsubishi Motor Corporation	3
96	NAV	Navistar International	3
97	OSK	Oshkosh Corporation	3
98	PCAR	PACCAR Inc	3
99	PPG	PPG Industries	3
100	SPAR	Spartan Motors Inc	3
101	STS	Supreme Industries, Inc.	3
102	SUP	Superior Industries International Inc.	3
103	SZKMF	Suzuki Motor	3
104	TERX	Terra Inventions Corp	3
105	TM	Toyota Motor	3
106	TSLA	Tesla Motor Company	3
107	TTM	Tata Motors	3
108	TTTM	T3 Motion Inc.	3
109	VOLVY	Volvo	3
110	WNC	Wabash National Corporation	3
111	ZAAP	ZAP	3

Table 4

Other Agricultural Manufacturers			
Reference	Ticker Symbol	Corporation	Sector
112	ALB	Albermarle Paper Manufacturing Company	4
113	AND	Acadian Timber Corp	4
114	ANS	Ainsworth Lumber Co. Ltd.	4
115	CFF	Conifex Timber Inc.	4
116	CFP	Canfor Corporation	4
117	DEL	Deltic Timber Corp	4
118	ECOB	Eco Building Products Inc	4
119	IFP	Interfor Corp	4
120	LUK	Leucadia National Corp.	4
121	MAA	Magindustries Corp.	4
122	MMM	3M Company	4
123	PCL	Plum Creek Timber Company	4
124	POPE	Pope Resources A Delaware LP	4
125	RYN	Rayonier Inc. REIT	4
126	SJ	Stella-Jones Inc.	4
127	TREX	Trex Company Inc.	4
128	UFPI	Universal Forest Products, Inc.	4
129	WEF	Western Forest Products, Inc.	4
130	WFT	West Fraser Timber Co. Ltd.	4
131	WY	Weyerhaeuser Company	4

Methodology

The data used in this study was extracted from the Bloomberg Terminals made available by the College of Business at Southern Illinois University at Carbondale. The data provides standard industrial classification (SIC) rated information describing 131 different manufacturing firms 2014's fiscal year. The statistical method used in this study uses cross-sections analysis which will assist firms in identifying causal effects of one or more independent variables upon a dependent variable at a given point in time. Cross-sectional regression analysis was chosen over time-series analysis due to the lack of adoption and compliance when the technology age arose. To further justify the use of cross-sectional data, the definition of time-series data should be described. Time-series data is the identification of aggregate economic variables behavior through time, in order to identify characteristics challenging the allocation of resources, so that an inference can be made towards the population. Cross-sectional data, in the research, draws inferences from a sample size of 131 firms during a single year to provide evidence for an individual and/or firm's use when analyzing their firm's strategy based on financial metrics.

To further the analysis, this study will utilize Ordinary Least Square (OLS) estimator method; for means of standardization due to the assumptions that OLS is an unbiased estimator where all errors are random and follow normal distribution. This method denotes *beta* (β) as the unknown parameter (coefficient) being estimated, X as the independent variables, and y as the dependent variable, where ε is the random error term and i is the index for that particular observation ($i = 1, \dots, n$).

$$y_i = \beta_0 + \beta_1 X_i + \beta_2 X_i + \beta_3 X_i + \varepsilon_i$$

If the parameters are deemed statistically significant, there is a dependent relationship between the two variables that are being tested (null hypothesis). The alternative hypothesis being tested suggests that there is no dependence between the two variables. It is hypothesized that marketing performance metrics have a large impact on the performance of the salesforce, explained by the operating return on assets and return on investment capital. The predicted outcome for operating return on assets and return on investment capital are rhetorical, suggesting operating return on assets and return on investment capital are good indicators of the impact of marketing on the agribusiness economics sales functions. In contrast, it is believed that sales are a vague indicator of performance implying and cannot be used as a performance metric. The implications from the results can be used to find the best measure of return for strategy management in marketing. The multiple regression models will test the significance for three dependent variables including: sales, operating return on assets, and return on investment capital.

The model will allow for the use of dummy variables to differentiate between firms who reported expenditures versus those who did not, measure the impact of Bloomberg Industry Classification System (BICS) product segment count on dependent variable, and divide the 131 manufacturing firms into different sectors to measure the impact of each sector on the other. By incorporating dummy variables in the model, individual sectors can be identified and parameters can be estimated, enabling more accurate results for individual sector performance. Moreover, the application of dummy variables in the OLS model compensates for the lack of value in particular field such as advertisement expense, product segmentation revenue value, and product operating income value.

$$\gamma_i = \beta_0 + \beta_1 X_i + \beta_2 X_i + \beta_3 D_i + \varepsilon_i$$

The next chapter (Chapter II) is divided into 6 main sections, reflecting the results from the data extracted to challenge the allocation of marketing resources, furthering the knowledge of marketing's impact on the sales functions. The research concludes with a chapter (Chapter III) that summarizes research findings and discusses the impact of marketing on the agribusiness economic sales functions after the results have been formulated.

CHAPTER II – ANALYSIS OF DATA

Introduction

Throughout the course of this research the objectives have identified the primary financial components thought to affect marketing's impact on the agribusiness economics sales functions. Thus, the inquiry into the application of these metrics is essential to justify a firm's alteration to their current strategy to include market-oriented functions in to business processes to increase operational effectiveness. The sample consists of 131 agricultural manufacturing firms. The firms were categorized by product types and inclusion of the agriculture industry. The manufacturing firms being analyzed were extracted from the Bloomberg Terminals and divided into four sectors. These sectors being: agricultural machinery manufacturers, processor and agronomy based manufacturers, automotive and automotive part manufacturers, and other agricultural manufacturers. These four sectors will differ in sample size due to availability of data within each sector. Each of these sectors services different target markets, therefore each sectors strategy will deviate from the industry norm.

The inclusion of each of these sectors will be described in the first three models depicting the agricultural manufacturing industry according to the three dependent variables, all the firms included in the sample, to provide relevant data to support industrial organization economic approach which determines what make an industry profitable, specifically what makes it profitable through marketing. By dividing the industry into sectors, the results of this research will justify the use of the resource-based view supporting and strengthening the two theories ideology through allocation, collaboration, communication, and integration of marketing oriented strategies, as compared to sales oriented strategies, to create competitive advantage. By

analyzing the operational effectiveness explained in Michael Porter's work, managers will be able to gain an understanding of financial metrics for a better representation of the firm's profits.

Through the use of the Ordinary Least Square (OLS) method multiple regression models will be constructed to cross analyze explanatory variables influence on the dependent variables. When measuring the statistical validity of the effects of descriptive tools on financial performance metric an *alpha* (α) of 0.05 (5.0%) level of significance will be used; in the tables and text this value will be referred to as the *P*-value. In the tables that follow, the values represented by the heading "estimate coefficient" present monetary values and/or take monetary factors into consideration. The following descriptive financial metrics represent millions of dollars: advertising expense, marketable securities, capital expenditure to sales, product segmentation revenue value, product operating income value, and product segmented assets. The impact of each descriptive metric (independent variable) will indicate whether or not the effect is positive or negative based on the level of significance. If the *beta* value is not significant (P -value > 0.05), for the purpose of this study, it will be considered irrelevant. When testing and measuring the significance of *beta* values, all null hypothesis will state that *beta* values are equal to zero ($\beta=0$) measured using standardized *t*-statistic. In contrast, the alternative hypothesis will test the opposite where *beta* is not equal to zero ($\beta\neq 0$). On a different note, the *f*-statistic will test whether or not R^2 is equal to zero. Therefore, the null hypothesis will state that R^2 values are equal to zero ($R^2=0$), meaning the explanatory variables describe the dependent variables perfectly. With regards to the alternative *f*-statistic hypothesis, this will state that R^2 is not equal to zero ($R^2\neq 0$).

Table 5

Manufacturing Industry Break Down		
Manufacturing Sectors	Sector Identification	Number of Firms
Agricultural Machinery Manufacturers	1	32
Processor and Agronomy Based Manufacturers	2	50
Automotive and Automotive Part Manufacturers	3	29
Other Agricultural Manufacturers	4	20
Total	4	131

Results

The compounding results from analyzing manufacturing industry across four separate sectors were found to be inconclusive; this includes all types of manufacturers for which information was collected. By regressing sales, operating return on assets, and return on operating income as defined in the text it can be concluded that the inventory turnover ratio, inventory to sales ratio, research and development expenditure to net sales, advertising expense, marketable securities, capital expenditure to sales, product segmentation revenue value, product operating income value, segmentation of assets, and BICS segment count are vague indicators of performance. The lack of significance indicates that the magnitude of each variables impact is inaccurately represented due to the high level of error present in the equation. This error traced back to the degrees of freedom disperse the impact of each variable across to many manufacturers and performance indicator as they pertain to marketing role in the sales function. To better align the needs of each industry with the performance on the dependent variables, being more selective when choosing independent variables couple have been used; this would have limited the marginal error and increases research efficiency potentially providing better and more accurate results.

CHAPTER III

Summary, Implications, and Conclusion

The purpose of this study was to examine the impact of marketing and its functions on the agribusiness economic sales functions. One-hundred and thirty-one publically traded firms were selected from the Bloomberg Terminals to represent agricultural manufacturing industry. These manufacturers were chosen due to their success and data availability. Each of these firms were placed into four sectors these being: agricultural machinery manufacturers, processor and agronomy based manufacturers, automotive and automotive part manufacturers, and other agricultural manufacturers. To measure the success and impact of marketing on the sales functions the research used sales, operating return on assets, and return on investment capital descriptive performance (dependent) variables. The explanatory variables used to describe the dependent financial metrics were inventory turnover ratio, inventory to sales ratio, research and development (R&D) expenditure to net sales, advertising expense, marketable securities, capital expenditure to sale, segmented assets, product segmentation revenue value, product operating income value, and BICS product segment count.

To measure profitability of these firms this research analyzed industrial organization economic theory and resource-based view of the firm to identify the best method of analysis. The work of many scholars assisted in rationalizing strategic and tactical decisions alterations to increase competitive advantage. The primary objective of this study was to quantify the results of marketing impact on the agribusiness economic sales function through collaboration, integration, communication, and adoption. The use of ordinary least square (OLS) method multiple regression models were used to see which explanatory variable had a statistically significant impact on descriptive financial metrics used for strategic goal development.

This study has its limitations. First, it only analyzes firms of the manufacturing industry as they relate to agriculture. To increase the accuracy and provide relevant data to all manufactures the restriction would have to be removed and board application would have to be imposed. Second, the analysis analyzes tangible goods. By only analyzing tangible goods various other components of business get lost, once again, restricting the application data and restricting the amount of impact explanatory variables have on dependent variables. Third, the use of cross-sectional data has inherent limitations for inferring relationship dynamics and causal effects. To justify the use of these parameters for strategic use it must be noted that these limitation are common among research and data analysis pertaining to marketing, its orientation, and influences on the firm. Fourth, the magnitude of this study was overpowering and was falsely represented due to the span of manufactures information gathered and included. This caused the data to be distorted and misrepresenting of the key variables. Lastly, the use of metrics distorts the validity and level accountability associated with long term and short term effects on strategy.

The implications of this research suggest that marketing is an essential component to be included in the strategic development. The active promotion of marketing-mix tools is positively associated to financial metrics that determine salesforce function performance. Thus, the financial metrics are equally important in supporting the development of marketing strategy to accomplish organizational goals, while increasing operational effectiveness through collaboration, communication, integration, and adoption for the. The results of this study provide justification for firms to eliminate barriers between the sales and marketing departments to identify the relationship between financial metric as they pertain to sales and marketing.

In a business environment where creating competitive advantage is keen, creating a successful strategic position will be required to compete. Therefore, a thorough understanding of

marketing-mix tools will assist in training, implementing, and tactically responding to alterations in the environment. Similarly, understanding the marketing-mix and financial metrics that influence outcomes will provide foundation for firms to alter strategy when a situation arises. Knowledge of sales and marketing functions prior to addressing strategies will increase the probability of achieve the optimal outcome.

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APPENDICES

APPENDIX A

DEFINITIONS

BICS Product Segment Count: Returns the number of standardized Bloomberg Industry Classification System (BICS) external level products shown on the Peer Product Comparison (PPC) screen for any given ticker.

Product Segmentation Revenue Value: Product/Geographic segmentation field specifying the revenue metric value for the given segment number. The Equity Funds Segment Number acts as an override, eliminating any constraints posed by the number of products. The Product/Geographic Override can be used to specify either a product or geographic breakdown of the data. Corresponding name and value fields are available for each metric.

Intersegment revenue may be included when this is the only breakdown disclosed by the company. For geographic segments, revenue origination is populated when revenue by destination is not disclosed.

Marketable Securities: Includes cash and liquid securities that can be converted into cash quickly at a reasonable price. Calculated as:

Cash & Near Cash + Marketable Securities & ST Investment + LT Marketable Securities

Capital Expenditure to Sales: Measures the percentage of capital expenditures to sales. Unit: Actual. Calculated as: $[(\text{Capital Expenditures} * -1) / \text{Net Sales}] * 100$

Advertising Expenses: This is the Advertising Expenses figure as reported by the company. The account title may be standardized and slightly different from the original account title in the company's financial statement. All publically traded companies report \$0.00 advertising revenue.

R & D Expenditure to Net Sales: This ratio is applicable to Industrial sector. R & D expenditure to Net Sales is calculated as follows: $(\text{R \& D expenses} / \text{Net Sales}) * 100$

Inventory to Sales Ratio: Calculated as Inventory found on the balance sheet divided by trailing 12 month sales for the most recent four quarters.

Inventory Turnover Ratio: Ratio showing how many times a company's inventory is sold and replaced over a period. Unit: Actual. Calculated as: $\text{Trailing 12 Month Cost of Goods Sold} / \text{Average Inventory}$

Product Operating Income Value: The amount of profit realized from a business's operations after taking out operating expenses - such as cost of goods sold (COGS) or wages - and depreciation.

Segmented Assets Value: Measures the value of assets that are used in operating activities that are directly attributed to the allocation of that segment.

Operating Return On Assets: Measure of how profitably a company is able to deploy its operating assets to generate operating profits. Unit: Actual. Calculated as: $[\text{Trailing 12 Month Operating Income} / ((\text{Total Assets beginning balance} + \text{Total Assets ending balance}) / 2)] * 100$

Return on Investment Capital: Indicates how effectively a company uses the sources of capital (equity and debt) invested in its operations. Average Invested Capital is the average of the beginning and ending balance of Total Invested Capital. It is computed as: $100 \times (\text{T12M Net operating profit after tax} / \text{Average invested capital})$

** All definitions in Appendix B are from The Bloomberg Terminal Glossary:

Relative Value Function for Agricultural Manufactures. FY 2014, via Bloomberg Finance LP, accessed February 21, 2015.

APPENDIX B

TABLE 1

Reference	Ticker Symbol	Corporation	Sector	Reference	Ticker Symbol	Corporation	Sector
1	AGCO	AGCO Corporation	1	41	BAYN	Bayer Pharmaceuticals	2
2	ALG	Alamo Group, Inc.	1	42	BDBD	Boulder Brands Inc.	2
3	ARTW	Art's Way Manufacturing Company	1	43	BFRE	BlueFire Renewables Inc	2
4	BGG	Briggs and Stratton	1	44	BG	Bunge Limited	2
5	BUCY	Bucyrus International	1	45	CAG	ConAgra Foods	2
6	CAT	Caterpillar Inc.	1	46	CE	Celanese	2
7	CMCO	Columbus McKinnon Corp.	1	47	CF	CF Industries Holdings, Inc.	2
8	CNH	CNH Industrial N.V.	1	48	CHD	Church & Dwight	2
9	DE	Deere and Company	1	49	CHMT	Chemtura	2
10	F	Ford Motor Company	1	50	CQB	Chiquita Brands Internation	2
11	FAST	Fastenal Company	1	51	DD	Dupont	2
12	GENC	Gencor Industries, Inc.	1	52	DF	Dean Foods	2
13	HIT	Hitachi, Ltd.	1	53	DOW	The Dow Chemical Company	2
14	HMC	Honda Motor Company	1	54	ECL	Ecolab	2
15	HUSQF	Husqvarna	1	55	EMN	Eastman Chemical Company	2
16	IBM	International Business Machines	1	56	EVGN	Evogene	2
17	IRBT	Irobot	1	57	EVK	Evonik Industries	2
18	JOYG	Joy Global	1	58	FMC	FMC Corp.	2
19	KUBTY	Kubota Corporation	1	59	GIS	General Mills	2
20	KWHIF	Kawasaki Heavy Industries Ltd	1	60	GPRE	Green Plains Inc	2
21	LECO	Lincoln Electric Holdings, Inc.	1	61	GRA	W.R. Grace and Company	2
22	LNN	Lindsay Corporation	1	62	HRL	Hormel Food Company	2
23	MTW	Manitowoc Company	1	63	INGR	Ingredion Incorporated	2
24	OGNG	Bravo Enterprises Ltd	1	64	IPI	Intrepid Potash	2
25	RR	Rolls Royce Holdings plc	1	65	K	Kellogg's	2
26	SHLD	Sears	1	66	KMGB	KMG Chemicals	2
27	SOM	Somero Enterprises, Inc.	1	67	KRFT	Kraft Foods	2
28	SOYL	American Soil Technologies, Inc.	1	68	KWR	Quaker Chemical Corporation	2
29	TEX	Terex Corporation	1	69	KWS	KWS SAAT	2
30	TITN	Titan Machinery, Inc.	1	70	LXS	Lanxess	2
31	TTC	Toro Company	1	71	MON	Monsanto Company	2
32	VV	Versatile Systems Inc.	1	72	MOS	The Mosaic Company	2
33	ADM	Archer-Daniels-Midland Company	2	73	POT	Potash Corp. of Saskatchewan, Inc.	2
34	AGU	Agrium Inc.	2	74	RIN	Vilmorin & Cie	2
35	AMRS	Amyris Inc	2	75	RTK	Rentech	2
36	ANDE	The Andersons, Inc.	2	76	SAP	Saputo Inc.	2
37	ANV	Allied Corporation	2	77	SXT	Sensient Technology	2
38	APD	Air Product & Chemical	2	78	SYT	Syngenta	2
39	AVD	American Vanguard Corp.	2	79	SZU	Sudzucker	2
40	BAS	BASF	2	80	TATE.L	Tate & Lyle plc	2

TABLE 2

Reference	Ticker Symbol	Corporation	Sector	Reference	Ticker Symbol	Corporation	Sector
81	TNH	Terra Nitogren Company	2	121	MAA	Magindustries Corp.	4
82	WDFC	WD-40	2	122	MMM	3M Company	4
83	ACAT	Arctic Cat Inc	3	123	PCL	Plum Creek Timber Company	4
84	AMTY	Amerityre Corp	3	124	POPE	Pope Resources A Delaware LP	4
85	BMW	Bayerische Motoren Werke AG	3	125	RYN	Rayonier Inc. REIT	4
86	CMI	Cummins Inc.	3	126	SJ	Stella-Jones Inc.	4
87	CTB	Cooper Tire and Rubber Company	3	127	TREX	Trex Company Inc.	4
88	FCAU	Fiat Chrysler	3	128	UFPI	Universal Forest Products, Inc.	4
89	GE	General Electric Company	3	129	WEF	Western Forest Products, Inc.	4
90	GM	General Motors	3	130	WFT	West Fraser Timber Co. Ltd.	4
91	GT	Goodyear Tire and Rubber Company	3	131	WY	Weyerhaeuser Company	4
92	HY	Hyster-Yale Materials Handling Inc	3				
93	KGTO	Kogeto Inc	3				
94	MLR	Miller Industries, Inc.	3				
95	MMTOF	Mitsubishi Motor Corporation	3				
96	NAV	Navistar International	3				
97	OSK	Oshkosh Corporation	3				
98	PCAR	PACCAR Inc	3				
99	PPG	PPG Industries	3				
100	SPAR	Spartan Motors Inc	3				
101	STS	Supreme Industries, Inc.	3				
102	SUP	Superior Industries International Inc.	3				
103	SZKMF	Suzuki Motor	3				
104	TERX	Terra Inventions Corp	3				
105	TM	Toyota Motor	3				
106	TSLA	Tesla Motor Company	3				
107	TTM	Tata Motors	3				
108	TTTM	T3 Motion Inc	3				
109	VOLVY	Volvo	3				
110	WNC	Wabash National Corporation	3				
111	ZAAP	ZAP	3				
112	ALB	Albermarle Paper Manufacturing Company	4				
113	AND	Acadian Timber Corp	4				
114	ANS	Ainsworth Lumber Co. Ltd.	4				
115	CFF	Conifex Timber Inc.	4				
116	CFP	Canfor Corporation	4				
117	DEL	Deltic Timber Corp	4				
118	ECOB	Eco Building Products Inc	4				
119	IFP	Interfor Corp	4				
120	LUK	Leucadia National Corp.	4				

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